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among 17 Billion Models:
The Importance of History and Religion**

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ISSN: 2365-9793

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ABSTRACT

Explaining Post-Cold-War Civil Conflict among 17 Billion Models: The Importance of History and Religion

Model uncertainty remains a persistent concern when exploring the drivers of civil conflict and civil war. Considering a comprehensive set of 34 potential determinants in 175 post-Cold-War countries (covering 98.2% of the world population), we employ stochastic search variable selection (SSVS) to sort through all 2^{34} possible models. Looking across both cross-sectional and panel data, three robust results emerge. First, past conflict constitutes the most powerful predictor of current conflict: path dependency matters. Second, larger shares of Jewish, Muslim, or Christian citizens are associated with increased chances of conflict incidence and onset - a result that is independent of religious fractionalization, polarization, and dominance. Third, economic and political factors remain less relevant than colonial origin and religion. These results lend credence to several existing schools of thought on civil conflict and provide new avenues for future research.

JEL Classification: D74, Q34, Z12, F54

Keywords: civil conflict, civil war, stochastic search variable selection (SSVS), greed versus grievances, religion and conflict

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1 Introduction

When the Cold War ended 30 years ago, what would have helped predict the intrastate conflicts of the next generation? Understanding the conditions under which large-scale organized violence is more likely to emerge constitutes a primary topic of scholarly research in political science, history, economics, sociology, and anthropology. Although researchers have made tremendous progress in laying out individual hypotheses of conflict, pinning down the conditions under which civil conflict (i.e., 25+ annual battle-related deaths) and civil war (1,000+ battle-related deaths) is more likely to emerge remains difficult.

Two issues stand out. First, the literature has proposed a voluminous set of candidate predictors. As a case in point, Table A1 illustrates the factors considered in four seminal works concerned with post-WWII events (Fearon and Laitin, 2003; Collier and Hoeffler, 2004; Montalvo and Reynal-Querol, 2005; Esteban et al., 2012b). While 26 variables are proposed between them, only four appear across all four studies. Thus, *model uncertainty* abounds, not least because theoretical models usually have to focus on one particular element – such as specific cultural, economic, geographical, or political factors – at the expense of simplifying assumptions along other dimensions. Consequently, the robust determinants of conflict incidence and onset remain hidden somewhere beneath $2^{26}+$ models.

Second, even seemingly robust correlates can become fragile, depending on which covariates are accounted for. For instance, it has become a stylized fact that conflict is more prevalent in poor countries (e.g., see Blattman and Miguel, 2010). How robust is that relationship which appears so firmly grounded in theoretical and empirical work? Employing post-Cold-War data for 175 countries covering 98.2% of the world population, Table 1 documents the results from predicting civil conflict and civil war incidence between 1992 and 2017.

Column (1) confirms the benchmark finding, producing a negative correlation that is both quantitatively and statistically significant (p-value of 0.000). Column (2) then accounts for political rights and infant mortality rates – factors previously suggested as meaningful predictors (Esty et al., 1995; Walter, 2004). Now, GDP/capita loses statistical power (p-value of 0.149) with its magnitude dropping by almost two thirds. We still obtain a negative relationship and the effect size is far from inconsequential, but this lack of robustness for what is considered one of the prime relationships in the literature is concerning. In columns (3) and (4), we conduct

Table 1: Results from logistic regressions, displaying marginal effects.

Dependent variable:	Any civil conflict 1992 – 2017 (mean= 0.406)		Any civil war 1992 – 2017 (mean= 0.200)	
	(1)	(2)	(3)	(4)
Ln(GDP/capita) ₁₉₉₁	-0.152*** (0.018)	-0.057 (0.038)	-0.061*** (0.023)	-0.016 (0.024)
Absence of political rights ₁₉₉₁		0.055*** (0.014)		
Infant mortality rate ₁₉₉₁		0.002 (0.001)		
Peace ₁₉₉₁				-0.008*** (0.001)
<i>N</i>	175	175	175	175

Notes: Robust standard errors are displayed in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

a similar exercise for civil war, this time incorporating a measure for the country’s consecutive peaceful years. Again, when including income alone, we find an estimated negative relationship that is both quantitatively and statistically meaningful (p-value of 0.013); but once peace years are accounted for, income levels become statistically irrelevant (p-value of 0.496), and the effect size has shrunk by a factor of three. Granted, these regressions are hand-picked to provide a straw-man, but they do serve to illustrate the fundamental model uncertainty burdening the literature.

In what follows, we present an empirical analysis to isolate the robust predictors of post-Cold-War civil conflict and civil war, incorporating a comprehensive set of potential factors. We deploy stochastic search variable selection (*SSVS*) which permits consideration of a large number of potential correlates searching over subsets of regressors that contain the best information content regarding the dependent variable. Housed in a Bayesian hierarchical approach, *SSVS* estimates posterior inclusion probabilities (PIPs), i.e., the conditional probability that a regressor possesses predictive power.

Our main dataset considers 34 variables proposed by the literature, pertaining to key concepts of economic development (seven variables), political institutions (four), demographics (two),

cultural characteristics (six), history (six), as well as geography and climate (nine). In our main empirical model, we carefully select these variables to balance a trade-off between data availability and the inclusion of each concept as best as possible to maintain fidelity with the extant literature. With 34 potential regressors, *SSVS* sorts through 2^{34} , or more than 17 billion, possible models, and we consider cross-sectional (one observation per country) and panel data using five-year intervals (1991-1995, 1996-2000, . . .).¹ In additional analyses, we account for those variables that are not available for all 175 countries, such as inequality, detailed measures on educational attainment, and traditional measures of religious fractionalization and polarization. It turns out that the inclusion of these additional variables in the empirical model does not add to the pool of statistically and empirically relevant predictors of civil conflict/war.

2 Theoretical Background

2.1 Conceptualizing Civil Conflict and Civil War

When and why people choose to take up arms against compatriots constitutes a dominating question in the human project. We focus on events since 1991, as the end of the Cold War constitutes a natural incision in geopolitical dynamics. An additional benefit of considering more recent events relates to data availability, which can otherwise prevent the study of representative samples. Historically, some cultural, economic, and political concepts have been especially difficult to measure in conflict-ridden societies, which can lead to the omission of a non-trivial, non-random number of nations and therefore selection biases.

Defined as a “contested incompatibility that concerns government and/or territory” that results in 25+ annual battle-related deaths (Pettersson, 2019), civil *conflict* measures internal and internationalized internal conflicts.² Civil *war* distinguishes itself by featuring 1000+ annual battle-related deaths (Blattman and Miguel, 2010). The corresponding literature typically explores the incidence and onset of these events (Blattman and Miguel, 2010), where incidence simply assesses whether a country is in civil conflict/war in a given year, while onset defines

¹For the final period, we average outcome variables over three years from 2016-2018 because data availability stops in 2018.

²Considering only internal (as opposed to internal and internationalized internal) conflicts produces consistent results (see row 2 of Tables D1-D4).

when such an event begins.

2.2 Theoretical Underpinnings

We briefly highlight the most relevant theoretical frameworks along with their empirical operationalization. An early conceptualization views conflict as the outcome of a *contest model* in which two competing groups decide how much to allocate to the contest for power (Haavelmo, 1954; Hirshleifer, 1989; Garfinkel, 1990). In a series of empirical papers, Collier and Hoefler (1998, 2004), Collier and Rohner (2008), and Collier et al. (2009) distinguish *greed* from *grievances*, broadly corresponding to opportunities (greed) and inequitable societal divisions across economic, ethnic, political, or religious dimensions (grievances). This distinction, although basic, delineates two (potentially complementary) philosophies on the fundamental causes of large-scale intrastate violence. Under these umbrella terms, it is important to understand which, if any, characteristics matter. This question is one that our analysis is well-positioned to answer since *SSVS* is particularly suited to incorporate a large number of potential covariates.

Related to grievances, cultural distributions have been proposed, most notably ethnic and religious fractionalization and polarization (e.g., see Montalvo and Reynal-Querol, 2005, Esteban and Ray, 2008, 2011a, and Esteban et al., 2012a,b). More generally, religious denomination may serve as a common identity that allows leaders to overcome collective action problems when mobilizing followers (Fearon and Laitin, 2003; Basedau et al., 2016). Particular religions have often been associated, positively and negatively, with the propensity to reach for arms (e.g., see Pinker, 2011, and Jenkins, 2014).³

Further, outside the greed-versus-grievance realm, historical events have been suggested to cast long shadows. Colonial origin and immediately preceding conflict are often seen as powerful predictors of violence (e.g., see Fearon and Laitin, 2003). Finally, national demographics, geography, and climatic anomalies have been proposed to inform the likelihood of conflict. The following Section discusses the variables corresponding to these broad categories, along with the

³For instance, Pinker (2011, l.705) quotes the New Testament (Matthew 10:34-37): “Think not that I am come to send peace on earth: I came not to send peace, but a sword.” Jenkins (2014, p.14) writes: “In modern times, radical Muslim clergy and activists have often cited religious justifications for violence, to the extent that many Jews and Christians even doubt that Islam is a religion, rather than a militaristic doomsday cult. Yet Christian leaders in 1914 or 1917... used well-known religious terms to contextualize acts of violence.”

respective sources that present the underlying hypotheses in detail.

3 Empirical Literature and Data

We study 175 countries with potential correlates measured in 1991 to predict conflict between 1992 and 2017. Although some countries remain absent because of data availability, this sample covers over 98% of the world population. Figure 1 visualizes conflict incidence from 1992-2017, highlighting missing countries in yellow. In Asia, we only miss seven, mostly small countries, such as Brunei or Timor-Leste. Only three African countries are missing with São Tomé and Príncipe, the South Sudan (founded in 2011), and Swaziland. In the Americas, we lack information for Aruba, the Cayman Islands, and Curaçao. This coverage compares favorably to that of the seminal pre-Cold-War studies summarized in Table A1 (138-161 countries; also see [Hegre and Sambanis, 2006](#)).

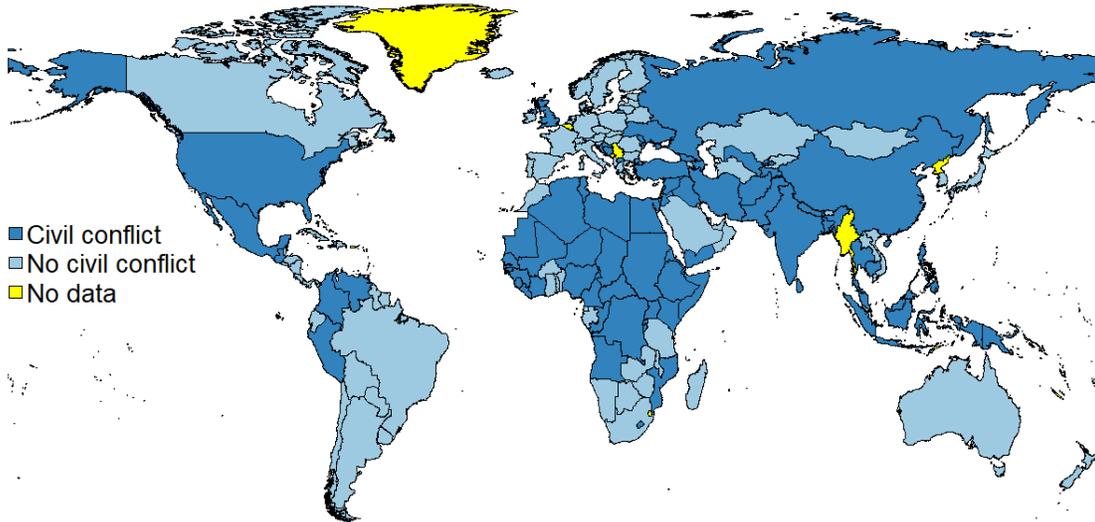


Figure 1: Data coverage, illustrated with conflict incidence between 1992 and 2017.

Table B1 summarizes the 34 variables we analyze in our benchmark sample (correlations between all variables are provided in Table 6; summary statistics for all additional variables are available in Table B2). We begin with those categories that are potentially malleable through development or policy intervention, whereas the final categories constitute largely invariable characteristics formed through history, geography, and climate. Naturally, some variables could

well be attributed to several categories, so these categorizations should be seen as suggestive and remain inconsequential for estimations.

3.1 Outcome Variables

To measure conflict, we access what has become the standard database, the Uppsala Conflict Data Program (UCDP; see [Gleditsch et al., 2002](#), [Pettersson et al., 2019](#), and [UCDP/ PRIO, 2019](#)). We first pursue cross-sectional data, coding whether the country experienced, for example, any conflict incidence year between 1992 and 2017. This concerns 71 of the 175 sample countries, whereas conflict onset occurred in 41 out of the 141 nations that were not in conflict in 1990. Civil war has befallen 35 countries and new civil wars sprung up in 26 out of the 162 countries that were not in civil war in 1990. To alleviate endogeneity concerns from reverse causality, we capture all independent variables in 1991 to predict the likelihoods of subsequent conflict starting in 1992.

3.2 Explanatory Variables

3.2.1 Economic Development

Following the literature, and indicative of *greed*-related hypotheses, we include GDP/capita ([Fearon and Laitin, 2003](#); [Blattman and Miguel, 2010](#)), as well as natural resource rents ([Collier and Hoeffler, 1998, 2004](#)) and international trade as shares of GDP ([Hegre and Sambanis, 2006](#); [Martin et al., 2008](#)). Further, we measure population welfare with life expectancy and infant mortality rates ([Esty et al., 1995](#)), as well as the duration of primary and secondary education ([Collier and Hoeffler, 2004](#)).⁴ Results are consistent when capturing education with population shares having completed primary, secondary, or tertiary schooling (from [Barro and Lee, 2013](#); see row 13 of Tables [D1-E4](#)).

In additional models, we find inequality ([Collier and Hoeffler, 2004](#); [Esteban and Ray, 2008, 2011b](#)), measured by Gini coefficients (that are only available for 106 sample countries), and a squared term of income levels to allow for potential nonlinearities (see [Collier and Hoeffler, 2004](#),

⁴GDP/capita correlates strongly with life expectancy (coefficient of 0.82) and infant mortality rates (-0.82). Nevertheless, our results are qualitatively consistent when excluding these variables because of their relatively high degree of multicollinearity with income levels (see row 3 of Tables [D1-E4](#)).

Hegre and Sambanis, 2006, and Collier et al., 2009 on the possibility of nonlinearities) remain statistically irrelevant (see row 9 of Tables D1-E4).

3.2.2 Political Institutions

Inclusive political institutions may offer opportunities to peacefully express and address grievances (Walter, 2004). Political rights and the rule of law have been suggested to decrease commitment problems that may otherwise encourage violence (Garfinkel, 2004). In practice, different elements of political institutions are often closely correlated. We incorporate an index measuring the absence of political rights (Collier and Hoeffler, 2004), ranging from one to seven, as our representative measure for political institutions. We do so for two reasons. First, political rights are available for all 175 countries in 1991, whereas comparable variables – such as the *polity2* indicator or the democracy variable (from Marshall and Jaggers, 2002; see Fearon and Laitin, 2003, Cotet and Tsui, 2013, and Conconi et al., 2014) – are only available for 151 countries. Importantly, the 24 countries that miss information on the *polity2* indicator are not ‘average’ in that only 12.5% (three of them) have experienced civil conflict between 1992 and 2017, as opposed to 45% in the full sample. And second, political rights in 1991 are closely correlated with the *polity2* measure (correlation coefficient of -0.89), Polity IV’s democracy and autocracy measures (-0.90 and 0.86), the absence of civil liberties (from Freedom House, 2018; 0.91), and executive constraints (from Marshall and Jaggers, 2002; -0.86). Nevertheless, results remain consistent when considering these alternative concepts (see rows 14 and 15 of Tables D1-E4).

To capture additional political parameters that have been suggested to inform conflict, we account for OPEC (Organization of the Petroleum Exporting Countries) membership in 1991, common law systems (Cotet and Tsui, 2013), and federalism (Sambanis, 2004). OPEC membership captures unusual wealth from oil reserves in combination with domestic political surroundings that allow forming part of the organization. Common law systems (as opposed to civil law) constitute fundamental characteristics of the judiciary, whereas federalism may affect the likelihood of conflict by increasing confidence in agreements with the government and through decentralization, thereby helping to address grievances of otherwise marginalized groups (Lijphart, 1977; Hechter, 2000).

3.2.3 Demographics

We employ two indicators capturing demographic characteristics. As conflict thresholds are defined on an absolute basis (i.e., 25 or 1,000 deaths in a year), we account for population size and population density (Collier and Hoeffler, 1998; Hegre and Sambanis, 2006; Cotet and Tsui, 2013; Acemoglu et al., 2019). For example, Esteban et al. (2012b, p. 1315) indicate that “[w]e note with some misgivings that the PRIO thresholds are not normalized by the population of the country in question, which undoubtedly biases civil wars in favor of large countries. The population control in our exercises should take care of this problem.”

3.2.4 Cultural Attributes

Heterogeneity among social groups has been proposed as a potential source of grievances that may ultimately foster conflict (Gellner, 1983; Ignatieff, 1994; Walker, 1994; Horowitz, 2000; Huntington, 2000; Fearon and Laitin, 2003). The literature highlights various such measures along ethnic, linguistic, religious, and social dimensions, usually capturing fractionalization and polarization. Fractionalization measures the probability of two randomly selected individuals belonging to different groups, while polarization considers the dominance of a small number of groups. We construct indices of religious fractionalization and polarization following Alesina et al. (2003, p. 159), Montalvo and Reynal-Querol (2005, p. 798), and Basedau et al. (2016), using novel data from the World Religion Database (Maoz and Henderson, 2013) that include substantially more countries than previous studies (e.g., Montalvo and Reynal-Querol, 2005). With x_1 , x_2 , x_3 , x_4 , and x_5 denoting shares of Christians, Muslims, Buddhists, Jews, and other adherents, fractionalization is calculated as

$$Fractionalization = 1 - \sum_{i=1}^5 x_i^2, \quad (1)$$

whereas polarization is calculated as

$$Polarization = 1 - \sum_{i=1}^5 \left(\frac{0.5 - x_i}{0.5} \right)^2 \times x_i. \quad (2)$$

Ranging from zero to one, higher values constitute greater degrees of fractionalization and polarization, respectively. In additional specifications, we find results robust to employing [Montalvo and Reynal-Querol's \(2005\)](#) variables (see row 10 of Tables [D1-E4](#)). Further, incorporating religious *dominance*, defined as one religious denomination constituting at least 60 percent of the populace (following [Basedau et al., 2016](#)) does not affect findings (see row 7 of Tables [D1-E4](#)). We also find that language fractionalization, a measure only available for 166 of the 175 sample countries, remains statistically irrelevant (see row 8 of Tables [D1-E4](#)).

The literature further discusses the proportion of the population adopting a particular religion. For example, monotheistic religions in particular have been linked with increased conflict potential ([Iyigun, 2015](#); [Skali, 2017](#); [Becker et al., 2020](#)). A common religious identity may facilitate overcoming the collective action problem that often prevents mobilization of the masses. Accordingly, [Fearon and Laitin \(2003\)](#), [Sambanis \(2004\)](#), and [Toft \(2007\)](#) use the population share identifying as Muslims, while [De Soysa \(2002\)](#) considers the shares of both Muslims and Christians as potential correlates of conflict. We incorporate population shares adhering to the four major world religions with Christianity (55% in the average country), Islam (25%), Buddhism (3%), and Judaism (1%).

3.2.5 Historical Characteristics

Acknowledging a country's history, we capture path dependency by considering the number of years since the previous conflict ([Hegre, 2001](#); [Collier and Hoeffler, 2004](#); [Weidmann and Ward, 2010](#); [Acemoglu et al., 2019](#)). The average country in our sample enjoyed almost 28 years of peace until 1991, although 34 countries were in conflict in 1991 and 20 countries receive the maximum value of 46 (since we cap that variable at the end of WWII). Results are consistent when employing a binary indicator for being at peace in 1990 instead and when measuring $\ln(1+\text{peaceful years})$ to acknowledge potentially diminishing returns in additional peace years (see rows 4 and 5 of Tables [D1-E4](#)).

Further, our analysis incorporates colonial origin with binary indicators for countries that at some point in their history were under British, French, Portuguese, Spanish, or Turkish rule ([Collier et al., 2009](#); [Cotet and Tsui, 2013](#)). Note that a country could be assigned to more than one of those groups if it was controlled by different powers at different times (e.g., Jamaica and

Trinidad and Tobago exhibit British and Spanish colonial history).

3.2.6 Geographical and Climactic Characteristics

A final set of covariates considers geography and climate. Following [Hegre and Sambanis \(2006\)](#), we control for binary indicators of Africa, Asia, North America, South & Middle America, and Oceania (Europe constitutes the reference point). Given the importance of geography, terrain, and accessibility for international factions (e.g., peacekeeping forces) for conflict ([Fearon and Laitin, 2003](#); [Blattman and Miguel, 2010](#)), we also include landlockedness and island status.

In addition, with a growing body of literature emphasizing the potential influence of climate indicators on conflict (e.g., see [Salehyan, 2008](#), [Hsiang et al., 2011, 2013](#), [Hsiang and Burke, 2014](#), and [Burke et al., 2015](#)), we consider rainfall and temperature. Specifically, we measure the deviation of rainfall and temperature from its long-run average where the long-run is calculated as a 30-year moving average for past values (see [Koubi et al., 2012](#)). We also conduct robustness checks using the growth in rainfall ([Miguel et al., 2004](#)) and temperature deviations from the sample mean ([Buhaug, 2010](#); [Hendrix and Salehyan, 2012](#)) as alternative indicators (see row 6 of Tables [D1-E4](#)).

4 Empirical Strategy

4.1 Overview

[Leamer's \(1985\)](#) extreme bounds analysis (*EBA*) constitutes the methodological precursor to *SSVS*. For example, [Hegre and Sambanis \(2006\)](#) use *EBA* to study 88 potential correlates of post-WWII civil war, whereas [Gassebner et al. \(2016\)](#) explore 66 factors to better understand coups d'état between 1952 and 2011.

SSVS presents a methodological improvement over an *EBA* approach for several reasons. First, coefficients can lack robustness in *EBA* if a variable proves highly collinear with other candidate variables ([Brock and Durlauf, 2001](#)). Second, [Brock et al. \(2003, p. 251\)](#) reiterate the major criticism of *EBA* as being “insensitive to the relative goodness of fit of different models. We believe this concern is valid: the fact that a model that appears to be grossly misspecified produces a different sign for [a coefficient], than does a model that does not appear

to be misspecified seems, intuitively, a weak reason to conclude that evidence concerning [this coefficient] is fragile.” Third, McAleer and Veall (1989) note that *EBA* does not account for the uncertainty in the extreme bounds estimates themselves. To overcome these concerns, we deploy a Bayesian approach to address model uncertainty. In the following, we intuitively sketch our empirical strategy, whereas technical details are referred to Appendix C.

4.2 Bayesian Methods

A Bayesian framework estimates the probability of each model representing the true data-generating process. This permits constructing a model average that avoids selecting a single model, which ignores model uncertainty altogether, as is commonly done using information criteria (such as the *Bayesian Information Criterion* or the *Akaike Information Criterion*). The process of recovering this probability implicitly assesses discrepancies in marginal effects (or coefficient magnitudes) for the same variable in different models. Differing effects from different specifications suggest greater model uncertainty. Note that these checks are not based on statistical significance, and therefore we account for the fragility of regression findings across specifications using a probabilistically coherent methodology without bumping into the issues which surround *EBA*.

The Bayesian approach tackles model uncertainty hierarchically. First, we introduce our model space, which constitutes the set of all models over which we believe the true model exists. Denoting the total set of potential determinants as K , a strictly linear (in variables) setup implies 2^K candidate models (in our case 2^{34}). While *EBA* would treat all models equally when making statements regarding the robustness of a coefficient estimate, a Bayesian approach places a prior probability over the model space. As is common, we base that prior probability on the size of the model. For example, a researcher might believe that there are few determinants of conflict and place higher weight on models with fewer determinants. Importantly, the prior probability on the model space remains agnostic about *which* variables appear in the model and only concerns the *number* of candidate variables. Thus, we place a second prior on the coefficients for each model.

In sum, model uncertainty is quantified by both the size of the models and which variables appear in a given model. Bayesian inference is based on Bayes’ rule, such that prior probabili-

ties (on both models and parameters) and data information (likelihood) are used to construct posterior probabilities. Each model, depending on its size and included variables, is assigned a posterior probability. These posterior probabilities can then be used to discuss which models most likely reflect the true model, and which coefficients are more robust to different specifications.

4.3 Stochastic Search Variable Selection (*SSVS*)

In our Bayesian approach, prior distributions specify the level of uncertainty regarding which model is the data generating process and Bayes' rule provides a coherent probabilistic way to update these prior beliefs given new information. *SSVS* (George and McCulloch, 1993, 1997) implements this approach by identifying the set of models, among all possible candidates, that potentially have better predictive performance.⁵

We begin with the generalized linear model (Nelder and Wedderburn, 1972), where the conditional probability distribution of y_i lies in the exponential family, such that $\mathbb{E}(y_i|\mathbf{x}_i) = g^{-1}(\mathbf{x}'_i\boldsymbol{\beta})$; $g(\cdot)$ constitutes the link function; \mathbf{x}_i represents a K -dimensional vector of predictors for $i = 1, 2, \dots, N$; and $\boldsymbol{\beta}$ stands for the vector of coefficients. For instance, a binary y_i would be distributed Bernoulli, making the link function $\log \frac{P(y_i=1)}{1-P(y_i=1)} = \mathbf{x}'_i\boldsymbol{\beta}$, whereas for a normally distributed y_i the link function becomes the identity function ($g^{-1}(\mathbf{x}'_i\boldsymbol{\beta}) = \mathbf{x}'_i\boldsymbol{\beta}$). Thus, deploying *SSVS* with a generalized linear model offers great flexibility in assessing model uncertainty related to conflict.

Intuitively, selecting a subset of regressors is equivalent to setting those β_k 's to zero that correspond to the non-selected regressors. A latent variable $\gamma_k = \{0, 1\}$ is introduced to define prior beliefs about the relevance of the k -th regressor, $P(\gamma_k = 1) = 1 - P(\gamma_k = 0) = p_k$. This latent variable allows the setup of a Gibbs-based algorithm for searching across the model space, implementing local changes to a single covariate at a time. We set $p_k = 1/2$, which implies a non-informative uniform prior. Put differently, a priori, we believe the inclusion of particular regressors obeys the law of flipping a fair coin. This combination of prior and hyper-parameters considers the competing set of regressors holistically, not favoring one particular variable over

⁵ *SSVS* is suggested to be less sensitive to multicollinearity issues than competing Bayesian alternatives based on Bayes factors, such as Bayesian model averaging based on Markov chain Monte Carlo model compositions (MC³; Ročková and George, 2014).

any other. A uniform prior also does not favor bigger models over smaller models or one set of variables over another, as we remain agnostic to the size and scope of the underlying model. Taken together, this implies we remain as agnostic as possible as to the structure of the model explaining civil conflict.

Finally, we employ prior distributions that in conjunction with sample information imply posterior distributions that are easy to take draws from, which is necessary for the Bayesian computations to be conducted.⁶ Generally, we set the prior information to be non-informative, i.e., posterior inference is based on sample information. Given the set of prior distributions, Bayes' rule is then used to obtain posterior distributions.

5 Empirical Findings

Figures 2-5 display all results graphically, only visualizing variables that reach PIPs of 0.5 and above, consistent with the minimum threshold level of statistical evidence suggested by Kass and Raftery (1995). The height of the respective bar indicates PIPs, whereas the direction (up or down) indicates whether we find the corresponding variable to be a positive or negative predictor. Dotted lines mark the common threshold levels for weak evidence ($0.500 \leq PIP < 0.750$), positive evidence ($0.750 \leq PIP < 0.950$), strong evidence ($0.950 \leq PIP < 0.990$), and decisive evidence ($PIP \geq 0.990$). To better illustrate findings, variables are color-coded with yellow indicating historical factors; light blue and blue mark political and economic variables, respectively; lime highlights demographic variables; cyan-colored bars indicate cultural attributes; and geography and climate are highlighted in orange. Row (1) of Tables D1-E4 report these results in table format.

5.1 Civil Conflict Incidence

Beginning with conflict incidence, Figures 2(a) and 2(b) present decisive evidence for past conflict to matter, i.e., a longer period of uninterrupted peace translates to lower chances of conflict (PIPs of 0.998 and 1.000 for the cross-sectional and panel samples). Next, the cross-sectional analysis reveals positive evidence for a larger Jewish population to be associated with increased

⁶Keep in mind that we need to simulate from our prior distributions to generate candidate draws from the assumed structure, and then reevaluate our priors, simulate, reevaluate, simulate, etc.

chances of civil conflict ($PIP = 0.948$). In the panel data, a large proportion of Muslims is decisively predictive ($PIP = 1.000$), whereas a larger share of Christians is at least weakly related to higher odds of conflict ($PIP = 0.723$). These results pertaining to religious shares are surprising as economic and political factors, as well as religious *fractionalization* or *polarization*, have traditionally received more attention in the literature than religious denomination. In terms of political institutions and economic development, higher GDP/capita is only weakly associated with diminished chances of conflict when studying panel data ($PIP = 0.520$) and remains statistically irrelevant in the cross-sectional estimations ($PIP = 0.289$; not displayed here).

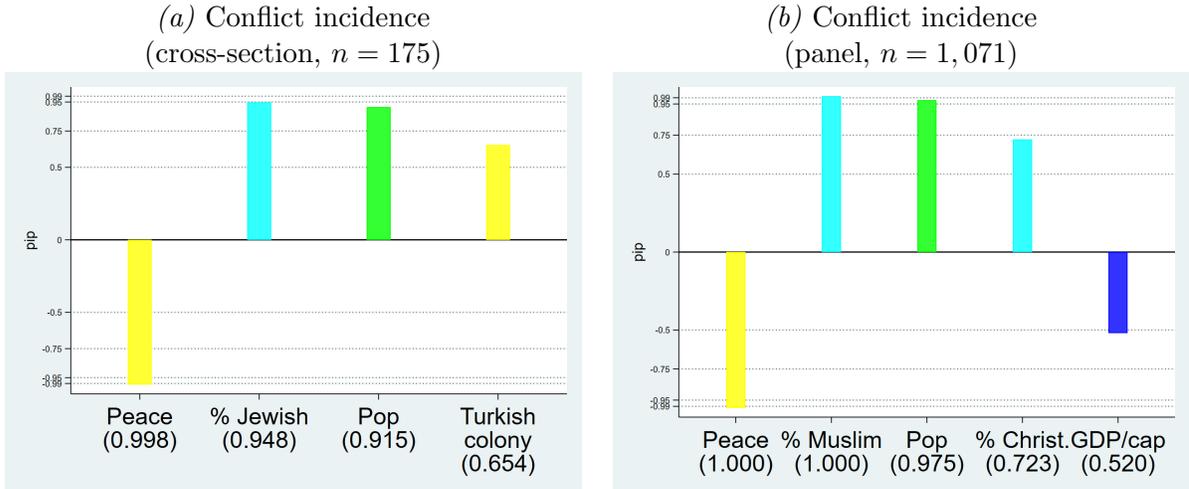


Figure 2: PIP results for civil conflict incidence. Only PIPs of 0.5+ are displayed with their values documented in parentheses below the respective variables. Colors: yellow = historical variables; blue = economic variables; lime = demographic variables; cyan = cultural variables; light blue = political variables; orange = geography and climate.

Further, populous societies experience more conflict (PIPs of 0.915 and 0.975) – a result that is perhaps less surprising once we recall that the outcome variable is measured in absolute (rather than per-capita) terms. Indeed, the median (mean) population size of conflict countries is 12 million (55 million), whereas the median (mean) population of peaceful countries is 3.7 million (11.5 million). Finally, countries that at some point in history formed part of a Turkish empire have been marginally more prone to conflict since the end of the Cold War.

5.2 Civil Conflict Onset

Figure 3 turns to the onset of civil conflict. In the cross-sectional data, only the absence of political rights and population size are weakly predictive of conflict onset (PIPs of 0.732 and 0.558). Thus, the onset of the 41 new post-Cold War conflicts remains difficult to predict. Nevertheless, this constitutes the only result out of our eight main specifications in which political institutions play any role whatsoever.

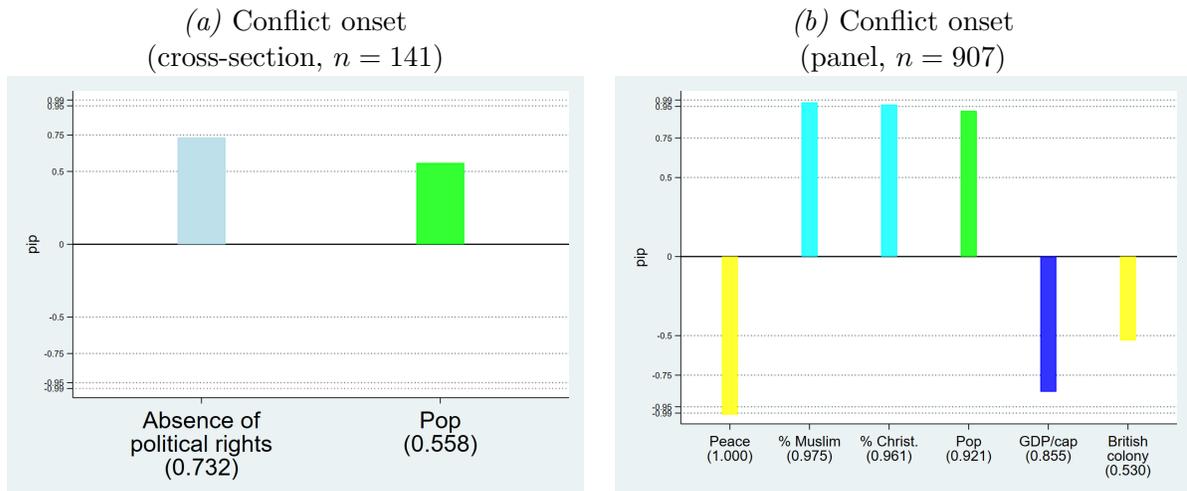


Figure 3: PIP results for civil conflict onset. Only PIPs of 0.5+ are displayed with their values documented in parentheses below the respective variables. Colors: yellow = historical variables; blue = economic variables; lime = demographic variables; cyan = cultural variables; light blue = political variables; orange = geography and climate.

Accessing panel data in Figure 3(b), we recover peace as a reliable, negative predictor ($PIP = 1.000$). Further, religious shares continue to matter, this time with strong evidence of a positive relationship for Muslims ($PIP = 0.975$) and Christians ($PIP = 0.961$). The familiar relevance of population size prevails, and income levels produce their strongest showing in our entire analysis as a negative predictor of civil conflict ($PIP = 0.855$). Finally, past British influence correlates negatively with the likelihood of conflict onset.

5.3 Civil War Incidence

Figure 4 presents the results pertaining to the incidence of civil war, painting a similar picture to that for civil conflict: peace emerges as the most reliable predictor with PIPs of 0.966 and 1.000.

Beyond that, the share of Jewish citizens constitutes a positive predictor, as in the prediction of civil conflict, with a PIP of 0.755 for the cross-sectional sample. Further, French colonies have remained more immune to civil wars than countries without French influence throughout history.

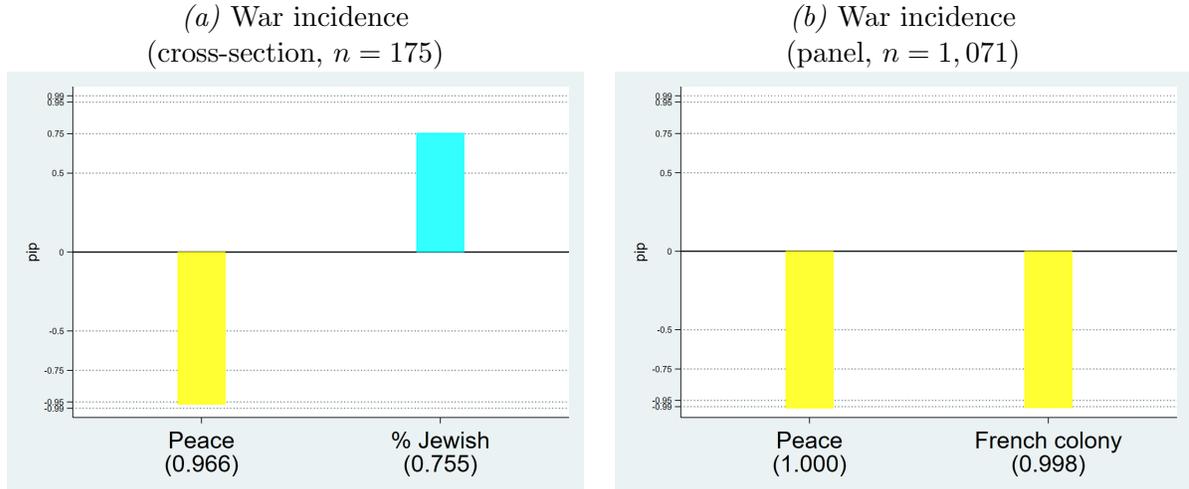


Figure 4: PIP results for civil war incidence. Only PIPs of 0.5+ are displayed with their values documented in parentheses below the respective variables. Colors: yellow = historical variables; blue = economic variables; lime = demographic variables; cyan = cultural variables; light blue = political variables; orange = geography and climate.

Taken together, these results suggest few attributes would have been capable of predicting the civil wars of the past 30 years; the factors that do stand out come from history and religion, rather than economics or politics. This is even more surprising because our benchmark *SSVS* employs priors that are open to a larger number of potentially significant predictors with $\frac{k}{2} = \frac{34}{2} = 17$, i.e., the prior likelihood of a variable to emerge as robust is 50/50. Thus, if anything, this model allows more leeway to covariates that are potentially on the fringe of being statistically meaningful.

5.4 Civil War Onset

Finally, Figure 5 displays results for the study of civil war onset. We find the familiar variables with the share of Jews, peace, and French colonial status being the only statistically robust predictors. These results are similar to those from studying civil war *incidence* and, again,

economic and political factors remain absent.

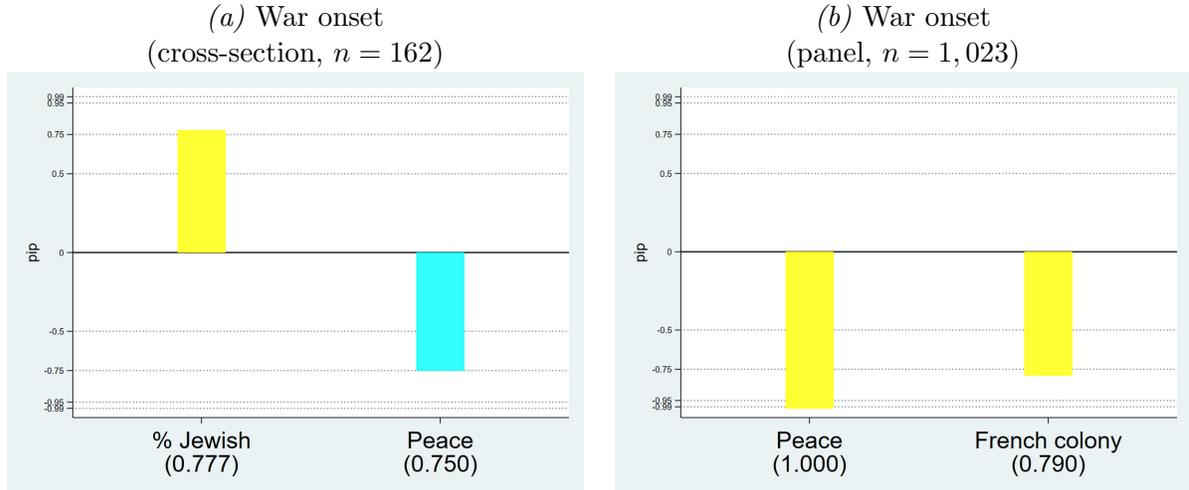


Figure 5: PIP results for civil war onset. Only PIPs of 0.5+ are displayed with their values documented in parentheses below the respective variables. Colors: yellow = historical variables; blue = economic variables; lime = demographic variables; cyan = cultural variables; light blue = political variables; orange = geography and climate.

5.5 Robustness Checks and Extensions

In addition to our main estimations, we conducted a number of alternative specifications, where we (i) exclude internationalized internal conflicts, (ii) exclude variables that are highly correlated with other variables to alleviate concerns about multicollinearity, (iii) apply alternative measures for key concepts, and (iv) include religious dominance, language fractionalization, Gini coefficients, ethnic fractionalization and polarization, democracy, autocracy, civil liberties, and executive control (variables that we omit in the main analysis because of limited data availability). The corresponding results are generally consistent with our main results and are available in Tables [D1-E4](#).

6 Conclusion

Focusing on 175 post-Cold-War countries, we employ *SSVS* to address model uncertainty in the prediction of civil conflict and civil war. Our analysis employs a comprehensive set of 34+ potential covariates, producing three main results. First, past conflict constitutes the strongest

correlate of intrastate conflict. The longer a country has been at peace domestically, the less likely it is to slip into conflict.

Second, larger shares of people identifying with particular religious denominations (Christian, Jewish, or Muslim) indicate an increased likelihood of conflict. It is beyond our study to investigate whether these groups actively incite conflict, whether they are more likely to be persecuted, or whether such religious shares inform other dynamics within a society (perhaps beyond the existing country-level literature) that alter the odds of conflict.

Third, some prolific factors do not withstand the inclusion of a comprehensive list of potential conflict predictors, most notably economic and political characteristics. For example, although we do find some evidence for income levels to matter, the corresponding predictive power remains limited throughout, if present at all. Political institutions remain absent in seven of the eight main specifications.

We also want to briefly address what remains a particular problem in this literature beyond model uncertainty: endogeneity. Our setting is well-positioned to address both reverse causality and omitted variables. Employing past values to predict contemporary realizations of conflict alleviates reverse causality concerns; and incorporating a comprehensive list of potential determinants limits worries related to omitted variables. Nevertheless, any interpretation of our findings should keep in mind that our empirical strategy is of course not in the position to fully resolve endogeneity concerns.

Our contributions are twofold. First, we hope to extend our understanding of the correlates of civil conflict and civil war in a post-Cold-War world. The fact that colonial history and religious denominations play more pronounced roles than economics and political institutions, for instance, illustrates (*i*) how difficult it is to escape a cycle of violence, regardless of income levels, the extent of international trade, natural resources, or educational attainment; and (*ii*) how relevant cultural attributes are in understanding the harbingers of conflict. Second, model uncertainty has complicated the interpretation of empirical findings in the literature, as doubts about the appropriate set of covariates have been difficult to alleviate. We hope to contribute towards providing a standard set of covariates that should be considered in empirical work related to civil conflict and civil war, at least in post-Cold-War samples.

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Appendix A: Correlates of civil conflict and civil war among four seminal studies

Table A1: Selected literature overview on predicting civil conflict and civil war.

Paper:	Fearon and Laitin 2003	Collier and Hoeffler 2004	Montalvo and Reynal-Querol 2005	Esteban et al. 2012b
Publication year:	(column 1 of Table 1)	(column 3 of Table 5 ^a)	(column 8 of Table 1)	(column 6 of Table 1)
Dependent variable:	Civil war onset	Civil war onset	Civil war incidence	Civil conflict incidence
Sample countries/years:	161/1945-1999	161/1960-1995	138/1960-1999	141/1960-2008
Economic development				
GDP per capita	✓---	✓---	✓	✓--
Oil/diamond production				✓
Oil exporter or oil exports	✓+++			
Primary commodity exports/GDP		✓+++	✓	
Income inequality		✓		
Economic growth		✓		
Political characteristics				
Democracy	✓		✓	✓
Lack of executive constraints				✓
Autocracy				✓
Political rights				✓
Civil liberties				✓
New state	✓+++			
Political instability	✓+++			
Demographic characteristics				
Population size	✓+++	✓+++	✓++	✓
Male secondary schooling		✓--		
Cultural characteristics				
Ethnic fractionalization	✓	✓++	✓	✓++
Ethnic polarization		✓+	✓++	✓+++
Greenberg-Gini index of ethnic difference				✓-
Religious fractionalization	✓	✓	✓	
Religious polarization			✓	
Social fractionalization		✓--		
Ethnic dominance		✓+		
Historical characteristics				
Lagged conflict/peace duration	✓---	✓		✓+++
Geographical characteristics				
Noncontiguous states	✓		✓	✓++
Mountainous terrain	✓+++	✓	✓	✓
Geographic dispersion		✓---		

Notes: Positive (negative) signs indicate a positive (negative) relationship with the outcome variable. + and - indicate $p < 0.10$; ++ and -- indicate $p < 0.05$; +++ and --- indicate $p < 0.01$. ^aGDP/cap from column 6 of Table 5.

Appendix B: Summary Statistics

Table B1: Summary statistics for cross-sectional sample ($n = 175$, unless indicated otherwise). Independent variables are measured in 1991.

Variable	Mean	(SD)	Source ^a	Variable	Mean	(SD)	Source ^a
Dependent Variables (1992-2017)				Cultural Attributes			
Civil conflict incidence	0.41	(0.49)	UCDP	% Christian	0.55	(0.38)	WRD
Civil conflict onset ($n = 141$)	0.29	(0.46)	UCDP	% Muslim	0.25	(0.36)	WRD
Civil war incidence	0.20	(0.40)	UCDP	% Buddhist	0.03	(0.14)	WRD
Civil war onset ($n = 162$)	0.16	(0.37)	UCDP	% Jewish	0.01	(0.06)	WRD
				Religious fractionalization	0.28	(0.19)	Own ^b
				Religious polarization	0.49	(0.29)	Own ^b
Economic Development				History			
Ln(GDP per capita)	8.06	(1.42)	UN	Peace duration in years	27.95	(15.60)	Own/UCDP
Trade as % of GDP	73.72	(44.83)	WDI	British colony	0.31	(0.47)	ICOW
Natural resources as % of GDP	7.67	(14.72)	WDI	French colony	0.14	(0.34)	ICOW
Infant mortality rate	49.01	(39.66)	WDI	Spanish colony	0.11	(0.32)	ICOW
Life expectancy	64.57	(9.93)	WDI	Turkish colony	0.10	(0.30)	ICOW
Duration of primary educ.	5.61	(0.98)	WDI	Portuguese colony	0.03	(0.18)	ICOW
Duration of secondary educ.	6.38	(0.89)	WDI				
Political Institutions				Geography and Climate			
Absence of political rights	3.73	(2.18)	FH	Africa	0.31	(0.46)	Own
Common law	0.23	(0.42)	Own	Asia	0.22	(0.42)	Own
Federal system	0.14	(0.34)	S	North America	0.1	(0.30)	Own
OPEC member	0.05	(0.22)	OPEC	South & Middle America	0.1	(0.30)	Own
				Oceania	0.05	(0.22)	Own
				Landlocked	0.21	(0.41)	Own
				Island	0.23	(0.42)	Own
				Rainfall	-3.55	(13.26)	Own/CCKP
				Temperature	-0.24	(0.31)	Own/CCKP

Notes: ^aUCDP = UCDP/ PRIO (2019); FH = Freedom House (2018); S = Sambanis (2004); WRD = Maoz and Henderson (2013); UN = UNdata (2019); WDI = World Development Indicators (World Bank, 2019); ICOW = The Issue Correlates of War Project (Frederick et al., 2017); CCKP = Climate Change Knowledge Portal (World Bank, 2020).

^bWith $x_1, x_2, x_3, x_4,$ and x_5 capturing the share of Christians, Muslims, Buddhists, Jewish and other denominations, religious fractionalization is calculated as $1 - \sum_{i=1}^5 x_i^2$, following Alesina et al. (2003). Religious polarization is calculated with $1 - \sum_{i=1}^5 \left(\frac{0.5-x_i}{0.5}\right)^2 \times x_i$, following Montalvo and Reynal-Querol (2005, p. 798).

Table B2: Summary statistics of the additional/alternative indicators for cross-sectional sample. Independent variables are measured in 1991.

Variable	N	Mean	(SD)	Source ^a	Variable	N	Mean	(SD)	Source ^a
Alternative Dependent Variables (1992-2017) (Excluding Internationalized Internal Conflicts)					Gini	106	37.32	(9.20)	SWIID
Civil conflict incidence	175	0.39	(0.49)	UCDP	Religious polarization	130	0.47	(0.36)	M
Civil conflict onset	144	0.29	(0.45)	UCDP	Religious fractionalization	130	0.28	(0.24)	M
Civil war incidence	175	0.17	(0.37)	UCDP	Ethnic polarization	130	0.51	(0.25)	M
Civil war onset	165	0.13	(0.33)	UCDP	Ethnic fractionalization	130	0.44	(0.28)	M
Alternative/Additional Independent Variables					Ethnic dominance	130	0.52	(0.50)	M
Peace (Y/N)	175	0.79	(0.40)	Own/ UCDP	No schooling (% population)	136	29.69	(26.78)	WDI
Ln(1+years at peace)	175	0.92	(5.17)	Own/ UCDP	Secondary education (% population)	136	28.66	(17.82)	WDI
Growth rate of rainfall	175	0.08	(0.29)	Own/ CCKP	Tertiary education (% population)	136	8.36	(7.68)	WDI
Temperature deviation from sample mean	175	-0.42	(0.34)	Own/ CCKP	Democracy	138	4.62	(4.08)	P-IV
Religious dominance	175	0.78	(0.41)	Own	Civil liberties	169	3.69	(1.78)	FH
Language fractionalization	166	0.39	(0.28)	A	Executive constraints	138	4.44	(2.26)	P-IV
					Autocracy	138	2.87	(3.38)	P-IV

Notes: ^aUCDP = UCDP/ PRIO (2019); FH = Freedom House (2018); WDI = World Development Indicators (World Bank, 2019); CCKP = Climate Change Knowledge Portal (World Bank, 2020); A = Alesina et al. (2003); SWIID = The Standardized World Income Inequality Database (Solt, 2019); M = Montalvo and Reynal-Querol (2005); P-IV = Polity IV Project (Marshall and Jaggers, 2002).

Table B3: Correlation matrix for cross-sectional sample ($n = 175$). Independent variables are measured in 1991.

	Civil conflict incidence	Civil conflict onset	Civil war incidence	Civil war onset	Ln(GDP per capita)	Trade as % of GDP	Natural resources as % of GDP	Infant mortality rate	Life expectancy	Duration of primary education	Duration of secondary education	Absence of political rights	Common law
Civil conflict incidence	1.000												
Civil conflict onset	1.000	1.000											
Civil war incidence	0.576***	0.530***	1.000										
Civil war onset	0.543***	0.530***	1.000	1.000									
Ln(GDP per capita)	-0.455***	-0.411***	-0.211**	-0.126	1.000								
Trade as % of GDP	-0.303***	-0.180*	-0.286***	-0.228**	0.247***	1.000							
Natural resources as % of GDP	0.085	0.086	0.099	0.102	-0.034	-0.041	1.000						
Infant mortality rate	0.462***	0.429***	0.252***	0.215**	-0.815***	-0.287***	0.166*	1.000					
Life expectancy	-0.422***	-0.372***	-0.251***	-0.172*	0.823***	0.260***	-0.136	-0.934***	1.000				
Duration of primary education	-0.076	-0.066	-0.079	-0.088	-0.019	0.050	-0.061	0.092	-0.157*	1.000			
Duration of secondary education	0.016	0.007	-0.036	-0.032	0.037	-0.060	-0.056	-0.065	0.059	-0.609***	1.000		
Absence of political rights	0.466***	0.475***	0.219**	0.166*	-0.572***	-0.083	0.325***	0.568***	-0.549***	-0.076	0.061	1.000	
Common law	-0.089	-0.151	0.068	0.075	0.056	0.127	-0.051	-0.015	0.000	0.355***	-0.186*	-0.120	1.000
Federal system	0.077	0.098	0.174*	0.170*	0.177*	-0.165*	-0.015	-0.086	0.110	-0.045	0.037	-0.172*	0.139
OPEC member	0.071	0.069	0.142	0.155*	0.157*	-0.025	0.331***	-0.052	0.055	0.013	-0.012	0.255***	-0.004
Ln(population size)	0.399***	0.293***	0.325***	0.276***	-0.116	-0.548***	0.052	0.122	-0.051	-0.262***	0.089	0.161*	-0.050
Population density	-0.094	-0.104	-0.062	-0.074	0.155*	0.471***	-0.100	-0.147	0.153*	0.034	0.020	-0.063	0.163*
% Christian	-0.359***	-0.330***	-0.204**	-0.193*	0.326***	0.058	-0.258***	-0.344***	0.253***	0.164*	-0.109	-0.518***	0.037
% Muslim	0.399***	0.391***	0.219**	0.223**	-0.236**	-0.059	0.314***	0.304***	-0.215**	-0.101	0.102	0.508***	-0.164*
% Buddhist	0.039	0.024	-0.036	-0.087	-0.082	-0.042	0.020	0.002	0.003	-0.027	-0.078	0.083	0.132
% Jewish	0.090	0.017	0.156*	0.187*	0.123	-0.006	-0.045	-0.089	0.107	0.025	-0.033	-0.074	0.144
Religious fractionalization	-0.034	-0.028	-0.008	-0.007	-0.209**	0.033	-0.044	0.218**	-0.236**	-0.108	0.227**	0.172*	0.204**
Religious polarization	-0.075	-0.062	-0.025	-0.018	-0.160*	0.019	-0.061	0.160*	-0.193*	-0.124	0.219**	0.116	0.223**
Peace duration in years	-0.548***	-0.366***	-0.446***	-0.353***	0.416***	0.251***	-0.016	-0.395***	0.419***	0.059	-0.086	-0.375***	0.005
British colony	-0.183*	-0.212*	0.000	-0.007	0.048	0.316***	-0.019	-0.025	-0.039	0.407***	-0.261***	-0.069	-0.217**
French colony	0.178*	0.250**	-0.116	-0.081	-0.358***	-0.140	0.018	0.377***	-0.362***	0.090	0.130	0.286***	-0.196**
Spanish colony	-0.077	-0.108	-0.090	-0.101	0.027	-0.083	-0.043	-0.080	0.113	0.124	-0.295***	-0.154*	-0.087
Turkish colony	0.161*	0.205*	0.077	0.081	0.026	-0.029	0.052	-0.163*	0.190*	-0.205**	0.144	0.156*	-0.087
Portuguese colony	0.036	-0.015	-0.016	-0.070	-0.072	-0.082	0.066	0.200**	-0.172*	-0.086	-0.045	0.081	-0.103
Africa	0.279***	0.300***	0.099	0.054	-0.560***	-0.159*	0.023	0.662***	-0.712***	0.303***	-0.047	0.435***	0.049
Asia	0.173*	0.071	0.179*	0.146	-0.009	0.052	0.272***	-0.021	0.100	-0.236**	-0.011	0.281***	0.036
North America	-0.153*	-0.081	-0.116	-0.095	0.169*	0.145	-0.117	-0.183*	0.184*	0.249***	-0.227**	-0.217**	0.235**
South & Middle America	-0.127	-0.150	-0.122	-0.095	0.071	-0.027	0.009	-0.100	0.119	-0.229**	-0.209**	-0.095	-0.095
Oceania	-0.140	-0.157	-0.052	-0.033	0.073	0.038	-0.022	-0.119	0.048	0.066	0.018	-0.197**	0.058
Landlocked	0.040	0.061	-0.007	-0.012	-0.300***	-0.094	0.061	0.282***	-0.310***	-0.260***	0.135	0.167*	-0.075
Island	-0.265***	-0.296***	-0.142	-0.168*	0.218**	0.318***	-0.161*	-0.273***	0.229**	0.289***	-0.129	-0.304**	0.245**
Rain	-0.056	-0.041	-0.015	0.006	0.053	0.006	-0.023	-0.008	0.035	-0.043	0.082	-0.030	-0.003
Temperature	-0.029	-0.059	-0.045	-0.078	0.069	0.009	-0.084	-0.055	0.015	0.108	-0.149*	-0.025	0.058

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B3: Correlation matrix for cross-sectional sample ($n = 175$). Independent variables are measured in 1991 (continued).

	Federal system	OPEC member	Ln(population size)	Population density	% Christian	% Muslim	% Buddhist	% Jewish	Religious fractionalization	Religious polarization	Peace duration in years	British colony
Federal system	1.000											
OPEC member	0.058	1.000										
Ln(population size)	0.255***	0.065	1.000									
Population density	-0.042	-0.054	-0.053	1.000								
% Christian	0.058	-0.289***	-0.215**	-0.092	1.000							
% Muslim	-0.049	0.406***	0.111	-0.018	-0.776***	1.000						
% Buddhist	-0.055	-0.051	0.109	0.078	-0.310***	-0.129	1.000					
% Jewish	-0.015	-0.022	0.008	0.016	-0.094	-0.026	-0.022	1.000				
Religious fractionalization	-0.025	-0.139	0.059	0.113	-0.245**	-0.132	0.146	0.025	1.000			
Religious polarization	-0.036	-0.153*	0.034	0.058	-0.201**	-0.184*	0.150*	0.037	0.973***	1.000		
Peace duration in years	0.041	-0.127	-0.220**	-0.007	0.294***	-0.288***	-0.016	-0.129	0.021	0.053	1.000	
British colony	0.088	0.065	-0.293***	0.184*	0.028	-0.025	0.001	-0.051	0.063	0.071	-0.020	1.000
French colony	-0.111	-0.018	0.008	-0.061	-0.293***	0.205**	0.077	-0.037	0.151*	0.110	-0.162*	-0.270***
Spanish colony	0.013	-0.084	0.099	-0.066	0.360***	-0.247**	-0.085	-0.023	-0.285***	-0.284***	0.089	-0.243**
Turkish colony	-0.075	0.186*	0.053	-0.033	-0.131	0.230**	-0.078	0.230**	-0.051	-0.050	0.121	-0.222**
Portuguese colony	0.016	-0.044	-0.002	-0.051	0.010	-0.012	-0.043	-0.017	0.010	-0.011	-0.062	-0.128
Africa	-0.122	0.012	-0.032	-0.124	-0.168*	0.195**	-0.085	-0.061	0.216**	0.171*	-0.224**	0.027
Asia	0.026	0.248***	0.254***	0.202**	-0.642***	0.445***	0.353***	0.136	0.012	-0.012	-0.183*	0.052
North America	0.094	-0.076	-0.218**	0.019	0.274***	-0.222**	-0.074	-0.015	-0.099	-0.067	0.150*	0.235**
South & Middle America	0.029	-0.079	0.015	-0.066	0.290***	-0.223**	-0.080	-0.020	-0.164*	-0.164*	0.065	-0.108
Oceania	0.058	-0.054	-0.273***	-0.058	0.190*	-0.155*	-0.049	-0.019	-0.065	-0.053	0.106	0.177*
Landlocked	-0.039	-0.118	0.049	-0.089	-0.097	0.028	0.058	-0.038	0.167*	0.200**	-0.031	-0.101
Island	-0.064	-0.129	-0.493***	0.273***	0.226**	-0.214**	0.026	-0.049	-0.080	-0.058	0.069	0.381***
Rain	0.074	0.088	-0.153*	0.072	-0.140	0.156*	0.027	0.086	-0.014	-0.017	0.125	0.045
Temperature	-0.024	-0.115	0.044	0.060	0.018	-0.183*	0.218**	0.012	0.085	0.110	-0.078	-0.023

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B3: Correlation matrix for cross-sectional sample ($n = 175$). Independent variables are measured in 1991 (continued).

	French colony	Spanish colony	Turkish colony	Portugese colony	Africa	Asia	North America	South & Middle America	Oceania	Landlocked	Island	Rain	Temperature
French colony	1.000												
Spanish colony	-0.143	1.000											
Turkish colony	-0.131	-0.118	1.000										
Portugese colony	-0.075	-0.068	-0.062	1.000									
Africa	0.489***	-0.201**	-0.094	0.146	1.000								
Asia	-0.134	-0.149*	0.103	-0.025	-0.358***	1.000							
North America	-0.075	0.185*	-0.108	-0.062	-0.219**	-0.176*	1.000						
South & Middle America	-0.135	0.647***	-0.111	0.040	-0.226**	-0.181*	-0.111	1.000					
Oceania	-0.093	-0.084	-0.076	-0.044	-0.156*	-0.125	-0.076	-0.079	1.000				
Landlocked	0.044	-0.094	-0.024	-0.096	0.088	0.067	-0.167*	-0.079	-0.118	1.000			
Island	-0.064	-0.071	-0.181*	-0.030	-0.165*	-0.069	0.320***	-0.098	0.421***	-0.282***	1.000		
Rain	-0.037	-0.286***	0.146	-0.042	0.066	0.123	-0.101	-0.292***	0.069	0.111	-0.016	1.000	
Temperature	0.035	0.043	-0.296***	-0.030	-0.031	0.039	0.231**	-0.024	-0.130	-0.036	0.082	-0.152*	1.000

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix C: Methodological Details on *SSVS*

General Background

SSVS tackles model uncertainty in a rank order (hierarchical) fashion. The first step is to define the model space, defining the set of all potential models: $\mathcal{M} = \{M_1, M_2, \dots, M_{2^K}\}$. Once the model space is defined, a prior, $\pi(M_m)$, is set for each $m = 1, 2, \dots, 2^K$. Here, the prior defines the probability of any model in \mathcal{M} being chosen. Naturally, a variable selection framework with K potential regressors leaves 2^K candidate models. The size of the model space is dictated not only by the number of unique covariates that may influence the dependent variable but also the manner in which these variables enter. The simplest model space construction is for each covariate to enter in a linear fashion. The model space would be even larger if we were to allow for interactions and higher order polynomial terms (since the corresponding literature on civil conflict and civil war does not pursue non-linearities – with the exception of income levels, which we discuss – we also steer clear of non-linearities).

Beyond the construction of the model space, there is the issue of the uncertainty pertaining to the parameter attached to each variable which belongs in a given model, M_m . More directly, we face uncertainty both in which model is drawn from the model space along with the magnitude and sign of any of the parameters that accompany those variables in model M_m . To capture this second layer of uncertainty, a prior probability is assigned to the parameters $\boldsymbol{\theta}_m$, given model M_m , $\pi(\boldsymbol{\theta}_m|M_m)$. In our discussion below, $\boldsymbol{\theta}_m = [\boldsymbol{\beta}_m^\top, \sigma^2]^\top$.

Lastly, the dependent variable y , given the predictors (\boldsymbol{x}), is generated from $y \sim p(y|\boldsymbol{x}; \boldsymbol{\theta}_m, M_m)$ (Chipman et al., 2001). The model posterior distributions, $\pi(M_m|y) = \frac{p(y|M_m)\pi(M_m)}{\sum_{l=1}^{2^K} p(y|M_l)\pi(M_l)}$, reflect the level of model uncertainty of the problem at hand. The prior distributions specify the level of uncertainty regarding which model is the data generating process and Bayes' rule provides a coherent probabilistic procedure to update these prior beliefs given new information (data).

SSVS

To implement this approach, we use stochastic search variable selection (*SSVS*; see [George and McCulloch, 1993, 1997](#)). *SSVS* identifies the set of models, among all possible candidates, that potentially have better predictive performance.

As stated in the text, one issue with selecting a subset of regressors (model) is the implementation of the model averaging across various vectors of differing length. The remedy of this is to set to 0 those β_k 's corresponding to the non-selected regressors, thus making the parameter vector for each model M_m of the same length and mitigating this concern. More directly, a latent variable $\gamma_k = \{0, 1\}$ is introduced with prior $P(\gamma_k = 1) = 1 - P(\gamma_k = 0) = p_k$. Setting $p_k = 1/2$ corresponds to a non-informative uniform prior. This prior implies setting higher probabilities to models with a number of regressors equal to $K/2$. $\boldsymbol{\gamma} = [\gamma_1, \gamma_2, \dots, \gamma_K]^\top$ denotes the random vector that defines specific models among all potential candidates, $\pi(\boldsymbol{\gamma}) = \prod_{k=1}^K p_k^{\gamma_k} (1 - p_k)^{1 - \gamma_k}$. $\boldsymbol{\gamma}$ may take 2^K different values, the size of the model space.

To facilitate posterior computation, we use conjugate priors. Conjugate priors are such that combining these with the likelihood by Bayes' rule, the posterior remains in the same prior distributional family. Here, the prior of the conditional marginal effects given a model ($\boldsymbol{\gamma}$), is multivariate normal, $\boldsymbol{\beta}_\gamma | \boldsymbol{\gamma}, \sigma^2 \sim N(\mathbf{0}_\gamma, \sigma^2 \mathbf{V}_\gamma)$, where the subscript $\boldsymbol{\gamma}$ indicates the subset of regressors given by $\gamma_k = 1$ and

$$\mathbf{V}_\gamma = \left(\kappa \left[(1 - \alpha) \mathbf{X}_\gamma^\top \mathbf{W}_\gamma \mathbf{X}_\gamma / N + \alpha \text{diag}(\mathbf{X}_\gamma^\top \mathbf{W}_\gamma \mathbf{X}_\gamma / N) \right] \right)^{-1},$$

where α constitutes a shrinkage parameter which is used to capture/mitigate near collinearity. Setting $\alpha = 0$, we obtain Zellner's g prior, which is commonly used in model selection such that prior information agrees with sample information. If the full rank condition of the covariance matrix is not fulfilled, $\alpha = 0.5$, implying equal weight. The prior information weight regarding the location parameter ($\boldsymbol{\beta}_\gamma$) is κ , which is set equal to 0.1 to be non-informative. We elect to use a noninformative prior so that we remain as agnostic as possible regarding the magnitude of any coefficient that is in the model. Alternatively, we take the position that, a priori, no coefficient

is large. Then, if we find that a coefficient has an estimated large magnitude, we can be more confident that this large effect is due to the fact that in truth the effect is large rather than fictitiously having started in this manner. \mathbf{W}_γ is a diagonal matrix with all elements equal to $p_{k,\gamma}(1 - p_{k,\gamma})$ in the case of the logit model. In addition, the inverse of the variance (precision) has a gamma distribution, $\sigma^{-2} \sim G(df/2, v \times df/2)$ where df captures the prior degrees of freedom (prior hypothetical sample size) for estimating the residual variance. Again, to remain agnostic we use a non-informative prior for σ^{-2} and set $df = 0.01$ to be non-informative. Finally, $v = (1 - ER^2)\hat{\sigma}_y^2$, ER^2 is the expected prior coefficient of determination in the regression ($ER^2 = 0.5$), and $\hat{\sigma}_y^2$ is the standard deviation of the dependent variable. Thus, v may be thought of as a prior estimate of σ^2 . In general, we set the prior information trying to be non-informative, i.e., posterior inference is based on sample information.

Posterior Distributions

Given the set of prior distributions, Bayes' rule is used to obtain posterior distributions. In particular, $\pi(\boldsymbol{\beta}_\gamma | \boldsymbol{\gamma}, \mathbf{y}, \mathbf{X}_\gamma)$ is a multivariate t distribution with degrees of freedom equal to $\bar{df} = df + N$, location vector $\bar{\boldsymbol{\beta}}_\gamma = \bar{\mathbf{V}}_\gamma \mathbf{X}_\gamma^\top \mathbf{y}$, and scale matrix $\bar{\mathbf{V}}_\gamma \times \bar{v}$, where $\bar{\mathbf{V}}_\gamma = (\mathbf{V}_\gamma^{-1} + \mathbf{X}_\gamma^\top \mathbf{X}_\gamma)^{-1}$, \bar{v} is defined implicitly through $\bar{v} \times \bar{df} = v \times df + \sum_{i=1}^N (y_i - \mathbf{x}_{i,\gamma}^\top \hat{\boldsymbol{\beta}}_\gamma)^2 + \hat{\boldsymbol{\beta}}_\gamma^\top [(\mathbf{X}_\gamma^\top \mathbf{X}_\gamma)^{-1} + \mathbf{V}_\gamma]^{-1} \hat{\boldsymbol{\beta}}_\gamma$, and $\hat{\boldsymbol{\beta}}_\gamma$ is the least squares estimator of the model. In addition, $\sigma^{-2} | \boldsymbol{\gamma}, \mathbf{y}, \mathbf{X}_\gamma \sim G(\bar{df}/2, \bar{v} \times \bar{df}/2)$, and $\pi(\boldsymbol{\gamma} | \mathbf{y}, \mathbf{X}_\gamma)$ is proportional to $g(\boldsymbol{\gamma}) = |\tilde{\mathbf{X}}_\gamma^\top \tilde{\mathbf{X}}_\gamma|^{-1/2} |\mathbf{V}_\gamma|^{-1/2} (df \times v + \mathbf{S}_\gamma^2)^{-(N+df)/2} \times \pi(\boldsymbol{\gamma})$, such that $\frac{P(\gamma_k=1, \boldsymbol{\gamma}_{(k)} | \mathbf{y}, \mathbf{X}_\gamma)}{P(\gamma_k=0, \boldsymbol{\gamma}_{(k)} | \mathbf{y}, \mathbf{X}_\gamma)} = \frac{g(\gamma_k=1, \boldsymbol{\gamma}_{(k)})}{g(\gamma_k=0, \boldsymbol{\gamma}_{(k)})}$, where $\mathbf{S}_\gamma^2 = \mathbf{y}^\top \mathbf{y} - \mathbf{y}^\top \mathbf{X}_\gamma (\mathbf{X}_\gamma^\top \mathbf{X}_\gamma + \mathbf{V}_\gamma^{-1})^{-1} \mathbf{X}_\gamma^\top \mathbf{y}$,

$$\tilde{\mathbf{X}}_\gamma = \begin{bmatrix} \mathbf{X}_\gamma \\ \mathbf{V}_\gamma^{-1/2} \end{bmatrix}, \text{ and } \boldsymbol{\gamma}_{(k)} = [\gamma_1, \dots, \gamma_{k-1}, \gamma_{k+1}, \dots, \gamma_K]^\top.$$

Taking into account that the logit model is ‘‘augmented’’ with a random utility that is linear in the regressors, probabilities are recovered as $P(y_i = 1) = \frac{1}{1 + e^{-\mathbf{x}_{i,\gamma}^\top \boldsymbol{\beta}_\gamma}}$. This implies that the Metropolis-Hastings algorithm can be used to obtain the posterior chain of the latent variables and to recover the implicit probability through the inverse function of the logit function for building the ratio of probabilities between the proposal and the actual draw. In particular, we use a mixture of three proposals with probabilities equal to $(1/3, 1/3, 1/3)$. The proposals are a

mixture of normals (Tüchler, 2008), a random walk Metropolis update based on a multivariate t proposal with 3 degrees of freedom, and an independence Metropolis sampler centered on the posterior mode with variance determined by the posterior information matrix based on a multivariate t .

Appendix D: Additional Results for Civil Conflict

Table D1: Results from *SSVS* estimations to predict conflict incidence (cross-section, $n = 175$ unless otherwise specified), displaying posterior inclusion probabilities (PIPs). Only variables reaching a value of $PIP \geq 0.500$ are reported.

	Missing countries	Peace	% Jewish	Pop	Turkish colony	% Muslim	Infant mortality rate	GDP/capita	Democracy	Autocracy
(1) Main analysis	-	-0.998	0.948	0.915	0.654					
(2) Excluding internationalized internal conflicts	-	-1.000	0.544	0.948	0.652	0.557				
(3) Excluding religious polarization, life expectancy, and infant mortality	-	-0.992	0.851	0.980		0.787		-0.864		
(4) Measuring peace with binary variable	-	-0.998	0.842	0.916		0.725		-0.704		
(5) Measuring peace by $\ln(1 + \text{years at peace})$	-	-0.998	0.718	0.861		0.631		-0.513		
(6) Alternative measures for climate with growth rate of rainfall and temperature deviation from sample mean	-	-0.997	0.948	0.907	0.547	0.561				
(7) Including religious dominance	-	-0.996	0.851	0.957	0.705		0.561			
(8) Including language fractionalization	9	-0.995	0.788	0.869	0.700		0.567			
(9) Including Gini	69	-0.984	0.739	0.614						
(10) Alternative measures for religious polarization and fractionalization	45	-0.893	0.799	0.936				-0.549		
(11) Including measures for ethnic fractionalization, polarization, and dominance	45	-0.866	0.842	0.915			0.508			
(12) Including measures for ethnic fractionalization, polarization, and dominance, as well as religious polarization and fractionalization (alternative measures)	45	-0.921	0.767	0.870					-0.552	
(13) Alternative education measures from Barro & Lee	39	-0.760	0.962	0.951						
(14) Including measures for democracy, civil liberties, and executive control	38	-0.986	0.683	0.880						
(15) Including measures for democracy and autocracy	37	-0.995	0.866	0.746					-0.814	-0.609

Table D2: Results from *SSVS* estimations to predict conflict incidence (panel, $n = 1,071$ unless otherwise specified), displaying posterior inclusion probabilities (PIPs). Only variables reaching a value of $PIP \geq 0.500$ are reported.

		Missing observations	Peace	% Muslim	Pop	% Christian	GDP/capita	Natural resource rents	Religious polarization	% tertiary education	Autocracy
(1)	Main analysis	-	-1.000	1.000	0.975	0.723	-0.520				
(2)	Excluding internationalized internal conflicts	-	-1.000		0.688						
(3)	Excluding religious polarization, life expectancy, and infant mortality	-	-1.000	0.999	0.934	0.746	-0.600				
(4)	Measuring peace with binary variable	-	-1.000	0.976	0.990						
(5)	Measuring peace by $\ln(1+\text{years at peace})$	-	-1.000	0.900	0.981		-0.781				
(6)	Alternative measures for climate with growth rate of rainfall and temperature deviation from sample mean	-	-1.000	0.991	0.982	0.699					
(7)	Including religious dominance	-	-1.000	1.000	0.875	0.630					
(8)	Including language fractionalization	64	-1.000	0.999	0.850						
(9)	Including Gini	332	-1.000	0.932	0.814						
(10)	Alternative measures for religious polarization and fractionalization	286	-1.000				-0.897	0.831			
(11)	Including measures for ethnic fractionalization, polarization, and dominance	286	-0.999		0.917						
(12)	Including measures for ethnic fractionalization, polarization, and dominance	286	-0.999		0.904		-0.908	0.757			
(13)	Alternative education measures from Barro & Lee	242	-1.000				-0.540	0.611	-0.851	0.651	
(14)	Including measures for democracy, civil liberties, and executive control	169	-1.000	0.969							
(15)	Including measures for democracy and autocracy	168	-1.000	0.945							-0.529

Table D3: Results from *SSVS* estimations to predict conflict onset (cross-section, $n = 141$ unless otherwise specified), displaying posterior inclusion probabilities (PIPs). Only variables reaching a value of $PIP \geq 0.500$ are reported.

	Missing countries	Absence of political rights	Pop	British colony	GDP/capita	Island	Oceania	Federalism	Temperature	Democracy	Autocracy
(1)	-	0.732	0.558								
Main analysis											
(2)	-	0.636		-0.666							
(3)	-	0.705	0.500		-0.537		-0.696				
(4)	-	0.677	0.585								
(5)	-	0.645	0.567				-0.547				
(6)	-	0.643	0.634				-0.547				
(7)	-	0.521	0.672								
(8)	7	0.569	0.550		-0.566						
(9)	55	0.584				-0.848					
(10)	41	0.944			-0.699			0.799			
(11)	41	0.947			-0.771		0.520	0.864	0.594		
(12)	41	0.919			-0.684		0.530	0.779			
(13)	34	0.583	0.707				-0.523				
(14)	30										
(15)	29									-0.976	-0.561

Table D4: Results from *SSVS* estimations to predict conflict onset (panel, $n = 907$ unless otherwise specified), displaying posterior inclusion probabilities (PIPs). Only variables reaching a value of $PIP \geq 0.500$ are reported.

	Missing observations	Peace	% Muslim	% Christian	Pop	GDP/capita	British colony	Oceania	Natural resource rents	Religious polarization	Life expectancy
(1)	-	-1.000	0.975	0.961	0.921	-0.855	-0.530				
(2)	-	-1.000	0.652		0.616	-0.566		-0.780			
(3)	-	-1.000	0.989	0.977	0.930	-0.964		-0.753			
(4)	-	-1.000	0.840	0.636	0.959	-0.711					
(5)	-	-1.000	0.661		0.858		-0.620				-0.595
(6)	-	-1.000	0.992	0.979	0.949	-0.842		-0.650			
(7)	-	-1.000	0.951	0.914	0.899	-0.652	-0.553				
(8)	60	-1.000	0.894	0.725	0.572	-0.665		-0.780			
(9)	280	-1.000	0.743								
(10)	264	-1.000			0.716	-0.919		-0.659	0.837		
(11)	264	-1.000			0.828	-0.813		-0.710	0.739		
(12)	264	-0.999			0.737	-0.885			0.859		
(13)	215	-1.000			0.635	-0.609			0.654	-0.504	
(14)	147	-1.000	0.961	0.924		-0.734		-0.581			
(15)	146	-1.000	0.925	0.907		-0.511		-0.811			

Appendix E: Additional Results for Civil War

Table E1: Results from *SSVS* estimations to predict war incidence (cross-section, $n = 175$ unless otherwise specified), displaying posterior inclusion probabilities (PIPs). Only variables reaching a value of $PIP \geq 0.500$ are reported.

	Missing countries	Peace	% Jewish	French colony	North America	Natural resource rents	Portuguese colony	Trade
(1) Main analysis	-	-0.966	0.755					
(2) Excluding internationalized internal wars		-0.996		-0.633	-0.597			
(3) Excluding religious polarization, life expectancy, and infant mortality	-	-0.998	0.576					
(4) Measuring peace with binary variable	-	-0.993						
(5) Measuring peace by Ln(1+years at peace)	-	-0.988						
(6) Alternative measures for climate with growth rate of rainfall and temperature deviation from sample mean	-	-0.981						
(7) Including religious dominance	-	-0.982	0.591					
(8) Including language fractionalization	9	-0.993	0.606					
(9) Including Gini	69	-1.000	0.987					
(10) Alternative measures for religious polarization and fractionalization	45	-0.991	0.914			0.648		
(11) Including measures for ethnic fractionalization, polarization, and dominance	45	-0.971	0.821			0.649		
(12) Including measures for ethnic fractionalization, polarization, and dominance, as well as religious polarization and fractionalization (alternative measures)	45	-0.975	0.875			0.573		
(13) Alternative education measures from Barro & Lee	39	-0.887	0.845					
(14) Including measures for democracy, civil liberties, and executive control	38	-1.000	0.964					
(15) Including measures for democracy and autocracy	37	-0.999	0.604				-0.660	-0.542

Table E2: Results from *SSVS* estimations to predict war incidence (panel, $n = 1,071$ unless otherwise specified), displaying posterior inclusion probabilities (PIPs). Only variables reaching a value of $PIP \geq 0.500$ are reported.

	Missing observations	Peace	French colony	North America	Primary education	Oceania	Population density
(1) Main analysis	-	-1.000	-0.998				
(2) Excluding internationalized internal wars		-1.000	-0.629	-0.761	-0.717	-0.587	
(3) Excluding religious polarization, life expectancy, and infant mortality	-	-1.000	-0.986				
(4) Measuring peace with binary variable	-	-1.000	-0.990				
(5) Measuring peace by $\ln(1+\text{years at peace})$	-	-1.000	-0.974				
(6) Alternative measures for climate with growth rate of rainfall and temperature deviation from sample mean	-	-1.000	-0.995				
(7) Including religious dominance	-	-1.000	-0.986				
(8) Including language fractionalization	64	-1.000	-1.000				-0.707
(9) Including Gini	332	-1.000					
(10) Alternative measures for religious polarization and fractionalization	286	-0.999	-0.628				
(11) Including measures for ethnic fractionalization, polarization, and dominance	286	-1.000	-0.831				
(12) Including measures for ethnic fractionalization, polarization, and dominance, as well as religious polarization and fractionalization (alternative measures)	286	-1.000	-0.938				
(13) Alternative education measures from Barro & Lee	242	-1.000	-0.930				
(14) Including measures for democracy, civil liberties, and executive control	169	-1.000	-0.865				
(15) Including measures for democracy and autocracy	168	-1.000	-0.910				

Table E3: Results from *SSVS* estimations to predict conflict onset (cross-section, $n = 162$ unless otherwise specified), displaying posterior inclusion probabilities (PIPs). Only variables reaching a value of $PIP \geq 0.500$ are reported.

	Missing countries	% Jewish	Peace	Island	Portuguese colony	North America	Population density	Natural resource rents	Portuguese colony	Trade
(1)	-	0.777	-0.750							
(2)	-	-0.843	-0.905	-0.664	-0.614					
(3)	-	0.630	-0.926				-0.633			
(4)	-	0.549	-0.887							
(5)	-	-0.864								
(6)	-	0.571	-0.794				-0.573			
(7)	-	0.634	-0.737							
(8)	8	0.585	-0.854							
(9)	62	0.954	-1.000							
(10)	45	0.935						0.584		
(11)	45	0.950						0.686	-0.519	
(12)	45	0.880						0.793		-0.672
(13)	35	0.708								
(14)	34	0.881	-0.968							
(15)	33	0.820	-0.961							

Table E4: Results from *SSVS* estimations to predict conflict onset (panel, $n = 1,023$ unless otherwise specified), displaying posterior inclusion probabilities (PIPs). Only variables reaching a value of $PIP \geq 0.500$ are reported.

		Missing observations	Peace	French colony	North America	Portuguese colony
(1)	Main analysis	-	-1.000	-0.790		
(2)	Excluding internationalized internal wars		-1.000	-0.807	-0.918	
(3)	Excluding religious polarization, life expectancy, and infant mortality	-	-0.999	-0.801		
(4)	Measuring peace with binary variable	-	-0.999	-0.763		
(5)	Measuring peace by $\text{Ln}(1+\text{years at peace})$	-	-1.000	-0.625		
(6)	Alternative measures for climate with growth rate of rainfall and temperature deviation from sample mean	-	-1.000	-0.752		
(7)	Including religious dominance	-	-1.000	-0.831		
(8)	Including language fractionalization	63	-1.000	-0.684		
(9)	Including Gini	311	-1.000			
(10)	Alternative measures for religious polarization and fractionalization	281	-1.000			
(11)	Including measures for ethnic fractionalization, polarization, and dominance	281	-1.000			
(12)	Including measures for ethnic fractionalization, polarization, and dominance, as well as religious polarization and fractionalization (alternative measures)	281	-1.000			
(13)	Alternative education measures from Barro & Lee	231	-1.000			
(14)	Including measures for democracy, civil liberties, and executive control	157	-1.000			-0.680
(15)	Including measures for democracy and autocracy	156	-1.000	-0.534		-0.678