

Canavire-Bacarreza, Gustavo Javier; Cotton, Christopher; Jetter, Michael; Montoya-Agudelo, Alejandra

**Working Paper**

## Polarized education levels and civil unrest

Queen's Economics Department Working Paper, No. 1417

**Provided in Cooperation with:**

Queen's University, Department of Economics (QED)

*Suggested Citation:* Canavire-Bacarreza, Gustavo Javier; Cotton, Christopher; Jetter, Michael; Montoya-Agudelo, Alejandra (2019) : Polarized education levels and civil unrest, Queen's Economics Department Working Paper, No. 1417, Queen's University, Department of Economics, Kingston (Ontario)

This Version is available at:

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## Polarized education levels and civil unrest

Gustavo Javier Canavire-Bacarreza

Christopher Cotton  
Queen's University

Michael Jetter

Alejandra Montoya-Agudelo

Department of Economics  
Queen's University  
94 University Avenue  
Kingston, Ontario, Canada  
K7L 3N6

2-2019

# Polarized education levels and civil unrest\*

Gustavo Javier Canavire-Bacarreza<sup>†</sup>   Christopher Cotton<sup>‡</sup>   Michael Jetter<sup>§</sup>  
Alejandra Montoya-Agudelo<sup>¶</sup>

February 7, 2019

## Abstract

After introducing a measure for educational polarization (*EduPol*), this paper presents a theoretical framework to understand whether and how *EduPol* may affect the contest for power in society. The model suggests that societies with high degrees of *EduPol* (i.e., substantial shares with either no or university-level education) are systematically more prone to civil unrest. We test this prediction on four measures of civil unrest: Political instability, domestic terrorism, civil conflict, and civil war. Our empirical estimations produce evidence consistent with this hypothesis as all four phenomena are positively associated with *EduPol* at the beginning of the respective period, exhibiting meaningful magnitudes. These results prevail when accounting for (i) potentially confounding factors, (ii) country- and time-fixed effects, (iii) economic inequality, (iv) ethnic and religious polarization and fractionalization, and (v) numerous alternative estimations and outcome variables.

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\*We thank the Center for Research in Economics and Finance (CIEF) at the Universidad EAFIT for its support. Cotton is grateful for financial support provided through his position as the Jarislowsky-Deutsch Chair in Economic & Financial Policy at Queen's University. All remaining errors are our own.

<sup>†</sup>Inter-American Development Bank, Washington, D.C., USA. Email: gcanavire@gmail.com

<sup>‡</sup>Queen's University, Department of Economics, Kingston, ON K7L 3N6. Email: cotton@econ.queensu.ca

<sup>§</sup>Corresponding author. University of Western Australia, IZA (Bonn), and CESifo (Munich), 35 Stirling Highway, Crawley 6009, WA. Email: mjetter7@gmail.com.

<sup>¶</sup>School of Economics and Finance, Universidad EAFIT, Medellín, Colombia. alejamontoyaa@gmail.com

# 1 Introduction

A polarized society can be vulnerable to civil unrest. According to [Esteban and Ray \(1994, p.820\)](#), “the phenomenon of polarization is closely linked to the generation of tensions, to the possibilities of articulated rebellion and revolt, and to the existence of social unrest in general”.<sup>1</sup> [Collier and Hoeffler \(2004, p.571\)](#) write that “the source of inter-group tension is not diversity but polarization”. To date, the role of polarization in explaining social tension and civil unrest has mostly been explored along ethnic and religious lines (e.g., see [Reynal-Querol and Montalvo, 2005](#), [Bhavnani and Miodownik, 2009](#), [Montalvo and Reynal-Querol, 2010](#), [Bosker and de Ree, 2014](#), or [Klasnja and Novta, 2014](#)).

In the following pages, we aim to extend and complement this literature, introducing *educational* polarization (*EduPol* from hereon) to describe the level of stratification within society along educational lines. We propose the idea that the educational divide in society can act as a systematic predictor of civil unrest. We begin by presenting an empirical measure of *EduPol* – a variable that we hope other researchers can exploit beyond our applications here. We then introduce a basic theoretical framework to explore the potential link between *EduPol* and civil unrest. Finally, our empirical analysis explores whether and how *EduPol* can predict civil unrest in the form of (i) political instability, (ii) domestic terrorism, (iii) civil conflict, and (iv) civil war, accessing data from up to 146 countries from 1950 to 2014.

Why and how could *EduPol* stir civil unrest? In general, polarization along educational dimensions constitutes a rich measure of polarization within a society, as it influences both economic and cultural differences between the educated and uneducated groups. An educational divide may widen differences in productivity and access to employment opportunities, thereby changing the distribution of income. However, this is not the only way that *EduPol* can divide the interests of a country. The theory of education as an institution views formal education as a mechanism for establishing a common system of values, beliefs, and behavior among the educated

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<sup>1</sup>We also refer to [Esteban and Ray \(1994, 1999, 2008, 2011\)](#), [Esteban et al. \(2012\)](#), and [Reynal-Querol and Montalvo \(2005\)](#) for seminal studies on polarization.

classes within society (e.g., [Meyer, 1977](#); [Meyer and Soysal, 1992](#); [Meyer et al., 2007](#)).<sup>2</sup> Beyond that, education confers status on the educated, qualifying those with degrees for managerial and elite positions in society, if for no other reason than because of a common expectation within society that such positions are reserved for those with degrees (e.g., [Bourdieu, 1977, 1984, 1999](#); [Bourdieu and Passeron, 1990](#)).<sup>3</sup> Indeed, the education-as-an-institution literature argues that education promotes values that are more in line with the values of educated people in other countries than with the values of the less-educated in one's own country (e.g., [Meyer, 1977](#); [Baker and LeTendre, 2005](#)). In the most basic sense, common education levels represent an “identity” around which unsatisfied citizens can organize themselves, similar to ethnicity or religion. A populace that is sharply divided among highly educated citizens on the one end and largely uneducated citizens on the other end is more likely to hold fundamentally different preferences and beliefs, in addition to their understanding of how society should operate and what governments should do. Finally, if *EduPol* is substantial, individuals with little education are easier marginalized in terms of political and economic rights, as well as opportunities. Such discrepancies define political outcomes and can give rise to grievances.

Recent popular examples can be found in the “Brexit” movement in the UK or the 2016 US presidential election process. In the UK, 27 of the 30 areas with the fewest graduates voted to leave the European Union ([BBC News, 2016](#)), whereas the vast majority of university graduates voted to remain.<sup>4</sup> Similarly, the 2016 US presidential election campaign revealed a sharp contrast in preferences between those with little formal education (voting largely for Trump) and those with a college degree (voting largely for Clinton). These voting differences along the lines of education have been documented and discussed on numerous occasions (e.g., see [Kirk and Scott, 2016](#), [Peters et al., 2016](#), or [Puglise, 2016](#)). At the same time, rising violence has been well-documented in the UK and the US (e.g., see [Lanyon, 2016](#), [Nagesh, 2016](#), or

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<sup>2</sup>The theory of education as an institution generally views this role of education as more important than the role of providing non-job-specific skills, which could be as easily learned through on-the-job training.

<sup>3</sup>In this context, we also refer to [Collins \(1971\)](#), [Bowles et al. \(1976\)](#), [Willis \(1977\)](#), [Rubinson \(1986\)](#), [Ramirez and Boli \(1987\)](#), [Baker \(1999\)](#), [Brown \(2001\)](#), and the review of these literatures in [Sadovnik \(2007\)](#).

<sup>4</sup>Those with only secondary education or a similar degree were more likely to support “Brexit” ([The Telegraph, 2016](#)). Only three out of 35 areas in which more than half of the residents have a degree voted to leave the European Union.

Okeowo, 2016).

Our paper first presents an empirical method to measure *EduPol* in a consistent and comparable manner across countries and years, using data on educational attainment. We then develop a simple theoretical model that illustrates how *EduPol* can fuel the likelihood of civil unrest between two groups, independent of economic or ethnic tensions. Finally, we provide empirical evidence for a strong relationship between *EduPol* and (i) political instability, (ii) domestic terrorism, (iii) civil conflict, and (iv) civil war. Using panel data for up to 146 countries (equivalent to over 93 percent of the world population), we find that *EduPol* is able to predict all four measures of civil unrest – findings that are relevant statistically and in terms of magnitude. These links remain robust to a battery of robustness checks, introducing a number of alternative factors that could, in theory, drive our findings, as well as country- and year-fixed effects. Overall, our goal is *not* to argue that other forms of polarization, such as those along ethnic or religious dimensions, do not matter; rather, we posit that *EduPol* in its own right can create an environment in which civil unrest is more likely to arise.

We hope this contribution can enrich two distinct streams of literature. First, we seek to improve our understanding of the conditions under which violent civil unrest can emerge, such as terrorism, civil conflict, and civil war. The closest study to ours is developed by Østby (2008), who explores social polarization in terms of several economic and social aspects (including education) in the context of civil war onset. Østby’s (2008) index considers years of education and is based on two artificial groups given by the mean. In addition to providing a theoretical intuition, our analysis goes deeper, deriving a more precise index for *EduPol* by incorporating four distinct levels of educational attainment available from Barro and Lee (2013). Further, we consider country-fixed effects (thereby controlling for any time-invariant unobservables on the country level), a variety of outcome measures associated with civil unrest, and a larger sample.<sup>5</sup> In this context, we also refer to Østby and Urdal (2011) who summarize existing research on educational attainment and conflict. Second, we aim to pull *EduPol* into the spotlight

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<sup>5</sup>Østby (2008) analyzes 36 developing countries from 1986 to 2004, including 519 observations. Our full sample exploring civil conflict and civil war employs up to 146 countries and 1,897 observations from 1950 to 2014.

as an important societal factor. Beyond our application to civil unrest presented here, our *EduPol* measure may prove to be relevant for other phenomena, such as corruption or economic performances, for instance.

## 2 A Polarization Index of Educational Attainment Levels

We begin by presenting an empirical measure of *EduPol*, which aims to be informative about both the magnitude of the educational gap between the highly- and less-educated groups within society, and how evenly divided society is across these groups. We first introduce the empirical construction of the index, followed by a comparison of several hypothetical scenarios and a brief discussion of the derived index across countries over time.

Although researchers have created alternative measures of educational inequality (e.g., [Thomas et al., 2001](#), [Castelló and Doménech, 2002](#), or [Ferreira and Gignoux, 2014](#)), few studies have explicitly considered educational *polarization* or, more generally, the ordinal nature of education (as discussed, [Østby, 2008](#), is a notable exception). This is particularly the case when considering potential drivers of various types of civil unrest.

### 2.1 Construction of the Index

We access the database introduced by [Barro and Lee \(2013\)](#) for information on the population shares of four distinct categories of educational attainment for everybody aged 25-60: No schooling, completed primary schooling, completed secondary schooling, and completed tertiary schooling. [Barro and Lee \(2013\)](#) provide this information for 146 countries on a five year basis, beginning in 1950. This provides us with 13 time periods (1950-1954, 1955-1959, ..., 2010-2014). Note that our results are virtually identical when using the entire population (up to the age of 99) or when using seven categories: No schooling, some primary schooling, complete primary schooling, some secondary schooling, complete secondary schooling, some tertiary schooling, and completed tertiary schooling (available upon request).

Our strategy to create the *EduPol* index is based on [Apouey \(2007\)](#) who explores polarization

within ordinal variables. Given four distinct levels of education, we consider education as an ordinal variable because a priori it is not clear *how much* education is added when moving from no schooling to primary schooling, as opposed to moving from secondary to tertiary schooling, for example. This becomes even clearer when considering a global sample, as every country features somewhat different educational structures. Thus, our index is median-based and independent of a cardinalization process, avoiding the problem of assigning a scale to calculate the mean.

In particular, with  $c$  categories (where  $1 \leq c \leq 4$ ) the index takes on the following form for country  $i$  in the five-year period  $t$ :

$$P_{it} = 1 - \frac{2^\alpha}{C-1} \sum_{c=1}^{C-1} |F_{cit} - \frac{1}{2}|^\alpha, \quad (1)$$

where  $F_{cit}$  denotes the cumulative proportion of people in category  $c$ , country  $i$ , and period  $t$ .  $C$  represents the total number of categories, in our case four. Following Apouey (2007, p.885), “ $\alpha$  reflects the importance that is given to the median category”, which for  $C = 4$  corresponds to  $\alpha = 0.42$  (equivalent to  $\frac{\ln(4)-\ln(3)}{\ln(2)}$ ; see Table I in Apouey, 2007). This ensures that the polarization index takes on the value of  $\frac{1}{2}$  in the case of a uniform distribution. The index is continuous and, in order to facilitate interpretation, we re-scale it to range from zero to one.

## 2.2 Illustrating the Index

Intuitively, if everybody shares the same level of education (e.g., everybody possesses complete secondary education), the index equals zero. If half of the populace exhibits no formal education, but the other half completed tertiary education, the index equals one. In general, the index increases when the proportion of people at the extremes increases or if the shares around the median category decrease.

Table 1 presents several hypothetical cases to illustrate how different distributions of education in a society are associated with the *EduPol* index. In each row, we highlight the median category in bold. Rows (1)-(4), labeled countries *A-D*, display the four extreme scenarios of no *EduPol* whatsoever, i.e., everybody possesses the same educational attainment. These com-



parisons illustrate that polarization does not depend on the *average* level of education – a fundamental difference to measures that capture the mean level of schooling in a society.

**Table 1:** Examples of the *EduPol* index, showing the respective share of society in each educational group.

Country	No schooling	Primary	Secondary	Tertiary	<i>EduPol</i>
<i>Zero EduPol</i>					
<i>A</i>	<b>1</b>	0	0	0	0.00
<i>B</i>	0	<b>1</b>	0	0	0.00
<i>C</i>	0	0	<b>1</b>	0	0.00
<i>D</i>	0	0	0	<b>1</b>	0.00
<i>Two distinct groups</i>					
<i>E</i>	<b>0.5</b>	0	0	0.5	1.00
<i>F</i>	0	<b>0.5</b>	0	0.5	0.67
<i>G</i>	0	<b>0.5</b>	0.5	0	0.33
<i>Symmetrical cases</i>					
<i>H</i>	0.1	<b>0.4</b>	0.3	0.2	0.43
<i>I</i>	0.2	<b>0.3</b>	0.4	0.1	0.43
<i>J</i>	0.25	<b>0.25</b>	0.25	0.25	0.50
<i>Changes within a country</i>					
<i>K</i> <sub>1</sub>	<b>0.5</b>	0.2	0.2	0.1	0.47
<i>K</i> <sub>2</sub>	0.4	<b>0.3</b>	0.2	0.1	0.30
<i>K</i> <sub>3</sub>	0.3	<b>0.2</b>	0.3	0.2	0.50

Country *E* displays the opposite scenario: We observe maximal *EduPol* if half the population possesses no schooling at all, whereas the other half completes their tertiary education. In reality, such an extreme distribution is unlikely, of course. For example, applying the *EduPol* calculation to information from 2010, only seven countries worldwide report tertiary education to be the largest of the four categories in their country (Canada, Ireland, Israel, New Zealand, Russia, South Korea, and the US). Globally, the mean and median values in the tertiary category are 16.5 and 13.9 percent in 2010.

Although the *EduPol* index does not assign a cardinal scale to education, it does incorporate the distance of educational categories to the median. Countries *E – G* highlight this property, as in all three cases the population is divided into two distinct groups. Nevertheless, the distance between the median group and the other group is diminishing and, consequently, the index declines consistently from countries *E* through *F* to *G*. If the index did not consider distances, one would derive the same value in all three cases. Further, countries *H* and *I* exemplify the measure’s symmetrical property, whereas country *J* highlights that a uniform distribution of educational attainment in a populace represents an intermediate degree of polarization, producing a value of exactly 0.5.

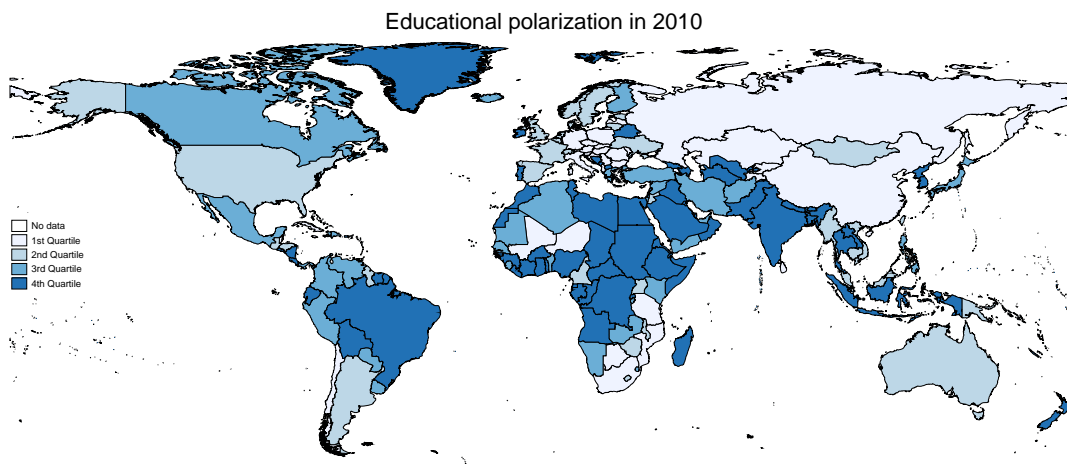
Finally, countries *K<sub>1</sub>-K<sub>3</sub>* sketch a hypothetical change in *EduPol* within a given country. The only difference between country *K<sub>1</sub>* and *K<sub>2</sub>* comes from ten percent of the population moving from no schooling to obtaining primary education. Consequently, *EduPol* decreases from 0.47 to 0.3 and the median educational level moves from no schooling to primary schooling. This also means that only ten percent of the population (those with tertiary education) are removed by more than one level from the median category. In scenario *K<sub>3</sub>*, however, we observe an increase in the number of highly educated citizens, which again raises the level of *EduPol*. This shows how a transition to a more educated society may lower or raise *EduPol*, which is again different to measuring pure averages or other properties of education levels.

### 2.3 Countries with Large Educational Polarization

To provide an intuition of *EduPol* around the world, Figure 1 maps the index for all 146 countries that are available in the 2010-2014 period from Barro and Lee (2013). The largest degrees of polarization are reached in Pakistan and India with values of 0.46 and 0.39, respectively. As it happens, both countries experienced (i) substantial political instability, (ii) an extraordinarily large number of domestic terror attacks, (iii) civil conflict, and (iv) civil war during that time.<sup>6</sup> In general, educational attainment is more polarized in the Middle East, Central African

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<sup>6</sup>Although our data sources will be introduced shortly, it is noteworthy to consider the relevant snapshots for Pakistan and India in the 2010-2014 period: The political instability index reaches exceptionally high values of 2.64 and 1.19, respectively (world average 0.04); 1,533 and 674 domestic terror attacks occurred (world average:



**Figure 1:** Educational polarization in 2010, where darker coloring indicates larger levels of polarization.

countries, and South America.

To provide some descriptive context, Table 2 presents basic correlations of the *EduPol* index with some prominent country-level characteristics with years of schooling, income levels, population size, the degree of democracy, as well as ethnic and religious polarization indices. We will introduce these variables formally (with respective sources) in the following section. Table 2 also illustrates that, empirically, the concept of *EduPol* differs fundamentally from educational attainment alone, as the corresponding correlation coefficient only reaches a value of 0.21. It is interesting, and perhaps somewhat surprising, to see that large *EduPol* is more likely to occur in richer countries with generally better schooling. Intuitively, polarization can only occur if a substantial number of citizens attain more education. Population size and democracy levels, as well as polarization along ethnic and religious dimensions, are largely unrelated to *EduPol* at first glance.

To get a better understanding of these relationships, Table 3 presents results from regressing *EduPol* on the respective variables. Columns (1)-(4) display coefficients derived from pooled regressions, whereas columns (5) and (6) introduce country- and time-fixed effects. It is interesting to see that ethnic and religious polarization remain unrelated to *EduPol*, whereas poorer and

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12.9); and both countries experienced civil conflict (25 or more battle-related deaths in a given year) and civil war (1,000 or more battle-related deaths in a given year).

**Table 2:** Correlations between *EduPol* and other prominent country-level variables.

Variables	Schooling	Ln(GDP/cap)	Ln(population size)	Polity	Ethnic polarization	Religious polarization
Educational polarization	0.21	0.22	0.06	-0.00	0.01	-0.07
<i>N</i>	1,897	1,430	1,430	1,430	852	852

larger nations are also those with high *EduPol* levels. (Note that since information on ethnic and religious polarization levels are only available once per country, these variables will fall out in the fixed effects estimation.) With this introduction of an empirical measure for *EduPol*, we now present a basic theoretical framework to illustrate our hypothesis of linking *EduPol* to civil unrest and social tension.

### 3 Theoretical Framework

We develop a game-theoretic model of civil unrest in which two societal groups compete for control over social and economic policy. The stylized model is adapted from [Esteban and Ray \(2011\)](#) to formalize the logic regarding how *EduPol* may affect the propensity for conflict among groups within a society.

#### 3.1 Theory of Education and Societal Conflict

Consider a society divided into two groups, denoted *A* and *B*, with a total of *n* individuals. Let  $\mu$  define the portion of the population in group *A*,  $n_A = \mu n$ , and  $n_B = (1 - \mu)n$ . Without loss of generality, we assume group *A* to be smaller than group *B*, and thus  $\mu < 1/2$ .

The two groups compete for control over public policy. Each individual simultaneously and independently chooses how much to invest (by providing time, resources, or effort) in their group's aggregate effort in the contest for power. We denote an individual's investment by  $x_a$  or  $x_b$ , depending on their group membership. Total investments by members of each group are defined as  $X_A = \sum_{a \in A} x_a$  and  $X_B = \sum_{b \in B} x_b$ . Given total effort, group *A* wins power with

**Table 3:** Results from OLS regressions, predicting educational polarization.

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Educational polarization (mean = 0.17)</i>						
Schooling	0.006*** (0.001)	0.001 (0.002)	0.002 (0.002)	0.004 (0.003)	0.004 (0.004)	-0.004 (0.006)
Ln(GDP/cap)		0.016*** (0.006)	0.017*** (0.006)	0.010 (0.009)	-0.020* (0.011)	-0.036*** (0.012)
Ln(Population size)		0.004 (0.002)	0.004 (0.003)	0.006* (0.003)	0.092*** (0.015)	0.050*** (0.017)
Polity			-0.002** (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001* (0.001)
Ethnic polarization				0.015 (0.023)		
Religious polarization				-0.015 (0.017)		
Country-fixed effects					yes	yes
Time-fixed effects						yes
# of countries	146	144	135	79	135	135
# of time periods	13	13	13	13	13	13
<i>N</i>	1,897	1,853	1,430	852	1,430	1,430
Adjusted <i>R</i> <sup>2</sup>	0.042	0.066	0.067	0.053	0.240	0.284

Notes: Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

probability

$$Pr(A \text{ wins}) = \frac{X_A}{X_A + X_B} \quad \text{and} \quad Pr(B \text{ wins}) = \frac{X_B}{X_A + X_B}.$$

The group that wins power sets the policy that is most favorable to its members. First, the winning group may divide rivalrous resources or economic rents in a way that benefits members of its own group. For simplicity, we assume that such division benefits members of the winning group equally and that the total surplus being divided is unaffected by which group controls policy. If group  $A$  wins power, each member of the group receives a benefit of  $\nu > 0$  from such an allocation. If group  $B$  wins power, each member of that group receives  $\mu n_A / n_B = \nu \mu / (1 - \mu)$ , as the benefit must be adjusted for differences in group size.

Second, the winning group chooses other aspects of policy that may create non-rivalrous benefits for the group in power – these may involve public goods or civil rights, for example. We assume that each member of society receives an additional benefit of  $\delta$  from the implementation of its own group’s preferred policies rather than the other group’s preferred policies.  $\delta$  is a non-pecuniary benefit that does not have to be split between the group members; it is received by each member of the winning group regardless of group size.

The strategic game involves all members of each group simultaneously and independently choosing their levels of individual effort in the collective contest for power. An individual  $a$  in group  $A$  chooses  $x_a$  to maximize their expected payoff:

$$EU_a(x_a) = \frac{X_A(x_a)}{X_A(x_a) + X_B} (\nu + \delta) - x_a. \quad (2)$$

An individual  $b$  in group  $B$  chooses  $x_b$  to maximize their expected payoff:

$$EU_b(x_b) = \frac{X_B(x_b)}{X_A + X_B(x_b)} \left( \nu \frac{\mu}{1 - \mu} + \delta \right) - x_b. \quad (3)$$

Notice that without loss of generality, these equations normalize the benefits from the other group’s policy to zero. To further simplify exposition, we define  $V_A \equiv \nu + \delta$  and  $V_B \equiv \nu \frac{\mu}{1 - \mu} + \delta$ .

The model can provide insight into the effect of an increase in *EduPol* on the level of conflict

within society. The two groups,  $A$  and  $B$ , may be defined based on the education of their members, with one representing the educated class and the other the uneducated class within society. An increase in  $EduPol$  manifests itself within the context of the model in two ways. First, it is associated with an increase in  $\delta$  as class disagreement on general policy becomes more substantial. The channel captures the fundamental idea from the sociological literature on education as an institution that views formal education as a mechanism for establishing a common system of values and beliefs among the educated classes (e.g. Meyer, 1977; Meyer and Soysal, 1992; Meyer et al., 2007). Indeed, there is evidence that those with high degrees of formal education exhibit a system of beliefs that has more in common with highly educated people in other countries than with less educated people within their own country (e.g., Meyer, 1977; Baker and LeTendre, 2005). Second, an increase in  $EduPol$  is associated with a more-equal division of the population across the two groups. This involves an increase in  $\mu$  as it comes closer to  $\mu = 1/2$ , as well as an increase in  $V_B$  as it converges towards  $V_A$ .

### 3.2 Equilibrium Outcomes

We solve for the symmetric Nash Equilibrium of this game, which is described by the individual contributions by members of each group,  $x_a^*$  and  $x_b^*$ . A detailed derivation of the results is provided in Appendix A. Lemma 1 describes the group-level outcomes in the symmetric equilibrium of the game.

**Lemma 1.** *In equilibrium, the aggregate investments from members of group  $J \in \{A, B\}$  are*

$$X_J^* = \frac{V_J V_J^2}{(V_J + V_{\setminus J})^2},$$

*individual investments by each member of  $J$  are  $x_j^* = X_J^*/n_J$ , and group  $J$  wins power with probability*

$$\pi_J^* = \frac{V_J}{V_J + V_{\setminus J}}.$$

Although not essential for the arguments in this paper, it is straightforward to show that the smaller of the two groups exerts more effort (both individually and in aggregate) and wins

power more often than the larger group. This insight reflects the collective action problem that is inherent in our framework (e.g. [Olson, 1965](#)), with the larger group having a more significant free rider problem when it comes to organizing and exerting effort. It also reflects the fact that in our framework members of the larger group may benefit less individually when their group wins power because any fixed rents must be divided among more people.

More relevant for the current paper are the comparative statics regarding the variables relevant to the *EduPol* measure. In equilibrium,  $X_J^*$  represents the aggregate investment of the members of group  $J$ , and  $\pi_B^* = X_B^*/(X_A^* + X_B^*) < 1/2$ , captures how closely contested the power struggle is.

**Proposition 1.**  $X_A^*$ ,  $X_B^*$ , and  $\pi_B^*$  are strictly increasing in both  $\delta > 0$  and  $\mu$  up to  $1/2$ .

This result shows how the aggregate efforts of both parties, as well as the competitiveness of the conflict are strictly increasing in the policy disagreement between the parties and how evenly divided the population is across the two parties. The following corollary follows immediately from [Proposition 1](#) under the assumption that *EduPol* interacts with the model through  $\delta$  and  $\mu$ .

**Corollary 1.**  $X_A^*$ ,  $X_B^*$ , and  $\pi_B^*$  are strictly increasing in *EduPol*.

The model provides general results about the relationship between the divide between groups, which may be interpreted as *EduPol*, and the degree of social tensions and civil unrest in society. In reality, these tensions may be expressed in various forms, some of which may exhibit organized violence, such as terrorism or even civil conflict and civil war. In general, we posit that it is reasonable to assume violence to become more likely as groups exert more effort, and as the conflict for power becomes more competitive. We will spend the remainder of the paper to test this hypothesis empirically by looking at measures for (i) political instability, (ii) domestic terrorism, (iii) civil conflict, and (iv) civil war.



## 4 Data and Empirical Methodology

### 4.1 Data

Along with the *EduPol* index introduced in Section 2 as our main independent variable, our empirical estimations focus on political instability, domestic terrorism, civil conflict, and civil war as outcome measures reflecting social tensions and civil unrest. All our data are derived from standard sources in the associated literature, as summarized in Table 4. First, we access the World Bank database (Group, 2016) for an index measuring political instability, available since 2000.<sup>7</sup> Second, we consult the Global Terrorism Database (GTD; START, 2015) for data on domestic terrorism from 1970 onwards.<sup>8</sup> Note that we focus on *domestic* terrorism, as opposed to *international* terrorism, since the former represents a natural measure of domestic social unrest, whereas the latter is likely more related to international relations, such as foreign policy behavior (e.g., see Savun and Phillips, 2009, or Pape, 2010).<sup>9</sup> Third, we access the Uppsala Conflict Data Program (UCDP, 2015) to derive annual country-level information for civil conflict and civil war since 1950.<sup>10</sup>

For the outcome variables, we calculate the five-year average of political instability (e.g., from 2000-2004, 2005-2009, and so on), the total number of domestic terror attacks in a five-year period (e.g., 1970-1974, 1975-1979, etc.), and finally code a country as being in a civil conflict (war) if at least one of the corresponding years produces 25 (1,000) or more battle-related deaths (see definitions of civil conflict and civil war in Blattman and Miguel, 2010, for example). Note that the *EduPol* variable is always measured in the first year of the respective five-year period (e.g., 1970, 1975, 1980,...) to alleviate concerns about reverse causality. Table 4 shows that the average country-five-year observation counts 12.96 domestic terror attacks,

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<sup>7</sup>The initial index measures political stability, but we invert the index to derive political *instability*. This facilitates the interpretation of our results since for all other outcome variables higher values indicate more social unrest.

<sup>8</sup>As is well known in the literature, the GTD does not feature data for 1993 because of a data loss.

<sup>9</sup>For example, Freytag et al. (2011) write: “For instance, Dreher and Gassebner (2008) and Savun and Phillips (2009) find that transnational terrorist activity is related to foreign policy behavior. However, such factors are less likely to matter to the (more common) phenomenon of domestic terrorism (e.g., see Savun and Phillips, 2009).

<sup>10</sup>The UCDP states that data before 1960 can be subject to measurement error. Nevertheless, our findings are virtually identical when excluding data before 1960.

**Table 4:** Summary statistics of main variables. Political instability and domestic terror attacks constitute re averages for the years  $t$  until  $t + 4$ , whereas all independent variables are taken at time  $t$ .

Variable	Mean (Std. Dev.)	Min. (Max.)	N	Source <sup>a</sup>	Description
<b>Panel A: Dependent variables</b>					
Political instability	0.11 (0.94)	-1.49 (2.64)	288	WB	Political stability and absence of violence/terrorism (inverted)
Domestic terror attacks	12.96 (81.04)	0 (2,139.20)	1,897	GTD	Number of domestic terror attacks
Civil conflict (25+ deaths)	0.19 (0.39)	0 (1)	1,897	UCDP	= 1 if at least 1 year with 25+ battle-related deaths
Civil war (1,000+ deaths)	0.13 (0.34)	0 (1)	1,897	UCDP	= 1 if at least 1 year with 1,000+ battle-related deaths
<b>Panel B: Variable of interest</b>					
Educational polarization	0.17 (0.09)	0 (0.54)	1,897	B&L	Educational polarization index (see Section 2 for details)
<b>Panel C: Control variables</b>					
Schooling	5.06 (3.28)	0 (13.42)	1,897	B&L	Years of schooling
GDP/cap	8.65 (11.84)	0.28 (116.44)	1,871	Gapminder	GDP/capita in thousand US\$, applying the natural logarithm
Population size	29.77 (108.92)	0.02 (1,340.97)	1,878	Gapminder	Population size in million, applying the natural logarithm
Polity	1.28 (7.48)	-10 (10)	1,453	Polity IV	Variable <i>polity2</i> , ranging from -10 (total autocracy) to +10 (full democracy)
Ethnic polarization	0.50 (0.26)	0.02 (0.96)	1,130	R-Q & M	Ethnic polarization index
Religious polarization	0.49 (0.35)	0 (0.98)	1,130	R-Q & M	Religious polarization index

*Notes:* WB = [Group \(2016\)](#); UCDP = Uppsala Conflict Data Program ([UCDP, 2015](#)); B&L = [Barro and Lee \(2013\)](#); Maddison = [The Maddison-Project \(2013\)](#); Polity IV = [Marshall and Jaggers \(2002\)](#); R-Q & M = [Reynal-Querol and Montalvo \(2005\)](#).

whereas civil conflict occurs in 19 percent of all cases and civil war in 13 percent. Finally, Panel C of Table 4 lists summary statistics for our main control variables – we will discuss the intuition behind these soon.

## 4.2 Empirical Methodology

Our empirical strategy follows a conventional OLS approach, where we predict political instability, domestic terror attacks, as well as the likelihood of civil conflict and civil war. Although we present OLS findings in our main estimations to facilitate the quantitative interpretation of results, we also employ negative binomial regressions in the case of terrorism and logit regressions to predict the binary cases of civil conflict and civil war. All our results are consistent when employing these alternative estimation methods and we will refer to them throughout our discussion.<sup>11</sup>

Using our first outcome variable of political instability for country  $i$  in the years  $t$  until  $t + 4$  as an example, we estimate

$$\sum_{s=t}^{t+4} \left( \frac{Instability_{is}}{5} \right) = \beta_1 (EduPol)_{it} + \mathbf{X}_{it} \beta_2 + \gamma_i \beta_3 + \theta_t \beta_4 + \delta_{it}, \quad (4)$$

i.e., we predict the average political instability score of the years  $t$  until  $t + 4$  with *EduPol* and a range of potentially confounding factors. We then replicate the regression strategy from equation 1 to predict the average annual number of domestic terror attacks in the years  $t$  until  $t + 4$ , as well as whether civil conflict or civil war occurred in at least one of these years.

If our hypothesis were of substance, we would expect a positive and statistically meaningful coefficient  $\beta_1$  that is relevant in quantitative terms. It is important to check whether that relationship is influenced by other predictors of political instability, terrorism, civil conflict, or civil war. Thus, the vector  $\mathbf{X}_{it}$  incorporates a set of control variables, capturing factors that may independently affect social unrest and organized violence. We access the existing

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<sup>11</sup>In our most complete estimations, we resort to conventional OLS frameworks to accommodate country- and time-fixed effects. By design, fixed effects estimations are difficult to conduct and interpret in logit or negative binomial regression frameworks (e.g., see [Greene, 2004](#), or [Cameron and Trivedi, 2005](#)), and the literature then usually moves to employing OLS regressions.

literatures on domestic terrorism and civil conflict to produce a comprehensive list of these potentially confounding factors. First, we consider the natural logarithm of GDP per capita and population size, as well as the *polity2* variable from the Polity IV data set, measuring the degree of democracy.<sup>12</sup> Second, as our focus lies on education, we control for average years of schooling (e.g., see [Østby and Urdal, 2011](#)). All of these variables are measured in the first year of the respective five-year span to alleviate concerns related to potential reverse causality. We also account for ethnic and religious polarization to ensure that our findings are not driven by distributional particularities across dimensions other than education. (Note that, since these values are only available once for every country – from [Montalvo and Reynal-Querol \(2005\)](#), or previously from [Alesina et al. \(2003\)](#) – we exclude country-fixed effects in these estimations.) In addition, educational *fractionalization* is not able to explain our findings (see appendix Tables [B4](#), [B6](#), [B10](#), and [B11](#)).

Further,  $\gamma_i$  represents country-fixed effects, controlling for country-specific factors that are time-invariant or only change slowly over time. For example, geographical aspects are sometimes discussed as drivers of terrorism and conflict, such as mountainous terrain, country area, elevation, or landlockedness.<sup>13</sup> In general, introducing country-fixed effects allows us to exploit within-country variation only, thereby substantially reducing the likelihood of a potential omitted variable bias (e.g., see [Besley and Persson, 2011](#), or [Cotet and Tsui, 2013](#), for the importance of implementing country-fixed effects when studying civil conflict).

In addition,  $\theta_t$  constitutes time-fixed effects that control for global trends in explaining civil unrest. For example, when it comes to terrorism, the earlier periods from the 1970s onwards are largely characterized by politically motivated terrorism (e.g., leftist movements), whereas much of the most recent episodes of terrorism are labeled as religious terrorism. With respect

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<sup>12</sup>See [Gassebner and Luechinger's \(2011\)](#) Table 1 for a summary of the relevant works suggesting GDP per capita, population size, or democracy to matter for terrorism. [Collier and Hoeffler \(1998, 2004\)](#), [Fearon and Laitin \(2003\)](#), [Esteban et al. \(2012\)](#), and [Conconi et al. \(2014\)](#) advocate for these three variables as predictors of civil conflict and civil war. For a detailed analysis of civil war and its determinants, we recommend [Blattman and Miguel \(2010\)](#).

<sup>13</sup>For geographical factors in explaining terrorism, we refer to [Blomberg et al. \(2004\)](#) and [Abadie \(2006\)](#). For the role of geography in predicting civil conflict and war, we recommend [Fearon and Laitin \(2003\)](#), [Reynal-Querol and Montalvo \(2005\)](#), or [Collier et al., 2009](#).

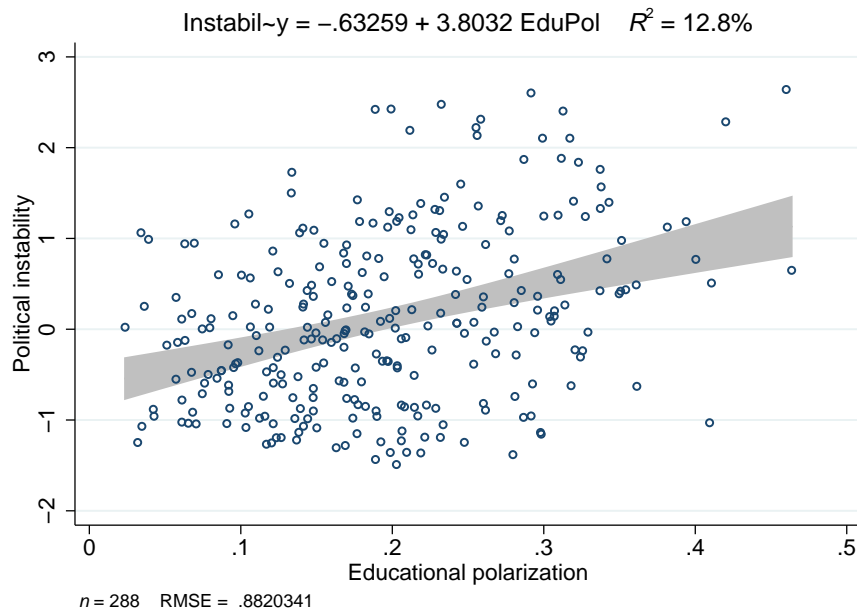
to civil conflicts and wars, major historical episodes, such as the Cold War, the fall of the Soviet Union, or decolonization could systematically affect the likelihood of organized violence around the world. Time-fixed effects account for such contemporaneous phenomena around the world. Finally,  $\delta_{it}$  denotes the usual error term and we cluster error terms at the country level throughout all estimations.

In extensions, we also consider the influence from other potential determinants, such as economic inequality (via the Gini coefficient, both pre- and post-redistributional policies), the lagged dependent variable, natural resources, oil rents, ethnic and religious polarization and fractionalization, alternative measures for political institutions (political rights and executive constraints), as well as military capabilities of the respective government. The Gini coefficient has been suggested as a meaningful predictor of terrorism (Enders and Hoover, 2012; Abadie, 2006) and civil conflict (Collier and Hoeffler, 2004; Esteban and Ray, 2011; Esteban and Ray, 2008). Similarly, past conflict appears to be a strong predictor of current conflict (Miguel and Satyanath, 2011; Esteban et al., 2012; Hull and Imai, 2013; Nunn and Qian, 2014). Natural resources and oil may matter (Collier and Hoeffler, 1998; Fearon and Laitin, 2003; Cotet and Tsui, 2013), as well as ethnic polarization (Reynal-Querol and Montalvo, 2005; Bhavnani and Miodownik, 2009; Montalvo and Reynal-Querol, 2010; Klasnja and Novta, 2014) and various facets of religion (Basedau et al., 2016). Collier and Hoeffler (2004) advocate the role of political rights, whereas Conconi et al. (2014) discuss electoral accountability when explaining domestic conflict. In addition, a stronger military may deter a violent rebellion, everything else equal, and we want to ensure that such dynamics are not confounding our findings. Summary statistics of these additional variables are referred to appendix B, Table B1. We eventually decided to not include these in our baseline estimations because of data availability, as our goal is to explore the role of *EduPol* for the largest sample of country-five-year observations possible. Finally, we also explore alternative outcome variables with (i) a state fragility index, (ii) domestic terror deaths (as opposed to attacks), and (iii) political terror indices. With this empirical setup in mind, we now move to describing the associated findings.

## 5 Empirical Findings

### 5.1 Political Instability

We begin by analyzing political instability and its relationship with *EduPol*. Figure 2 displays a simple scatterplot of the *EduPol* values (x-axis) and the associated values of political instability (y-axis), along with the fitted line and the respective confidence intervals. Across the 288 observations (144 countries for two time periods: 2005-2009 and 2010-2014), a strong positive association emerges. *EduPol* alone is able to explain 12.8 percent of the variation in political instability and a ten percentage point increase in *EduPol* relates to a 0.38 point increase on the political instability index. In terms of magnitude, this would correspond to more than 45 percent of a one standard deviation in political instability (equivalent to  $\frac{0.38}{0.94}$ , see Table 4).



**Figure 2:** Educational polarization and political instability.

However, this basic correlation can of course only be seen as suggestive since Figure 2 does not account for the influence of the potentially confounding factors discussed in Section 4.2. Table 5 presents results from the corresponding regression analysis. In column (1), we only use *EduPol* and the average years of schooling to predict political instability in an OLS setting.

We then subsequently add GDP per capita and population size in column (2), as well as the remaining covariates in columns (3) and (4). Finally, column (5) accounts for time-fixed effects in the most complete estimation. (Note that we exclude country-fixed effects in this particularly restricted sample with only two observations per nation.)

**Table 5:** Results from OLS regressions, predicting political instability in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)
<i>Dependent variable: Political instability (mean = 0.11)</i>					
Educational polarization	1.506* (0.783)	2.381*** (0.681)	2.255*** (0.675)	2.328*** (0.753)	2.314*** (0.755)
Years of schooling	-0.158*** (0.023)	-0.010 (0.032)	0.015 (0.033)	0.025 (0.042)	0.023 (0.043)
Ln(GDP/cap)		-0.404*** (0.061)	-0.408*** (0.064)	-0.430*** (0.078)	-0.427*** (0.078)
Ln(population size)		0.168*** (0.025)	0.183*** (0.032)	0.122*** (0.032)	0.121*** (0.032)
Polity			-0.024*** (0.009)	-0.028*** (0.010)	-0.028*** (0.010)
Ethnic polarization				-0.012 (0.225)	-0.012 (0.225)
Religious polarization				-0.167 (0.172)	-0.168 (0.172)
Time-fixed effects					yes
# of countries	144	143	133	78	78
# of time periods	2	2	2	2	2
$N$	288	286	264	155	155
Adjusted $R^2$	0.349	0.583	0.575	0.600	0.599

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Once all regressors are incorporated, the coefficient associated with *EduPol* remains a positive predictor of political instability. With a p-value of 0.003, the model confidently suggests

*EduPol* to be a statistically meaningful regressor. In terms of magnitude, the coefficient of 2.3 suggests that a ten percentage point increase in *EduPol* relates to a 0.23 point increase in the political instability index, equivalent to 24 percent of one standard deviation. Overall, the most complete regression is able to explain as much as 60 percent of the statistical variation in political instability. It is also interesting to see that richer, smaller, and more democratic nations experience less instability, whereas polarization along ethnic or religious lines remains less important.

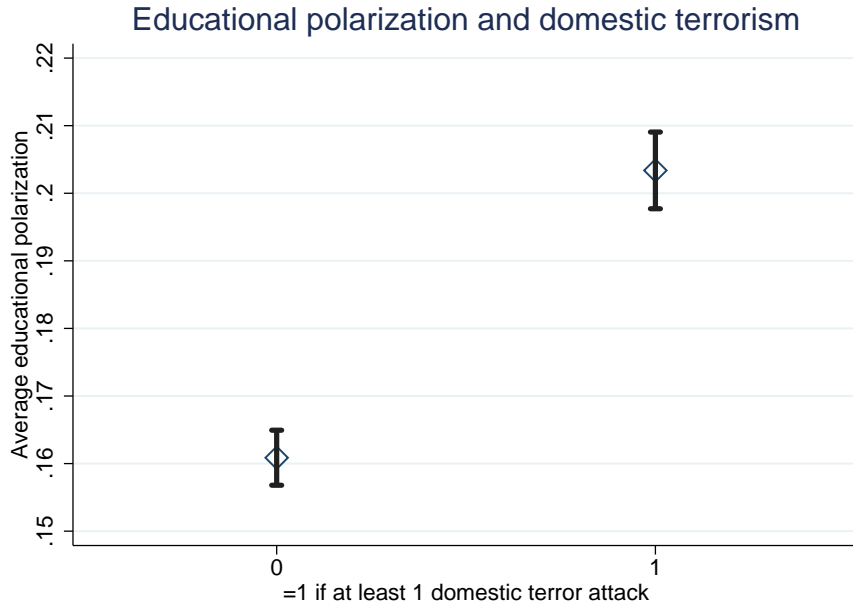
Finally, we also conducted a range of robustness checks, building on the most complete specification displayed in column (5) of Table 5. Specifically, the results are robust to (i) accounting for the Gini index (to acknowledge the effects of economic inequality), (ii) employing an alternative outcome variable measuring state fragility, and additionally controlling for (iii) natural and oil resources, (iv) educational fractionalization, (v) ethnic fractionalization, (vi) shares of religious denominations, (vii) religious polarization and fractionalization, (viii) political rights, (ix) executive constraints, and (x) national military capabilities. The corresponding results can be found in appendix B, Tables B2, B3, and B4.

## 5.2 Domestic Terrorism

In Figure 3, we turn to the relationship between *EduPol* and the number of domestic terror attacks. As a descriptive graphic, we show the average *EduPol* value for observations with no domestic terror attacks and those with at least one such attack. Indeed, domestic terrorism is substantially more likely to happen when *EduPol* is higher.

Table 6 turns to results from a full regression analysis. In columns (1)-(4), we follow the same sequence of regressions as in Table 5, but then include country- and time-fixed effects in columns (5) and (6), given richer data availability for terrorism since 1970. As with political instability, *EduPol* remains a positive predictor of the number of domestic terror attacks. Once fixed effects are included in the final columns, statistical relevance blurs (with a p-value of 0.06 in the most complete estimation), but magnitudes actually *increase* when compared to the findings from the previous columns. In the final estimation, a ten percentage point increase in the *EduPol* index





**Figure 3:** Educational polarization and domestic terrorism.

is associated with 17 additional terror attacks.

It is important to highlight that the literature usually employs count models such as the negative binomial regression framework to predict the number of terror attacks. Once we replicate Table 6 with negative binomial regressions, the coefficient associated with *EduPol* remains statistically relevant on the ten percent level (see Table B5). Further, the findings from Table 6 are consistent when accounting for the familiar list of additional controls with (i) economic inequality via the Gini index, (ii) the lagged dependent variable, (iii) natural and oil resources, (iv) ethnic polarization and fractionalization, (v) shares of religious denominations, religious polarization and fractionalization, (vi) political rights, (vii) executive constraints, and (viii) national military capabilities. Results are also consistent when predicting (i) deaths from domestic terrorism and (ii) political terror scales from Amnesty International or the US State Department. The corresponding results are referred to appendix B, Tables B2, B6, B7, B8, and B9.

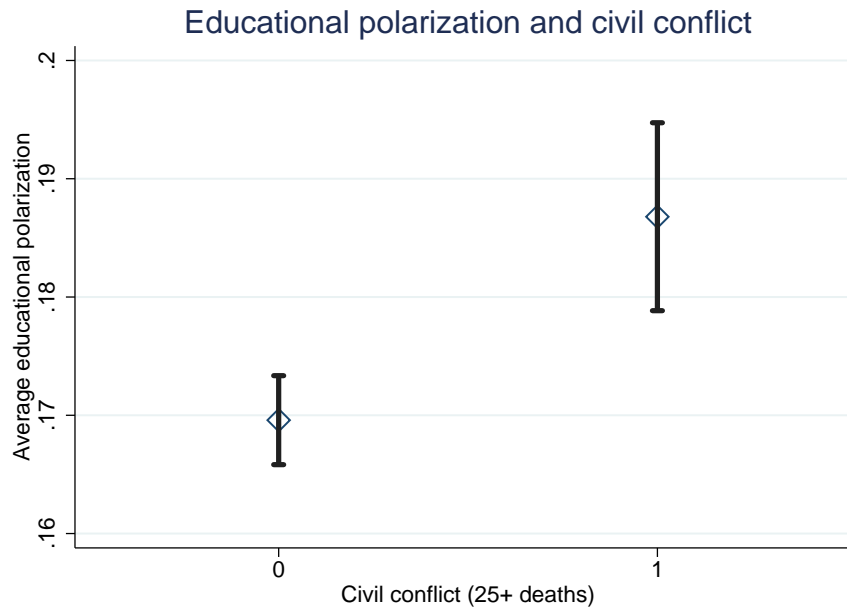
**Table 6:** Results from OLS regressions, predicting domestic terror attacks in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Domestic terror attacks (mean = 12.96)</i>						
Educational polarization	137.445*** (49.857)	137.508*** (49.785)	159.984*** (58.282)	120.730** (52.584)	160.621** (79.595)	170.727* (93.370)
Years of schooling	-0.112 (0.497)	0.053 (0.607)	-1.254 (0.897)	-1.434 (1.095)	0.671 (5.659)	4.305 (7.663)
Ln(GDP/cap)		-1.951 (2.118)	-1.568 (2.263)	-0.664 (3.107)	-0.526 (23.111)	-3.714 (26.895)
Ln(population size)		7.850*** (1.828)	9.916*** (2.387)	7.518*** (2.765)	20.016** (8.512)	26.526** (12.431)
Polity			1.029*** (0.356)	0.816* (0.411)	0.566 (0.491)	0.964 (0.592)
Ethnic polarization				-5.998 (16.554)		
Religious polarization				8.900 (12.288)		
Country-fixed effects					yes	yes
Time-fixed effects						yes
# of countries	146	144	135	79	135	135
# of time periods	9	9	9	9	9	9
$N$	1,897	1,853	1,430	852	1,430	1,430
Adjusted $R^2$	0.022	0.051	0.064	0.033	0.049	0.063

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

### 5.3 Civil Conflict

As our third measure for social unrest, we now turn to civil conflict. Figure 4 summarizes the average *EduPol* value for those country-five-year observations that experience a civil conflict versus those that do not. Again, these basic descriptive statistics suggest countries with higher *EduPol* to be more prone to substantial social unrest.



**Figure 4:** Educational polarization and civil conflict.

Table 7 documents the results from OLS and logit regressions, predicting whether the respective country experienced at least one year with 25 or more battle-related deaths in the respective five year span. As before, we move from a parsimonious model to accounting for the influence of the entire list of covariates, as well as country- and time-fixed effects. Column (4) employs a logit model to account for the binary nature of the outcome variable. Comparing the derived coefficients associated with *EduPol* to those from an OLS regression shows that the econometric methodology makes virtually no difference here (compare column 3 to column 4). In the most complete estimation, an increase in the *EduPol* index by ten percentage points elevates the likelihood of civil conflict by 4.2 percentage points. This result also remains meaningful in

statistical terms with a p-value of 0.023.

**Table 7:** Results from OLS and logit regressions, predicting the occurrence of civil conflict (0/1) in period  $t$  until  $t + 4$ . Results from logit regressions display marginal effects.

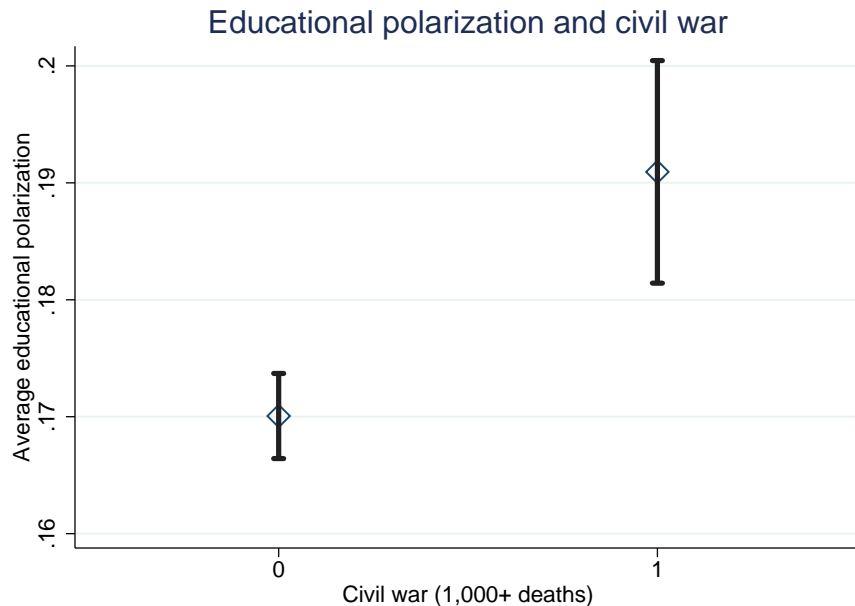
	(1)	(2)	(3)	Logit regression (4)	(5)	(6)
<i>Dependent variable: Civil conflict (mean = 0.19)</i>						
Educational polarization	0.518*** (0.170)	0.615*** (0.175)	0.632*** (0.214)	0.696*** (0.165)	0.530*** (0.172)	0.420** (0.182)
Years of schooling	-0.025*** (0.005)	-0.024** (0.010)	-0.030** (0.012)	-0.044** (0.020)	-0.035** (0.015)	-0.040* (0.022)
Ln(GDP/cap)		-0.058** (0.024)	-0.038 (0.029)	-0.018 (0.030)	0.058 (0.037)	0.015 (0.043)
Ln(population size)		0.079*** (0.016)	0.058*** (0.020)	0.051*** (0.017)	0.132** (0.051)	0.076 (0.052)
Polity		0.004 (0.003)	0.004 (0.004)	0.004 (0.003)	0.003 (0.003)	0.004 (0.003)
Ethnic polarization			-0.002 (0.109)	0.009 (0.101)		
Religious polarization			-0.027 (0.074)	-0.001 (0.078)		
Country-fixed effects					yes	yes
Time-fixed effects						yes
# of countries	146	135	79	79	135	135
# of time periods	13	13	13	13	13	13
$N$	1,897	1,430	852	852	1,430	1,430
Adjusted $R^2$	0.047	0.168	0.149		0.028	0.032

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

As with the other dependent variables, we also controlled for the additional covariates suggested before. Here again, the corresponding results are consistent with those from the main estimations displayed in Table 7. These robustness checks are referred to appendix B, Tables B2 and B10.

## 5.4 Civil War

Finally, we consider what is perhaps the most extreme expression of social unrest: Civil war. Figure 5 reveals that, as with the other outcome variables, organized violence is more likely to happen when *EduPol* is high. The results from OLS and logit regressions are documented in Table 8 and *EduPol* prevails as a positive and statistically meaningful predictor of civil war. In the most complete estimation (displayed in column 6), the p-value associated with the *EduPol* coefficient reaches a value of 0.04, i.e., we obtain statistically meaningful evidence of a positive link with the likelihood of civil war. It is noteworthy to point out that all other covariates become statistically irrelevant once all control variables are accounted for in column (6). This further speaks to the strong association between *EduPol* and the likelihood of civil war emerging.



**Figure 5:** Educational polarization and civil conflict.

Finally, as with the other three outcome measures of organized violence, this result is consistent when exploring the roles of inequality and the additional covariates. The corresponding regression results are available in Tables B2 and B11.

**Table 8:** Results from OLS and logit regressions, predicting the occurrence of civil war (0/1) in period  $t$  until  $t + 4$ . Results from logit regressions display marginal effects.

	(1)	(2)	(3)	Logit regression (4)	(5)	(6)
<i>Dependent variable: Civil war (mean = 0.13)</i>						
Educational polarization	0.410*** (0.151)	0.472*** (0.162)	0.430** (0.173)	0.451*** (0.129)	0.377*** (0.140)	0.311** (0.150)
Years of schooling	-0.015*** (0.005)	-0.008 (0.009)	-0.020* (0.011)	-0.027 (0.018)	-0.012 (0.011)	-0.019 (0.018)
Ln(GDP/cap)		-0.051** (0.024)	-0.016 (0.028)	-0.003 (0.029)	0.023 (0.029)	-0.002 (0.033)
Ln(population size)		0.067*** (0.016)	0.049** (0.020)	0.040*** (0.015)	0.111** (0.044)	0.071 (0.044)
Polity		0.001 (0.002)	0.002 (0.003)	0.002 (0.003)	0.000 (0.002)	0.000 (0.003)
Ethnic polarization			-0.052 (0.096)	-0.032 (0.089)		
Religious polarization			-0.013 (0.067)	0.007 (0.074)		
Country-fixed effects					yes	yes
Time-fixed effects						yes
# of countries	146	135	79	79	135	135
# of time periods	13	13	13	13	13	13
$N$	1,897	1,430	852	852	1,430	1,430
Adjusted $R^2$	0.024	0.127	0.098		0.032	0.030

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## 6 Conclusions

This paper aims to make two contributions. First, we derive a measure of educational polarization (*EduPol*) that is consistent and comparable across countries and over time. We suggest that, similar to ethnic and religious polarization measures, *EduPol* may be an important characteristic of society. As such, we hope that the *EduPol* index can serve researchers in the social sciences. Second, we propose that societies with polarized education levels (i.e., large shares of society are concentrated on the extremes of either virtually no education or university-level degrees) are more likely to experience civil unrest and social tensions. Intuitively, highly educated citizens are likely to differ fundamentally from uneducated citizens in their political preferences and beliefs, and these educational cleavages can raise the chances of social tensions, everything else equal. To formalize this intuition, we present a simple theoretical framework built on long-standing stylized facts in the sociology, political science, economics, and education literatures. Indeed, with few assumptions the model suggests that higher degrees of *EduPol* increase social tensions and the contest for power in a society.

We then take this prediction to the data by exploring four types of social unrest: Political instability, domestic terrorism, civil conflict, and civil war. Although one could certainly think of additional indicators of social unrest, data availability allows us to systematically test for these four measures in their relationship with the *EduPol* index. Indeed, the corresponding findings are systematic in that *EduPol* emerges as a positive and statistically relevant predictor with meaningful and realistic magnitudes. This result is robust to the inclusion of a host of potentially confounding factors, as well as country- and time-fixed effects. We also find that other types of polarization (namely along ethnic and religious dimensions), fractionalization, or income inequality are unable to explain our findings.

Taken together, we see these empirical results as evidence consistent with the idea that *EduPol* can systematically raise the chances of civil unrest. Of course, our study is not without weakness and we want to briefly discuss what we believe are the three major threats to identification. First, although our structure of regressing future measures of civil unrest (from

year  $t$  until  $t + 4$ ) on initial values of *EduPol* (taken at year  $t$ ) alleviates concerns about reverse causality, we cannot fully exclude that possibility. Nevertheless, accounting for lagged values of the respective dependent variable leaves our results intact, which provides us with additional confidence. Second, omitted variables are always a concern when predicting country-level phenomena on a global scale. We aim to minimize these concerns as well as possible by accounting for a long list of covariates and, perhaps most importantly, for country- and year-fixed effects. Third, it is possible that our measure of *EduPol* proxies other societal characteristics that we do not (and perhaps cannot) account for with our sample. We found it difficult to think of such a measure, but it is of course never possible to exclude that possibility in its entirety.



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## **Table of Contents: Appendix**

**A1 Theoretical Proofs**

**B1 Empirical Robustness Checks**



## Appendix A1

### Proof of Lemma 1

Individual  $j$  in group  $J$  chooses investment  $x_j$  to maximize his expected payoffs, taking as given equilibrium investment  $x_j^*$  from other members of group  $J$  and  $x_{\setminus J}^*$  from each member of the other group  $\setminus J$ . Thus, he chooses  $x$  to maximize

$$EU_i(x_j; x_j^*, X_{\setminus J}^*) = \frac{x_j + (n_J - 1)x_j^*}{x_j + (n_J - 1)x_j^* + n_{\setminus J}x_{\setminus J}^*} V_J - x_j.$$

Taking derivative with respect to  $x_j$  yields the first order condition

$$\frac{n_{\setminus J}x_{\setminus J}^*}{(x_j + (n_J - 1)x_j^* + n_{\setminus J}x_{\setminus J}^*)^2} V_J - 1 = 0.$$

One may check second order conditions to verify that the value of  $x$  which solves this equation is indeed a maximum. In the symmetric equilibrium,  $x_j = x_j^*$ . Substituting this into the FOCs gives

$$\frac{n_{\setminus J}x_{\setminus J}^*}{(n_J x_j^* + n_{\setminus J} x_{\setminus J}^*)^2} V_J = 1. \quad (5)$$

One can derive a symmetric FOC for group  $\setminus J$ :

$$\frac{n_J x_j^*}{(n_J x_j^* + n_{\setminus J} x_{\setminus J}^*)^2} V_{\setminus J} = 1. \quad (6)$$

With (5) and (6), we have two equations and two unknowns. It is straightforward to solve for  $x_j^*$  and  $x_{\setminus J}^*$ .

$$x_j^* = \frac{V_{\setminus J} V_J^2}{n_J (V_J + V_{\setminus J})^2} \quad \text{and} \quad x_{\setminus J}^* = \frac{V_J + V_{\setminus J}^2}{n_{\setminus J} (V_J + V_{\setminus J})^2}.$$

This is individual effort. Therefore,  $X_J^* = n_J x_j^*$  and  $X_{\setminus J}^* = n_{\setminus J} x_{\setminus J}^*$ . The probability group  $J$  wins the context is

$$\pi_J^* = \frac{X_J^*}{X_J^* + X_{\setminus J}^*} = \frac{V_J}{V_J + V_{\setminus J}}.$$

### **Proof of Proposition 1**

Follows from the straightforward but algebraically tedious calculation of the derivatives of  $X_A^*$ ,  $X_B^*$  and  $\pi_B^*$  with respect to  $\delta$  and  $\alpha$ . After the derivatives are calculated, one can verify that they are all positive conditional on  $\delta > 0$  and  $\alpha \in (0, 1/2)$ .

### **Proof of Corollary 1**

Follows immediately from Proposition 1 given the assumption that in the context of the model an increase in *EdPol* is associated with only an increase in  $\mu$ , increase in  $\delta$ , or both.

## Appendix B1

**Table B1:** Summary statistics of additional variables.

Variable	Mean (Std. Dev.)	Min. (Max.)	N	Source <sup>a</sup>	Description (if necessary)
Gini (pre-tax & pre-transfer)	45.08 (8.41)	24.47 (75.92)	521	Solt	Gini before taxation and transfer payments
Gini (post-tax & post-transfer)	36.83 (9.91)	14.06 (65.50)	521	Solt	Gini after taxation and transfer payments
State fragility index	9.10 (6.65)	0 (24.20)	399	QoG	Variable <i>cspf_sfi</i> in the QoG database, measuring state fragility from 0-25
Deaths from domestic terrorism	27.85 (205.61)	0 (5,345.80)	1,897	GTD	Number of people killed from domestic terrorism
Political terror scale (Amnesty International)	2.86 (0.98)	1 (5)	570	QoG	Variable <i>gd_ptsa</i> in the QoG database, measuring terror levels from 1-5
Political terror scale (US State Department)	2.45 (1.09)	1 (5)	888	QoG	Variable <i>gd_ptss</i> in the QoG database, measuring terror levels from 1-5
Natural resource rents	9.77 (13.42)	0 (75.09)	1,114	WB	Natural resource rents in percentage of GDP
Oil rents	4.75 (11.30)	0 (68.85)	1,158	WB	Oil rents in percentage of GDP
Educational fractionalization	0.28 (0.21)	0.01 (0.99)	1,885	own	Educational fractionalization index, calculated via a Herfindahl Hirschman index
Ethnic fractionalization	0.43 (0.29)	0.01 (0.96)	1,130	M&R-Q	Ethnic fractionalization index
Religious fractionalization	0.31 (0.24)	0 (0.78)	1,130	M&R-Q	Religious fractionalization index
% Muslim	24.8 (36.57)	0 (99.40)	968	QoG	Share of Muslims in society
% Catholic	33.39 (37.24)	0 (97.30)	968	QoG	Share of Catholics in society
% Protestant	12.21 (21.81)	0 (97.80)	968	QoG	Share of Protestants in society
Political rights	3.73 (2.16)	1 (7)	1,191	FH	Political rights, decreasing from 1 to 7
Executive constraints	4.3 (2.28)	1 (7)	1,353	Polity IV	Executive constraints, increasing from 1 to 7
National capability score	0.01 (0.02)	0 (0.21)	1,275	CoW	Composite Index of National Capability

*Notes:* WB = Group (2016); M&R-Q = Montalvo and Reynal-Querol (2005); Solt = Solt (2009, 2016); QoG = Quality of Government database (Teorell et al., 2011); FH = FreedomHouse (2014); Polity IV = Marshall and Jaggers (2002); CoW = Correlates of War (Singer and Stuckey, 1972).

**Table B2:** Exploring the role of income inequality, using pre-tax and pre-transfer Ginis.

Dependent variable:	Political instability		Domestic terror attacks		Civil conflict		Civil war	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Educational polarization	2.676*** (0.789)	2.719*** (0.781)	180.089** (74.962)	179.470** (77.540)	0.549** (0.270)	0.556** (0.271)	0.580** (0.258)	0.590** (0.262)
Gini (pre-tax & pre-transfer)	-0.015** (0.007)		-1.522*** (0.427)		-0.004 (0.003)		-0.004 (0.003)	
Gini (post-tax & post-transfer)		-0.012** (0.006)		-0.758* (0.453)		-0.001 (0.003)		-0.001 (0.003)
Control variables <sup>a</sup>	yes	yes	yes	yes	yes	yes	yes	yes
Country-fixed effects			yes	yes	yes	yes	yes	yes
Time-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
# of countries	89	89	96	96	96	96	96	96
# of time periods	2	2	9	9	11	11	11	11
<i>N</i>	150	150	447	447	460	460	460	460
Adjusted <i>R</i> <sup>2</sup>	0.625	0.626	0.068	0.060	0.271	0.265	0.199	0.191

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . <sup>a</sup>Includes schooling, Ln(GDP/capita), Ln(population size), and the Polity IV index of democracy (variable *polity2*).

**Table B3:** Results from OLS regressions, predicting the state fragility index in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: State fragility index (mean = 0.11)</i>						
Educational polarization	-1.663 (3.767)	9.744*** (2.544)	6.398*** (2.304)	7.397** (3.495)	4.303*** (1.546)	4.425*** (1.543)
Years of schooling	-1.708*** (0.102)	-0.570*** (0.127)	-0.422*** (0.112)	-0.529*** (0.163)	-0.425*** (0.144)	-0.138 (0.170)
Ln(GDP/cap)		-3.385*** (0.269)	-3.276*** (0.226)	-3.016*** (0.314)	-1.823*** (0.514)	-1.162* (0.648)
Ln(population size)		0.318** (0.154)	0.380** (0.156)	0.217 (0.181)	-4.019*** (0.944)	-2.414** (1.196)
Polity			-0.206*** (0.041)	-0.243*** (0.050)	-0.127*** (0.036)	-0.123*** (0.035)
Ethnic polarization				1.046 (1.108)		
Religious polarization				-0.451 (0.783)		
Country-fixed effects					yes	yes
Time-fixed effects						yes
# of countries	133	131	131	77	131	131
# of time periods	3	3	3	3	3	3
$N$	399	393	391	229	391	391
Adjusted $R^2$	0.627	0.818	0.849	0.860	0.472	0.484

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table B4:** Results from additional OLS regressions, predicting political instability in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Political instability (mean = 0.11)</i>						
Educational polarization	2.002*** (0.731)	2.254*** (0.801)	2.073** (0.910)	2.102*** (0.660)	2.180*** (0.713)	2.620*** (0.729)
Natural resource rents	-0.005 (0.006)					
Oil rents	0.018** (0.009)					
Educational fractionalization		-0.200 (0.598)				
Ethnic polarization		0.017 (0.324)				
Ethnic fractionalization		-0.093 (0.293)				
Religious polarization			1.155* (0.624)			
Religious fractionalization			-2.451*** (0.852)			
% Muslim			-0.000 (0.002)			
% Catholic			-0.003 (0.003)			
% Protestant			-0.001 (0.002)			
Political rights				0.125*** (0.028)		
Executive constraints					-0.092*** (0.029)	
National capability score						-3.253** (1.401)
Control variables <sup>a</sup> and time-fixed effects	yes	yes	yes	yes	yes	yes
# of countries	132	78	51	140	134	139
# of time periods	2	2	2	2	2	1
$N$	259	155	102	280	268	139
Adjusted $R^2$	0.587	0.596	0.628	0.626	0.579	0.590

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . <sup>a</sup>Includes schooling, GDP/capita, population size, and the Polity IV index of democracy (variable *polity2*).

**Table B5:** Results from negative binomial regressions, predicting domestic terror attacks in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Domestic terror attacks (mean = 12.96)</i>						
Educational polarization	16.124 (1.784)	13.999 (1.614)	13.139 (1.619)	13.616 (2.142)	3.265 (0.656)	1.268 (0.721)
Years of schooling	0.086 (0.045)	0.010 (0.068)	-0.022 (0.071)	-0.103 (0.084)	0.223 (0.026)	0.094 (0.047)
Ln(GDP/cap)		-0.133 (0.165)	-0.141 (0.159)	0.113 (0.256)	-0.098 (0.077)	-0.039 (0.115)
Ln(population size)		1.028 (0.091)	0.890 (0.123)	0.786 (0.167)	0.085 (0.051)	0.063 (0.066)
Polity			0.036 (0.022)	0.050 (0.033)	-0.008 (0.010)	0.026 (0.015)
0.5em] Ethnic polarization				-0.370 (0.855)		
Religious polarization				0.737 (0.565)		
Country-fixed effects					yes	yes
Time-fixed effects						yes
# of countries	146	144	135	79	132	132
# of time periods	9	9	9	9	9	9
$N$	1,897	1,853	1,430	852	1,415	1,415

Notes: Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table B6:** Results from additional OLS regressions, predicting domestic terror attacks in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Domestic terror attacks (mean = 12.96)</i>						
Educational polarization	218.892*	116.652*	101.720*	222.502**	208.257**	51.114*
	(124.214)	(60.732)	(53.378)	(106.401)	(100.193)	(30.237)
Lagged dependent variable	0.531					
	(0.369)					
Natural resource rents	-0.359					
	(0.651)					
Oil rents	1.194					
	(1.275)					
Educational fractionalization		-2.351				
		(19.316)				
Ethnic polarization		-8.323				
		(19.570)				
Ethnic fractionalization		7.738				
		(15.555)				
Religious polarization			21.271			
			(35.155)			
Religious fractionalization			-41.787			
			(48.857)			
% Muslim			0.087			
			(0.088)			
% Catholic			0.107			
			(0.141)			
% Protestant			0.353**			
			(0.167)			
Political rights				-1.237		
				(2.743)		
Executive constraints					3.400	
					(2.537)	
National capabilities score						-170.673
						(284.975)
Control variables <sup>a</sup> , country <sup>b</sup> - and time-fixed effects	yes	yes	yes	yes	yes	yes
# of countries	134	79	52	141	135	140
# of time periods	9	9	9	9	9	9
$N$	1,021	852	519	1,183	1,343	1,266
Adjusted $R^2$	0.137	0.031	0.149	0.056	0.064	0.047

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . <sup>a</sup>Includes schooling, GDP/capita, population size, and the Polity IV index of democracy (variable *polity2*). <sup>b</sup>The regressions displayed in columns (2) and (3) exclude country-fixed effects because the additional covariates are only available once for every country.



**Table B7:** Results from OLS regressions, predicting deaths from domestic terror attacks in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Deaths from domestic terror attacks (mean = 27.85)</i>						
Educational polarization	299.023*** (109.167)	312.924*** (110.992)	330.092*** (110.763)	252.001** (119.780)	295.657** (137.130)	301.291* (162.433)
Years of schooling	-1.756 (1.089)	0.650 (1.683)	-0.769 (2.268)	-2.918 (2.464)	7.644 (13.877)	15.556 (19.071)
Ln(GDP/cap)		-11.944** (5.799)	-12.035** (5.909)	-6.330 (7.461)	-35.257 (56.754)	-42.812 (64.409)
Ln(population size)		14.253*** (3.782)	16.540*** (4.550)	14.021** (5.815)	46.669*** (17.083)	57.630** (25.272)
Polity			1.265* (0.644)	1.294 (0.781)	0.166 (0.991)	0.958 (1.264)
Ethnic polarization				-10.580 (35.622)		
Religious polarization				25.893 (29.764)		
Country-fixed effects					yes	yes
Time-fixed effects						yes
# of countries	146	144	135	79	135	135
# of time periods	9	9	9	9	9	9
$N$	1897	1853	1430	852	1430	1430
Adjusted $R^2$	0.015	0.034	0.040	0.019	0.041	0.044

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table B8:** Results from OLS regressions, predicting the political terror scale provided by Amnesty International in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Political terror scale provided by Amnesty International (mean = 2.86)</i>						
Educational polarization	1.437** (0.577)	1.938*** (0.484)	1.823*** (0.483)	1.437** (0.615)	1.671*** (0.496)	1.759*** (0.501)
Years of schooling	-0.153*** (0.018)	-0.106*** (0.026)	-0.086*** (0.027)	-0.120*** (0.033)	0.036 (0.057)	0.029 (0.076)
Ln(GDP/cap)		-0.188*** (0.064)	-0.189*** (0.066)	-0.133 (0.082)	-0.150 (0.150)	-0.169 (0.150)
Ln(population size)		0.214*** (0.033)	0.219*** (0.035)	0.195*** (0.039)	-0.016 (0.284)	-0.060 (0.351)
Polity			-0.015* (0.008)	-0.014 (0.010)	-0.024*** (0.009)	-0.024*** (0.009)
Ethnic polarization				-0.064 (0.375)		
Religious polarization				-0.006 (0.253)		
Country-fixed effects					yes	yes
Time-fixed effects						yes
# of countries	130	129	125	72	125	125
# of time periods	6	6	6	6	6	6
$N$	570	560	548	312	548	548
adj. $R^2$	0.252	0.394	0.394	0.432	0.061	0.062

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table B9:** Results from OLS regressions, predicting the political terror scale provided by the US State Department in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Political terror scale provided by the US State Department (mean = 2.45)</i>						
Educational polarization	1.197* (0.695)	2.281*** (0.531)	2.136*** (0.514)	2.135*** (0.689)	1.708*** (0.439)	1.518*** (0.465)
Years of schooling	-0.165*** (0.019)	-0.038 (0.023)	0.001 (0.023)	-0.011 (0.033)	0.055 (0.036)	-0.022 (0.046)
Ln(GDP/cap)		-0.385*** (0.056)	-0.391*** (0.055)	-0.343*** (0.077)	-0.166 (0.130)	-0.233 (0.149)
Ln(population size)		0.250*** (0.029)	0.267*** (0.033)	0.232*** (0.038)	0.577*** (0.192)	0.335 (0.202)
Polity			-0.031*** (0.007)	-0.033*** (0.010)	-0.024*** (0.008)	-0.029*** (0.008)
Ethnic polarization				-0.225 (0.308)		
Religious polarization				0.061 (0.214)		
Country-fixed effects					yes	yes
Time-fixed effects						yes
# of countries	138	137	131	76	131	131
# of time periods	7	7	7	7	7	7
$N$	888	876	830	485	830	830
Adjusted $R^2$	0.251	0.515	0.522	0.491	0.129	0.145

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table B10:** Results from additional OLS regressions, predicting the occurrence of civil conflict (0/1) in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Civil conflict (mean = 0.19)</i>						
Educational polarization	0.523*** (0.184)	0.811*** (0.293)	0.774*** (0.273)	0.578*** (0.192)	0.468** (0.198)	0.520** (0.200)
Lagged dependent variable	0.235*** (0.049)					
Natural resource rents	0.006 (0.004)					
Oil rents	-0.004 (0.004)					
Educational fractionalization		0.187 (0.178)				
Ethnic polarization		-0.060 (0.154)				
Ethnic fractionalization		0.048 (0.142)				
Religious fractionalization			-0.454 (0.382)			
Religious polarization			0.150 (0.279)			
% Muslim			0.000 (0.002)			
% Catholic			-0.001 (0.002)			
% Protestant			0.001 (0.001)			
Political rights				0.013 (0.012)		
Executive constraints					-0.007 (0.012)	
National capability score						-3.586 (3.506)
Control variables <sup>a</sup> , country <sup>b</sup> - and time-fixed effects	yes	yes	yes	yes	yes	yes
# of countries	134	79	52	141	135	140
# of time periods	9	9	9	9	9	9
$N$	1,021	852	519	1,183	1,343	1,266
Adjusted $R^2$	0.080	0.152	0.207	0.019	0.024	0.025

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . <sup>a</sup>Includes schooling, GDP/capita, population size, and the Polity IV index of democracy (variable *polity2*). <sup>b</sup>The regressions displayed in columns (2) and (3) exclude country-fixed effects because the additional covariates are only available once for every country. 49

**Table B11:** Results from additional OLS regressions, predicting the occurrence of civil war (0/1) in period  $t$  until  $t + 4$ .

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Civil war (mean = 0.13)</i>						
Educational polarization	0.482*** (0.161)	0.607** (0.257)	0.600** (0.230)	0.491*** (0.160)	0.351** (0.154)	0.370** (0.160)
Years of schooling	-0.001 (0.019)	-0.019 (0.011)	-0.021* (0.012)	-0.010 (0.020)	-0.007 (0.022)	-0.008 (0.019)
Lagged dependent variable	0.325*** (0.049)					
Natural resource rents	0.007** (0.003)					
Oil rents	-0.005* (0.003)					
Educational fractionalization		0.187 (0.150)				
Ethnic polarization		-0.168 (0.139)				
Ethnic fractionalization		0.135 (0.136)				
Religious fractionalization			-0.629* (0.374)			
Religious polarization			0.318 (0.279)			
% Muslim			0.000 (0.002)			
% Catholic			-0.001 (0.002)			
% Protestant			0.002 (0.002)			
Political rights				0.022** (0.010)		
Executive constraints					-0.017** (0.008)	
National capabilities score						-5.131** (2.393)
Control variables <sup>a</sup> , country <sup>b</sup> - and time-fixed effects	yes	yes	yes	yes	yes	yes
# of countries	134	79	52	141	135	140
# of time periods	9	9	9	9	9	9
$N$	1,021	852	519	1,183	1,343	1,266
Adjusted $R^2$	0.136	0.110	0.138	0.030	0.035	0.040

*Notes:* Standard errors clustered at the country level are displayed in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . <sup>a</sup>Includes schooling, GDP/capita, population size, and the Polity IV index of democracy (variable *polity2*). <sup>b</sup>The regressions displayed in columns (2) and (3) exclude country-fixed effects because the additional covariates are only available once for every country.