

PREDICTING FUTURE CHALLENGES

Quantitative risk assessment tools for the EU's Eastern and Southern neighbourhoods

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ABSTRACT

Understanding and anticipating violent conflict and the breakdown of governance in the European Union (EU) neighbourhood is complex. However, it is of great value for academia and EU foreign policy. How can the EU know about, prepare for, and possibly help prevent governance breakdown and violent conflict in its neighbourhood? To answer this question, we propose innovative quantitative approaches to capture violent conflict and governance breakdown through survey-based and non-survey-based data at the sub-national level. We assess different theoretical approaches to explaining violent conflict and governance breakdown with a focus on social resilience. Moreover, we discuss numerous methodological tools including random forests, Bayesian methods, and change point analysis. The paper highlights the possibility of measuring and predicting violent conflict and governance breakdown in the EU neighbourhood at the sub-national level. We underline our arguments with initial empirical analyses. Further, we point to several research gaps such as the necessity to develop data collection efforts in order to build analyses and predictions on better data.

1. INTRODUCTION

European Union (EU) foreign and security policy faces two substantial challenges in its immediate southern and eastern neighbourhood. The first challenge relates to areas of limited statehood (ALS). These are areas where the central government authorities and institutions are too weak to set and enforce rules and/or do not have a monopoly on the means of violence. The second key challenge is contested orders (CO). Such order contestation finds expression where state and non-state actors challenge the norms, principles, and rules according to which societies and political systems are or should be organised (see Börzel and Risse [2018] for the conceptual framework). These two challenges do not necessarily present immediate threats to the EU. However, if order contestation and/or limited statehood deteriorate into governance breakdown and violent conflict, challenges turn into threats for the EU. Therefore, a key question for EU foreign and security policy is: How can the EU know about, prepare for, and possibly help prevent governance breakdown and violent conflict in its neighbourhood? In particular, in this working paper, we seek to address the following interrelated questions: What data and methods are available to analyse and predict violent conflict and governance breakdown in the EU's neighbourhood? Building on these data and methods, how can we best analyse and predict violent conflict and governance breakdown in the EU's neighbourhood?



Policy questions concerning violent conflict and governance breakdown have become more pressing for EU foreign and security policy in recent years. The level of conflict has increased in the EU's neighbourhood (see section 5.1), mainly driven by the situations in Syria and Ukraine. Furthermore, an increased number of non-state conflicts often follow state-based conflicts, suggesting that state-based conflict often creates a vacuum that the state is not able to control. To be able to assess the security threats to the EU we need to understand who fills this vacuum and by what means. Moreover, to assess political risk in the countries surrounding Europe, we need to understand not only what is going on at the national level but particularly also at the sub-national level. Countries are not equally affected by conflict and governance breakdown across their territory. Some areas are more prone to conflict and governance breakdown than others. Understanding violent conflict and governance breakdown adequately, therefore, requires a sub-national perspective.

Building resilience in its neighbourhood has become a priority for the EU in recent years (European Union 2016). Societal resilience can help to minimise the risk of, and possibly prevent, violent conflict and governance breakdown (see Cadier, Capasso and Eickhoff [2019]). The EU's aim is to help reduce conflict and governance breakdown in its immediate surroundings through strengthening resilience in both its Eastern and Southern neighbourhoods. As social trust, legitimacy, and institutional design are critical components of resilience (see Börzel and Risse [2018]), we concentrate on these three features in our approach. Focusing on resilience should help us analyse and understand why governance breakdown and violent conflict do (not) occur. Furthermore, resilience and its components should allow for predictions of where governance breakdown and/or violent conflict will (not) emerge.

In order to increase the EU's preparedness to both prevent and respond to threats of governance breakdown and violent conflict in ALS/CO, the EU-LISTCO project not only aims to understand what leads to governance breakdown and violent conflict in these areas, but also how we can predict these phenomena, and how well. There has been a growing literature on quantitative forecasting as well as extensive literature focusing on sub-national variation of conflict. However, there is much less research on forecasting or early warning for sub-national conflict. Our research contribution is to improve the prediction of a more comprehensive set of political outcomes, not limited to political violence but also covering governance breakdown.

To address this gap, this paper elaborates on the development of a subnational ALS/CO risk assessment tool and methodology, which will consist of a set of quantitative forecasting models, using state of the art data and statistical methods.



Our tool aims to create a better and more accessible understanding of forecasting which is easy to communicate to practitioners and researchers alike. The tool and methodology will be based on existing sub-national and geo-coded conflict events, as well as data on other types of political events such as demonstrations and riots. This contribution is relevant from two perspectives. From a policy perspective, we will be able to provide a state-of-the-art tool to help predict violent conflict and governance breakdown in the EU's neighbourhood. Through this tool, we can contribute to the EU's preparedness for effectively addressing the challenges of ALS/CO. From a scientific perspective, our forecasting approach adds two contributions. First, our models allow for testing the scope and power of established theoretical explanatory factors deemed relevant when analysing violent conflict and governance breakdown. Second, methodologically we gather, evaluate, and present new data as well as methods for predicting conflict and governance breakdown. Through these processes, we help to evaluate which data sources are most useful and which methods best equipped to allow for robust prediction models.

The first section of the paper will present the state of the art of forecasting in general, and sub-national forecasting more specifically. The next section presents our key variables and how we assess them empirically. This includes our main dependent variables, the key predictor variables, as well as relevant alternative predictors. The third section presents the methods employed to evaluate the data, i.e., to analyse as well as predict violent conflict and governance breakdown. The fourth step provides some initial and preliminary empirical findings to indicate the usefulness of our approach and the direction for further analysis throughout the EU-LISTCO research. The final section concludes the paper with a summary of our approach, reflections on advantages and shortcomings and ideas for future research.

2. STATE OF THE ART: FORECASTING

2.1 Forecasting

Forecasts, early warning systems, and predictions are easily confused with one another and require definition. Following Hegre et al. (2017: 114), we define forecasts as “predictions about unrealized outcomes given model estimates from realized data”. Early-warning systems are systematic procedures set up to provide regular forecasts for conflict-related events comparable to daily weather forecasts. Prediction, on the other hand, is a more general concept that refers to the assignment of a probability distribution to an outcome based on model estimates, but which may be applied to realised as well as unrealised outcomes. In less formal language, forecasts are predictions about tomorrow given information we have about what has

happened in the past and up until today. In order to be able to forecast, we need two inputs i.e., realised data and estimators. The output of these two inputs can then produce our predictions (see Hegre et al. [2017] for these definitions).

2.2 National Level Forecasting

Forecasting is now widely used throughout the discipline of peace and conflict research. This development was much supported by the advances in computationally intensive methods to collect and analyse data. However, much of the existing research on forecasting concentrates on the country level of analysis. The focus is not confined to armed conflict but extends to predicting irregular leadership transfers (e.g., Beger et al. [2014]), one-sided violence (e.g., Scharpf et al. [2014]), non-violent movements (e.g., Chenoweth and Ulfelder [2017]), and many other forms of political violence (Ward et al. 2013) and its consequences. These studies have in common that they use data at a granular level in relation to the timespan covered (sometimes days or months instead of years) to predict conflict in the short term. Other studies rely on country-year data to produce long-range predictions. Hegre et al. (2013, 2016) forecast civil conflict many decades into the future, as do Witmer et al. (2017).

Currently, several large-scale conflict and political violence prediction initiatives are ongoing. At the country level, these include the Political Instability Task Force (PITF) and the EU Global Conflict Risk Index.¹ The latter initiative aims to provide risk assessment for violent conflict in the next one-to-four years at the country level using quantitative and open source indicators. More specialised initiatives include the US Holocaust Museum that has been producing regular early warnings for mass atrocities² and the One Earth Future which is producing coup d'état risk forecasts.

While country-level studies and forecasting produce valuable research results, we know from recent research that sub-national level analyses matter significantly, particularly for understanding governance and violent conflict (Blair et al. 2017; Stollenwerk 2018; Witmer et al. 2017)

2.3 Sub-National Forecasting

The previous section discussed forecasting at the national level. However, as sub-national conflict and governance research has shown, conflict and governance

¹ <http://conflictrisk.jrc.ec.europa.eu/>

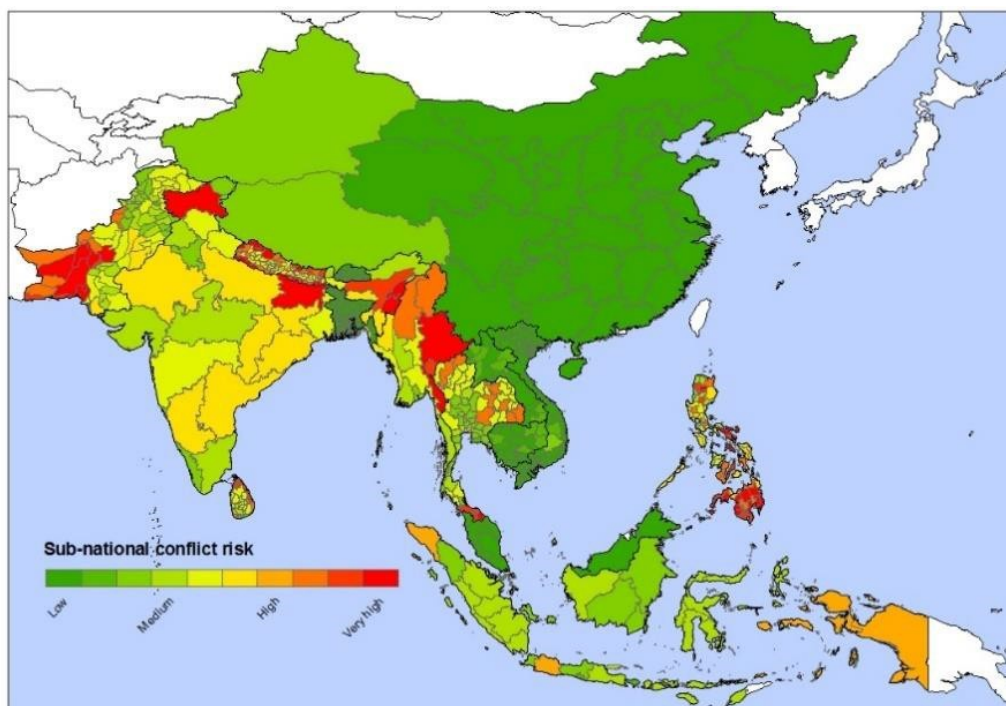
² <https://www.ushmm.org/confront-genocide/how-to-prevent-genocide/early-warning-project>

breakdown are often geographically limited to particular areas within countries (see also figure 7 below). This suggests that forecasting should also be focusing on a more fine-grained geographical level. Currently, there is limited research on forecasting at the sub-national level, but there are several ongoing efforts to tackle these issues, including EU-LISTCO.

A few scholars have conducted local-level violence prediction in specific countries. For example, Blair et al. (2017) use several rounds of survey data to successfully predict the occurrence of different types of violence in Liberia, Metternich et al. (2013) use data on anti-governmental networks to predict conflict behaviour in Thailand, and Hirose et al. (2017) use survey experiments to assess how well civilian attitudes predict patterns of violence in Afghanistan.

A few studies also predict conflict risk at the regional level. Rustad et al. (2011) look at South East Asia and predict conflict risk at the first administrative level for 15 countries, based on both national- and local-level variables (figure 1).

Figure 1: Subnational conflict risk in South Asia



Source: Rustad et al. 2011

Schutte (2017) predicts major civil conflict zones within and across ten African countries. By using geographic covariates based on a large body of literature providing general insights into sub-national conflict risks, such as population,



distance to capital and border, accessibility, wealth, and natural land cover, Schutte can predict out-of-sample conflict zones in most of his ten case countries.

In sum, all of these studies demonstrate that violent conflict varies widely within countries. As such, they underline the need for a sub-national perspective on governance breakdown and violent conflict. At the same time, governance effectiveness and its breakdown also vary substantially within countries (Stollenwerk 2018; Wig and Tollefsen 2016). However, the absence of studies trying to predict governance breakdown at the sub-national level make efforts to do so even more relevant. If the goal is to forecast both phenomena adequately, then sub-national perspectives are essential.

To further improve the ability to predict sub-national conflict risk and governance breakdown, more sub-national data on violence, governance breakdown, and predictors for both phenomena is necessary. There are pioneering efforts to address this need, focusing either on more granular events or pitched at a more fine-grained geographic or temporal level. The Integrated Crisis Early Warning System (ICEWS) in particular has focused on a range of domestic and international crises graded by intensity (O'Brien 2010). Particularly valuable insights from ICEWS are, for example, the separate modelling of conflict phases (onset, continuation, termination) as well as the utility of a multi-method approach for forecasting.

For our purposes, the most important on-going project is the Uppsala-based ViEWS; a violence early warning project.³ ViEWS provides early warnings for the four forms of political violence recorded by the Uppsala Conflict Data Program (UCDP): armed conflict involving states and rebel groups; armed conflict between non-state actors; violence against civilians; and forced population displacement. The project applies these early warnings to specific actors, sub-national geographical units, and countries. However, the geographical coverage is currently restricted to Africa. The ViEWS project produces and publishes forecasts for one month ahead and three years into the future (Hegre et al. 2019). Due to its elaborated and similar methodology, the ViEWS project will be a very valuable comparison for the EU-LISTCO project. However, while using similar approaches, the EU-LISTCO project differs from and adds to the ViEWS project in several respects. First, since ViEWS is currently restricted to Africa, the additional forecasts EU-LISTCO will produce for areas outside of Africa serve as valuable extensions and comparisons between both projects. Second, ViEWS focuses on predicting violent conflict. EU-LISTCO will add the

³ <https://www.pcr.uu.se/research/views/>



component of governance breakdown to the discussion in order to be able to predict both violent conflict and governance breakdown in the EU neighbourhood. Third, the EU-LISTCO consortium will combine qualitative and quantitative research in order that the quantitative work will benefit from the original qualitative research undertaken within the project and vice versa.

While several projects looking into sub-national conflict predictions are emerging, none of these existing efforts is explicitly tailored to tackle the issues of ALS and CO. The forecasting methodology developed by EU-LISTCO will address these issues directly requiring both theoretical and methodological innovation. Theoretically, the core tasks will be to develop a model that captures the concepts of violent conflict and governance breakdown as fully as possible. We also aim to establish a closer link between quantitative forecasting and more qualitative foresight methodology than has hitherto been apparent. To this end, among other approaches, we work in a Bayesian modelling framework that allows us to assess the extent to which it is possible to include qualitative foresight expertise directly in statistical modelling through the use of informed priors (Gill and Walker 2005).

3. KEY VARIABLES AND MEASUREMENTS

3.1 Outcome Variables

The main outcome variables in the EU-LISTCO project are governance breakdown and violent conflict. We understand violent conflict as taking place when multiple violent non-state actors fight with state actors or among themselves over control of territory, and/or when conflicts about the domestic/international order turn violent. Governance breakdown becomes visible when state, non-state, and external/international actors do not or no longer provide public goods and services (see Börzel and Risse [2018] for these definitions). However, as the EU-LISTCO conceptual framework points out, governance breakdown and violent conflict are the ends of a longer escalation process (Börzel and Risse 2018). During the course of such a process, we would expect various types of political events that can be tied to both ALS and CO to occur – e.g., demonstrations and riots reflecting political disagreement or violent events of various degrees of intensity and severity.

To account for this process, we will use diverse data sources for the outcome variables, reflecting a stream of various political events and developments. While the various data sources have different geographic and time coverage and include different types of data (survey and non-survey data), they all include a specific geo-location and specific date. This allows us to disaggregate and investigate these processes both over time and between spaces and thus to account for both violent conflict and governance breakdown.

3.1.1 Data Structure

Most conflicts are confined to limited areas within countries. Similarly, governance effectiveness also varies significantly at the sub-national level. Thus, treating violent conflict and governance breakdown as national phenomena that can be explained using only country-level covariates is potentially flawed. This has led to a recent increase in the number of studies that combine sub-national conflict event and governance data with sub-national explanatory variables.

A key challenge when combining spatial data from disparate sources and of different resolutions is how to adopt a common unit of analysis that can accommodate all types of data. Combining spatial data from various sources is not trivial, but raises the spatial scale problem, as identified by Atkinson and Tate (2000). How do we make spatial data fit together? Moreover, how do we aggregate spatial data of interest to the common unit of analysis, such as a district, region, or country?

For our sub-national models, we make use of version 2.0 of the PRIO-GRID⁴ (Tollefsen et al. 2012) dataset as our spatial data framework. The PRIO-GRID provides us with a global data framework with sub-national units, where each unit of observation is a quadratic grid cell of 0.5 x 0.5 decimal degrees (roughly 55 x 55 km at the equator). In total, the grid consists of 64,818 terrestrial cells per year. We exclude ocean cells without any terrestrial areas as well as polar regions from our final dataset. Whereas administrative entities are endogenous to the political outcomes, our grid cells are exogenous to our outcomes, thus providing a unit of analysis well suited to our political conflict outcomes. The grid cell also provides us with spatio-temporally consistent units, allowing us to study our phenomena of interest using time-series modelling.

Our unit of analysis is the grid cell-year, where we aim for one observation per year between 1992 and 2013 for as many areas as possible.⁵ Each cell-year observation includes data on our political outcomes, as well as relevant explanatory variables. In the following sections, we elaborate on the data sources already included in our PRIO-GRID framework and the ones we will include in our new approach. Moreover, we describe how we operationalise the different variables, starting with the key outcome variables, followed by an overview of the important predictors and control variables.

⁴ <http://grid.prio.org/>

⁵ We are currently in the process of extending this dataset to 2017, which will be made available for the next iteration of this paper.

3.1.2 Measuring Violent Conflict

The UCDP Georeferenced Event Dataset (GED Version 18.1) includes data on three types of violent events: State-based conflicts, non-state conflicts, and one-sided violence. As such, GED will help us to access occurrences of violent conflict. A conflict event is coded as “[a]n incident where armed force was used by an organised actor against another organized actor, or against civilians, resulting in at least one direct death at a specific location and a specific date” (Croicu and Sundberg 2017: n.p.).

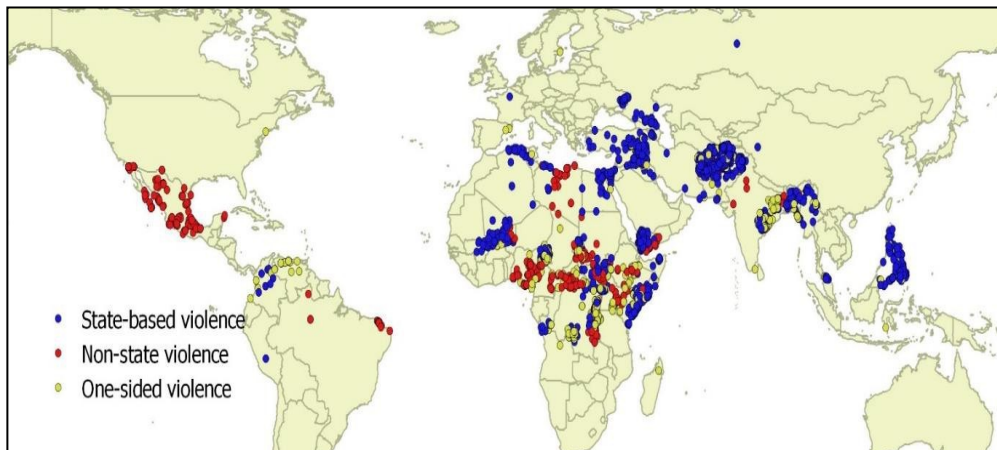
We use the data on state-based conflicts and non-state conflicts to measure violent conflict as our dependent variable. We will use the data on one-sided violence to measure security governance (breakdown) as this data rather refers to citizen-centred security (see section 3.1.3, also Lee et al. [2014]).

The GED dataset has global coverage and includes events from 1989 until 2017. The global coverage, including the EU’s Eastern and Southern neighbourhood as our focus regions, was a key reason why we chose GED over alternatives such as the Armed Conflict Location & Event Data Project (ACLED), which has significantly lower geographical and temporal coverage. In addition to the time, location, and actors, the GED data also includes an estimate of battle-related deaths for each event. Table 1 gives a full description of each of the event types in the GED dataset, while the map in figure 2 indicates the spread of the various event types in 2017.

Table 1: Description of event types for The UCDP Georeference events Data

Main Type	Description	N observations 1989-2017
State-based conflicts	A contested incompatibility that concerns government and/or a territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in a calendar year.	100,626
Non-state conflicts	The use of armed force between two organized armed groups, neither of which is the government of a state, which results in at least 25 battle-related deaths in a year.	12,491

Figure 2: Location of GED events for 2017



Source: UCDP GED Global Version 18.1.

Even though the GED data is the best available data source for our purposes, some limitations remain. First, the timeframe we are currently able to cover with this data is limited to 1989 to 2017. While this is a significant timeframe that allows for robust prediction efforts, an even longer one would be desirable. Second, it is important to keep in mind that the threshold for conflicts to be included in the GED data is 25 battle-related deaths in total across all events linked to the same conflict. In other words, violent conflicts that result in less than 25 battle-related deaths will not be visible in the data. This is not to say that such events are irrelevant, but rather that this threshold reflects a coding decision by the GED team that will affect the coverage of events in our analyses.

3.1.3 Measuring Governance Breakdown

Our approach focuses on goods and service provision as essential features of effective governance. We assume that severe shortages of goods and services for the population are key indicators of governance breakdown. We consider three service categories that are essential for the well-being of the population: security, public health, and basic subsistence. This also implies that we may see a governance breakdown in one sector, but not in another — e.g., governance may break down in the public health sector, but not in the security sector. When we measure these different service categories empirically, we assume that goods and service provision should not fall below a certain threshold (not yet defined) in order to prevent governance breakdown. Moreover, for each service category we consider both perceptions of governance effectiveness and de facto service delivery, as both are essential aspects of effective governance (Stollenwerk 2018). Perceptions of

governance refer to the subjective satisfaction of governance recipients with service provision – i.e., the extent to which they perceive governance as effective. Conversely, *de facto* service provision focuses on whether goods and services are actually being provided. While perceptions of services and *de facto* provision can overlap, they may also diverge significantly. In other words, while we may witness a governance breakdown from the perspective of citizens through their subjective negative evaluations of services, *de facto* service provision might, nevertheless, be fulfilling satisfying standards. The reverse scenario may of course also occur.

3.1.3.1 Security Governance

To capture security governance (breakdown), we rely on an indicator from the UCDP GED data on one-sided violence. One-sided violence is the use of armed force by the government of a state or by a formally organised group against civilians which results in at least 25 deaths. Extrajudicial killings in custody are excluded. It is important to note that this indicator has not been used in the operationalisation of violent conflict as our dependent variable (see section 3.1.2.). We are thus able to differentiate between citizen-centred security and state-centered security (Lee et al. 2014). One-sided violence is related to citizen-centred security (or insecurity) as part of effective (or ineffective) governance. On the other hand, our violent conflict measures, as another part of the dependent variable, are related to state-centred security, as these conflict occurrences indicate an infringed monopoly of force by the state.

We capture the subjective dimension of security governance (breakdown) through questions included in the World Values Survey (WVS) on how secure respondents currently feel in their neighbourhoods, how often they or their families have felt unsafe from crime in the preceding twelve months, and whether or not they have been victims of crime in the same period.

3.1.3.2 Public Health Governance

Maternal mortality ratios are a key proxy indicator of the broader public health situation, where higher rates signal worse public health governance. We use data from the WHO on maternal mortality ratios (modelled estimate, per 100,000 live births) to assess governance (breakdown) in the public health sector.

We capture the subjective dimension of public health governance through a question included in the WVS asking how often the respondent or their family have gone without needed medicine or medical treatment in the preceding twelve months. This question serves as a negative proxy and reveals how severe citizens perceive the shortage of public health services to be.



3.1.3.3 Basic Subsistence

To measure the extent to which we can observe a governance breakdown in the basic subsistence sector empirically, we rely on data about food security from the Food and Agriculture Organization (FAO) of the UN. Specifically, we measure the prevalence of undernourishment as the percentage of the total population in the country that is undernourished – i.e., whose food intake is insufficient to maintain dietary energy requirements. If citizens do not have enough to eat, this may signal not only a severe shortage of basic food but also a shortage of water, as much food production, particularly in the agricultural sector, relies on sufficient water supplies.

We capture the subjective dimension of basic subsistence governance through a question included in the WVS asking how often respondents or their families have gone without enough food to eat in the preceding 12 months. This question serves as a further negative proxy and reveals how severe the shortage of food supply is from the perspective of citizens.

In sum, analysing governance breakdown in these three separate governance categories will present a holistic operationalization of the phenomenon. We will also combine these three governance categories into one an additive index, which will allow us to assess the governance situation as a whole and to understand the extent to which governance breakdown occurs as a more general phenomenon. That said, there are some decisive shortcomings of the current model when attempting to predict governance breakdown. First, the indicators for de facto service delivery are outcome measures. As such, they are proxies for governance and its breakdown and do not capture the phenomenon directly. Second, the indicators for both the subjective and the de facto evaluation of service delivery do not include information on who the actual governance providers are. Therefore, we are not able to differentiate governance breakdown that occurs because the state does not provide these services from situations where other actors, such as external or non-state actors, fail at this task. Third, the data, particularly the survey data, is restricted regarding its geographical and time coverage. Although we will combine as many geographical regions and as many time periods as possible, data on governance breakdown will be likely more restricted than, for example, the GED data on violent conflict. This is also the case for the sub-national disaggregation of the data.

3.2 Key Predictor Variables

The EU-LISTCO project focuses on how social resilience can minimise and possibly prevent the risk of violent conflict and governance breakdown. Moreover, it is of paramount interest to the project how the EU as an external actor can contribute to

strengthening resilience in its Eastern and Southern neighbourhoods. We understand resilience to be the “capacity of societies, communities and individuals to manage opportunities and risks in a peaceful and stable manner, and to build, maintain or restore livelihoods in the face of major pressures.” (European Commission and High Representative of the Union for Foreign Affairs and Security Policy 2017: 3). Three components of resilience outlined in the EU-LISTCO conceptual framework (Börzel and Risse 2018) are of particular interest to the research: social trust, legitimacy, and institutional design. We therefore integrate all three factors in our prediction models and quantitative analyses to evaluate to what extent these factors can help predict violent conflict and governance breakdown, and more precisely how they can help to prevent both.

3.2.1 Social Trust

“Trust is largely understood as a cooperative attitude towards other people based on the optimistic expectation that others are likely to respect one’s own interests” (Draude et al. 2018: 354). Social trust helps to overcome problems of collective action and enables peaceful cooperation among individuals (Ostrom 2009). Social trust thus becomes a key factor to enable effective governance and to prevent violent conflict. We distinguish between three types of social trust: *personalised trust*, where people trust each other because they directly know each other; *particularised trust*, where people trust each other because they belong to the same social group, such as religious communities; and *generalised trust*, where people trust each other without knowing each other and due to a generalised belief that interaction partners can be trusted (see Draude et al. [2018]).

In ALS in particular, where state capacity is limited, trusting relationships can help to ensure effective governance if the state fails to provide governance services. Social trust can thus help to prevent governance breakdown and ensure effective governance even if the state is weak. Moreover, social trust helps people to establish peaceful day-to-day interactions and minimises the potential for violent conflict. Consequently, violent conflict is less likely to erupt in environments where strong social trust prevails.

We capture social trust through survey data from the WVS and a number of regionally focused surveys such as the Afrobarometer or the Arab Barometer. For capturing generalised trust, we rely on two questions from the WVS; one asking whether respondents feel that people can be trusted or that they need to be very careful in dealing with people, and another asking if people think that they can trust people they meet for the first time. To capture particularised trust, we rely on two questions from the WVS that ask whether respondents think that they can trust (1)

people of another religion or (2) people of another nationality. To capture personalized trust, we rely on a series of questions from the WVS that asks respondents whether they think they can trust their family, their neighbourhood, and people they know personally.

3.2.2 Legitimacy

Legitimacy is the extent to which governance actors enjoy social acceptance among local populations (Risse and Stollenwerk 2018). In other words, legitimacy is the degree to which the governed accept the right to rule of governance actors (Levi et al. 2009; Gilley 2009). This definition of empirical legitimacy applies both to state actors and to external and non-state actors such as the UN or local NGOs. Legitimacy lowers the costs of governance, since it induces compliance that is largely independent of the content of directives or actions. If governance actors are considered legitimate, they do not have to rely on other, more costly mechanisms to ensure compliance and cooperation such as coercion or incentives (Schmelzle and Stollenwerk 2018). In ALS, legitimacy is particularly important, since it may often constitute the only mechanism to ensure compliance and cooperation. Where the state has only weak capacities, it is unlikely to be able to achieve compliance and cooperation through coercion and is also unlikely to have the resources to achieve compliance through incentives. Legitimacy is therefore essential for enabling effective governance in such areas and consequently for preventing governance breakdown. Moreover, if citizens consider the state and other potential governors to be legitimate, they are less likely to engage in (violent) opposition to the state and such actors. Violent conflict should therefore be less likely in areas where the state and other governors enjoys broad social acceptance, i.e., legitimacy.

To capture legitimacy, we rely on data from the WVS. We use numerous questions to measure legitimacy empirically with a focus on state legitimacy. As state legitimacy and legitimacy in general are notoriously hard to measure (von Haldenwang 2016; Weatherford 1992; Gilley 2009, 2006), we proxy state legitimacy through questions about the confidence citizens have in key state institutions. The WVS asks respondents whether they have confidence in the armed forces, the police, the courts, and the parliament. We will utilise these questions in a factor analysis to create an index of state legitimacy. Furthermore, on theoretical grounds, it also makes sense to combine these indicators into one state legitimacy index as they mirror different branches of government: executive power (police and armed forces), judicial power (courts), and legislative power (parliament). Additionally, we will also analyse how the legitimacy of individual state institutions affects violent conflict and governance breakdown.



We also aim to take the legitimacy of external and non-state actors into account. Governance actors other than the state can contribute to effective governance and a peaceful environment (Brass 2016; Krasner and Risse 2014). The WVS includes questions which allow us to proxy the legitimacy of such actors. As EU-LISTCO has a special interest in the legitimacy the EU enjoys in its neighbourhood, we will use the question on the confidence respondents have in the EU to capture its legitimacy. Moreover, we will also include questions on the confidence citizens have in churches, major companies, and charitable humanitarian organisations.

3.2.3 Institutional Design

Institutions are considered to be “persistent and connected sets of rules (formal and informal) that prescribe behavioural roles, constrain (as well as enable/B&R) activity, and shape expectations” (Keohane 1989: 161). In EU-LISTCO, we concentrate on political or governance institutions. These are institutions designed for rulemaking and/or the provision of public goods and services and are essential to ensure effective governance and to avoid violent conflict. An institutional design needs to be ‘fit for purpose’ in the sense that it should make available adequate financial resources and manpower as well as a precise legal framework in order to achieve effective governance through these institutions (Krasner and Risse 2014). The institutional design can refer to state actors, but also to external and non-state actors. Capturing the institutional design of a governance constellation through quantitative measurements is complex. We therefore proxy the institutional design through data on foreign aid. The assumption is that if foreign aid is available to a country or region, more resources and personnel are available to ensure effective governance and a peaceful environment. We use data on the number of foreign aid projects present in a given country/area as well as data on the amount of foreign aid paid to a country or area. We draw on data provided by the AidData Project on World Bank IBRD-IDA Projects in the World Bank Geocoded Research Release (Version 1.4.2).

Residual statehood, which is the remaining statehood we find in areas where it is otherwise limited, is another aspect of institutional design. We understand statehood as the central government authorities’ administrative capacities to make and implement rules, and their ability to maintain their monopoly on force (Risse 2011). In general, existing studies of the relationship between institutions and conflict suggest three explanations for why institutions should have a pacifying effect on conflict. First, high-quality institutions can reduce commitment problems, providing constraints on executive power and avoiding the need for political challengers to have militias in order to keep political elites in line (Walter 2015). Second, institutions can prevent grievances from becoming violent by including diverse political

entrepreneurs and providing a channel for marginalised groups to express their discontent (Cederman, et al. 2013; Hegre and Nygård 2015). Third, Fearon and Laitin (2003) emphasise that institutions proxy state penetration, where high-quality institutions reduce the opportunity space for potential and active rebels. Moreover, while statehood can only be considered one explanatory factor among many for effective governance (Lee et al. 2014), residual state capacity may significantly help to reduce governance breakdown and violent conflict.

To capture residual statehood, we include a measure of a country's bureaucratic quality using data from the International Country Risk Guide (ICRG). The bureaucratic quality is quantified on a scale from 0 to 4, where 0 suggests weak bureaucratic quality and 4 indicates that the bureaucracy is strong and relatively immune to shocks and changes to the government. The institutional strength and quality of the bureaucracy tends to minimise policy revisions when governments change. Consequently, countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services receive high scores. These countries have a low risk of governance breakdown as the bureaucracy tends to be somewhat autonomous from political pressure and to have an established mechanism for recruitment and training. Countries that lack the cushioning effect of a strong bureaucracy receive low points because a change in government tends to be traumatic in terms of policy formulation and day-to-day administrative functions (see also Stollenwerk [2018]).

However, it is important to note that (residual) statehood can also have detrimental effects on governance and possibly foster violent conflict, even in cases where statehood is limited. If states use their limited capacity to oppress their constituencies, and in the event of violent action against their own citizens, governance breakdown and violent conflict may become more likely. Such predatory state behaviour is apparent in many areas of limited statehood (Reno 2015; Baker 2015, 2010). Therefore, while holding that residual statehood can help prevent violent conflict and governance breakdown, the opposite scenario ought to be kept in mind.

Overall, due to data quality and availability, initial analyses will have to show whether the full range of advanced prediction techniques can be applied to all the available data for our key predictor variables as outlined in this working paper. For example, as many surveys are only available for a few years and questionnaires are not always comparable between various surveys or change from one survey wave to another, it is our goal to prepare as much survey data as possible for prediction purposes. Wide variations in the country coverage of surveys further complicate this endeavour. Consequently, our in-depth analysis will indicate the data sources to

which we can apply advanced prediction techniques. However, even if prediction should turn out to be impossible with some of the available data due to methodological reasons, we will still be able to utilise such data for inferential statistical techniques, allowing us to identify the drivers of violent conflict and governance breakdown. Forecasting methods and inferential techniques of statistical analysis will therefore complement each other.

3.3 Alternative Predictors – National Level

Our key motivation is to examine the drivers of violent conflict and governance breakdown at the subnational level. However, we believe that several country-level characteristics also shape the motivation of and opportunity for political events. It is therefore necessary to capture such country-level dynamics and analyse the relevant variations between countries. Thus, in developing our models, we take a multilevel approach, where we include variables at both the sub-national and country levels. Below, we briefly provide a theoretical rationale for the country-level variables included in the models. We then proceed to elaborate on the national and sub-national data, and the operationalisation of each variable.

3.3.1 Level of Democracy

Several studies have explored the relationship between democracy and conflict, where findings suggest that conflict is more likely in inconsistent regime types. Hegre et al. (2001) found that the relationship between democracy and conflict resembles an inverted U shape. Here, consolidated democracies or autocracies have the lowest risk of conflict, whereas inconsistent or transitional regime types have a higher risk of conflict. Gleditsch and Ruggeri (2010) also find democracy to decrease the possibility of the onset of conflict. Full democracies provide alternatives to taking up arms by addressing grievances through peaceful means. On the other hand, full autocracies will meet any uprising with severe repression and force, crushing any uprising in its early stages. However, inconsistent regimes are failing at both, as they attempt the delicate balance of repression and concessions. Semi-democratic regimes that are neither democracies nor autocracies are often, but not always, in transition between the two extremes.

In order for effective governance to take place and to avoid governance breakdown, democracy also plays a key role. If people have a say in political processes and democratic input mechanisms exist which allow them to hold government accountable for its actions, governance should be more effective, both de facto and in citizens' perceptions. In short, in areas where the level of democracy is high, we expect to see a lower likelihood of governance breakdown.

To account for the level of democracy in each country-year, we make use of the Liberal Democracy Index from the Varieties of Democracy (V-Dem) project that provides multidimensional and disaggregated datasets on democracy. The liberal democracy index from V-Dem (v2x_libdem) captures the extent to which the ideal of liberal democracy is achieved, focusing on quantifying the limits placed on government. The variable ranges from 0 to 1 and is measured at the country level for every year. We include the liberal democracy score for each country, as well as its squared term, to allow for a non-linear effect of democracy on our outcome.

3.3.2 Political Repression

Political repression has been linked to civil conflict. We build on existing research arguing that levels of political repression can affect civil conflict. Violent repression of non-violent challengers occurs in regimes around the world to silence critical opposition and stop calls for reform. Most literature focuses on the relationship between political repression and protest behaviour. However, the existing literature (see Chenoweth et al. [2017]) has not reached a consensus on the effect of repression on protest. Examples of this relationship reveal both a positive and negative effect on protest behaviour, as repression could both increase dissent by intensifying motivations and decrease it by increasing its costs.

Where political repression prevails, governance breakdown also becomes more likely. As the state invests its resources in repressive policies and actions, fewer resources are available to provide goods and service to the population. Additionally, repressive behaviour likely also excludes large parts of the population from goods and service provision. Consequently, both the perception of goods and service provision and the de facto delivery of such services suffer in repressive systems.

To account for the level of repression and brutality in a country, we make use of the Political Terror Scale (Wood and Gibney 2010). This measures the levels of political violence and terror that a country experiences each year based on a five-level ‘terror scale’ originally developed by Freedom House. The data used in compiling this index comes from three different sources: the yearly country reports of Amnesty International, the U.S. State Department Country Reports on Human Rights Practices, and Human Rights Watch’s World Reports. The five-level index assigns a value to each country-year (Haschke 2010: 4). The five levels are:

1. Countries are under a secure rule of law, people are not imprisoned for their views, and torture is rare or exceptional. Political murders are extremely rare.
2. There is a limited amount of imprisonment for nonviolent political activity. However, few persons are affected, torture and beatings are exceptional.

Political murder is rare.

3. There is extensive political imprisonment or a recent history of such imprisonment. Execution or other political murders and brutality may be common. Unlimited detention, with or without a trial, for political views is accepted.
4. Civil and political rights violations have expanded to large numbers of the population. Murders, disappearances, and torture are a common part of life. In spite of its generality, on this level terror affects those who show an interest in politics or ideas.
5. Terror has expanded to the whole population. The leaders of these societies place no limits on the means or thoroughness with which they pursue personal or ideological goals.

3.4 Alternative Predictors – Local Level

Our ambition with this working paper is to develop a tool and an empirical strategy for predicting political outcomes at the sub-national level, i.e., within and across countries. We introduce a set of sub-national explanatory variables, measured at the grid cell level, offering considerable in-country variation. We now turn to presenting our sub-national indicators and their operationalisation.

3.4.1 Economic Factors

The relationship between low per capita income and conflict is among the most robust findings in the literature on intrastate conflict (Hegre and Sambanis 2006). While there is no consensus on the mechanisms linking poverty to conflict, several propositions have been made. Collier and Hoeffler (2004) argue that poorer countries have an increased risk of conflict violence as impoverished individuals have nothing to lose in terms of foregone income, whereas potential rebels in more affluent countries have more to lose from taking up arms. This proposition is often referred to as the individual opportunity cost argument. Likewise, Jakobsen et al. (2013) show that lower per capita income is related to an increased risk of conflict, also attributing this finding to the individual opportunity cost argument.

Another proposed explanation of the poverty-conflict nexus is that low per-capita income constrains the capacity of the state (Fearon and Laitin 2003). Thus, more affluent countries have a lower risk of conflict as these countries have the capability necessary to deter conflict and topple potential challengers or secessionists, even when they arise in the periphery. Both Collier and Hoeffler (2004) and Fearon and Laitin (2003) employ the same measure, GDP per capita, and reveal the same correlation. However, their explanation for this correlation differs.

Country-level studies have proposed various explanations for the poverty-conflict nexus. Few studies match their theoretical expectations with data at appropriate levels of analysis. This is unfortunate, as both poverty and inequality show considerable variation within states (Elbers et al. 2003; Kanbur and Venables 2005).

One limitation of existing local studies of the poverty-conflict nexus has been the lack of data on poverty at the local level. This is not surprising, given that conflicts mainly take place in developing countries, where data quality is poor, even for national statistics (Jerven 2013). Several alternative proxies of prosperity have been used: economic activity derived by dividing GDP by local population estimates; the Gross Cell Product (GCP) (Nordhaus, 2006); economic activity measured by night-time luminosity (Shortland et al. 2013); and the use of survey data on individual and household assets (Østby et al. 2009).

At a sub-national scale, Buhaug et al. (2011) explored the relationship between GCP data and conflict onset and observed that relatively impoverished areas have a higher risk of conflict outbreak, whereas other studies have found intergroup inequalities to increase local civil war risk (Østby 2008; Cederman et al. 2011).

Economic development is also a relevant factor for predicting governance breakdown. Countries and areas that have many economic resources at their disposal in order to provide goods and services are less likely to experience governance breakdown. Moreover, if citizens have sufficient private funds to buy goods and services within the private sector in cases where the state does not provide these services, governance becomes more effective. Conversely, if citizens lack the economic resources to buy goods to compensate for inadequate state provision, governance breakdown becomes more likely. This is the case for both perceived governance effectiveness and de facto service delivery.

We include two proxies of local economic development. First, we include the Gross Cell Product from the G-Econ dataset (Nordhaus 2006), which provides estimates of economic output at a 1x1 degree resolution for the year 1990. Disaggregated to PRIO-GRID, we constructed a measure of (logged) gross cell product (GCP) per capita, analogous to the country-level GDP per capita measure.

Second, we include calibrated levels of night-time luminosity, that measures average night-time light emission from the DMSP-OLS Night-time Lights Time Series Version 4 (Average Visible, Stable Lights, & Cloud Free Coverages), calibrated to account for intersatellite differences and interannual sensor decay using calibration values from Elvidge et al. (2013) to render them more suitable for time-series analysis. Values are standardised to be between 0 and 1, where 1 is the highest observed value in the time-series, and 0 is the lowest.

3.4.2 Protest

Protest can escalate and turn into violent conflict. For predicting the likelihood of violent conflict, we therefore include protests as a variable to analyse whether and when protest fuels violent conflict. As we do not propose that protest also increases the likelihood of governance breakdown, we only include this variable in the models where violent conflict is the dependent variable. To measure protest, we use the Integrated Crisis Early Warning System (ICEWS) dataset. Even though this dataset codes a much broader set of political events than just protest, we exclusively focus on the protest data to avoid endogeneity problems with our dependent variable. ICEWS extracts data from text and codes events representing interactions between actors (both cooperative and hostile) from 1995 to 2018. Each event includes information on the source actor, the type of event, and the target actor. In addition to information on the timing of the event, ICEWS also codes the approximate location of events by point coordinates. This allows us to integrate the ICEWS data into our global spatial data framework. Table 2 shows the frequency of protest events between 2010 and 2017.

Table 2: ICEWS protest events between 2010 and 2017

Main Type	Sub-Types	N observations
Protest (engage in)	Demonstrate, hunger strike, strike or boycott, obstruct passage, violent protest	203,744

3.4.3 Ethnic Exclusion

Political exclusion is considered a key driver of conflict, with excluded ethnic groups more likely to take up arms and areas dominated by excluded populations more likely to experience conflict (Cederman et al. 2010).

In cases where ethnic groups experience political exclusion, governance breakdown also becomes more likely. If members of an ethnic group perceive that they are systematically excluded from political processes, this is likely to have a negative impact on their perception of governance. Political exclusion of ethnic groups is also relevant for de facto service delivery. If a substantial part of the population is not included in political processes, this is likely to drive down service provision, as not all potential contributors to public goods provision are included in governance processes.



We quantify the ethno-political status of the local population by looking at the political status of local ethnic groups; i.e., whether the population is denied representation and participation in national politics. This variable is created by first identifying which ethnic groups reside within each grid cell using the GeoEPR dataset (Wucherpfennig et al. 2011), which maps all politically relevant ethnic groups around the world since 1946, and then accounting for the groups' political status from the EPR dataset (Cederman et al. 2010).

3.4.4 Population Size

Previous research suggests a positive relationship between population size and local conflict risk (Hegre et al. 2009). Governance effectiveness might also suffer from a high population density as goods and services need to be provided to and shared among more people. Put simply, it is harder to keep 100,000 people healthy than 100 people, to name just one example. Population density is also likely to affect perceptions of governance negatively as citizens feel they have to share goods and services with (too) many people.

Hence, we include an indicator of (log) cell population, derived from the Gridded Population of the World (GPW), v3 dataset (CIESIN et al. 2005). This data has global coverage for every fifth year starting in 1990 and up to projected populations for 2020. We interpolate for every year in between those for which data is available.

3.4.5 Urban-Rural Divisions

Several studies show that less accessible areas provide safe havens and facilitate mobilisation and space for competing authorities (Tollefsen and Buhaug 2015). From early guerrilla literature (Guevara 2004) to modern insurgencies, the large majority of active insurgencies involve marginalised groups that enjoy strongholds in the remote countryside. Accounting for proximity to regional urban centres is probably important, as rebel attacks necessarily occur where government forces and representatives are present (radio and police stations, army barracks, etc.). Accordingly, while the inaccessibility argument assumes better opportunities for insurgent activities in remote hinterlands, tactical considerations (and possible bias in media reporting) imply that we should expect most violent activities to occur in the vicinity of population centres.

For governance effectiveness and its breakdown, we expect diverging effects. Remote areas are likely to suffer from worse public health and basic subsistence governance as infrastructure for these services and expertise in the population is more limited than in urban areas. This applies to both de facto and perceived service provision. On

the other hand, security might be lower in urban areas due to higher crime rates. Therefore, people residing in rural areas should be and feel safer.

To account for the rural-urban continuum, we include a measure of the average travel time (in logged minutes) from the cell to the nearest city of at least 50,000 people (Nelson 2008). These estimates are based on information about: land transportation networks, such as roads, railroads, and navigable rivers; the environmental context, including elevation, slope, and forest cover; and political factors (i.e., national boundaries). The original travel-time data is very high-resolution raster data with 0.01×0.01 decimal degree pixels. We calculate the mean pixel value for pixels within our grid cells. One shortcoming to be kept in mind is that the data we use are from the year 2000, as no other are available. However, as the travel time and its reduction depend on large-scale infrastructure improvements, this shortcoming might be less relevant for our purposes than factors that can change more quickly over time, such as conflict events or protest.

Overall, we will also try to include survey data for the alternative predictors where they can be considered relevant in order to assess how citizens' perceptions of political processes affect the likelihood of governance breakdown and/or violent conflict. Examples may include data from the WVS on the satisfaction of citizens with the way democracy works in their country. However, due to the data limitations outlined in section 3.1 and 3.2, this requires major data collection and evaluation efforts that are currently ongoing. Over the course of the EU-LISTCO research project, we will evaluate and include additional survey data for these purposes wherever possible.

4. METHODS

4.1 OLS/Logit

As a first approach, we model the probability of conflict and governance breakdown using logistic regression. We fit separate models for the GED and the governance breakdown data for the years 1992 to 2013 or the highest number of years we can cover. The logistic regression model assumes a binomial distribution of a binary response. We let $y_i = 1$ if there is some form of conflict present in the i 'th PRIO-GRID cell at time t , and $y_i = 0$ if there is no conflict present. The logistic regression model is then given by the formula:

$$\log\left(\frac{\pi_i}{1 - \pi_i}\right) = \sum_{j=1}^p \beta_j x_{i,j}$$

Here, β is the parameter vector of the model, x_i , is the vector of covariates for the i 'th observation.

We fit two preliminary models for the GED data. The first model includes travel time to nearest city, distance to border, excluded minorities, night-time light emission, and population as covariates, as these are variables likely to affect conflict. The second model also includes the liberal democracy score and territorial control. In later models, we plan to include this as well as the other outlined variables. At the global level, the model that includes the liberal democracy score does significantly better.

To assess the predictive power of a model, we will later use a 'leave one out' cross-validation approach (see Schutte [2017]). In this draft we restrict ourselves to out of sample validation. We compare predicted probabilities of conflict for 1990-2016 to actual conflict events in 2017. The predictive power is represented by an ROC-curve below.

Moreover, we will address the challenge that conflict is a rather rare event compared to non-conflict or peace. It is therefore easy to get 'correct' predictions for binary outcomes where models are simply predicting a vast number of zero-values correctly. To try to tackle the problem of predicting conflict adequately, we will deploy confusion matrices, separation plots, and other suitable statistical tools to increase the accuracy of our predictions (see Greenhill et al. [2011]).

4.2 Bayesian Method

The predictive power of conflict and governance breakdown models may be enhanced by using Bayesian statistical methods. In the Bayesian approach, the parameters of the statistical model are not considered as fixed effects but treated as random variables. This implies that a prior probability distribution of the model parameters needs to be specified before the analysis. For example, in the logistic regression model above, the parameter β may be given a multivariate normal prior distribution (μ, σ) . To specify the hyperparameters μ and σ of this distribution, we need to consider, for example, our knowledge of past conflict events and patterns. When the choice of the prior distribution is well informed, the Bayesian approach may result in more precise inferences about the model parameters.

For further analysis, we plan to build a hierarchical Bayesian model. A hierarchical model is well suited to conflict and governance breakdown prediction as information on conflict and governance data is available at different levels. For example, conflict patterns may vary from country to country, but there may also be distinct conflict patterns at a higher level, for example between continents. These higher-level

patterns are accounted for in the hierarchical Bayesian model by assigning the model parameters different priors for different continents. This means that the hyperparameters are themselves random variables, and the prior specification will need to decide upon the hyperprior distribution which generates the continent-specific hyperparameters.

The advantage of a hierarchical Bayesian approach is that the inferences may be even more finely tuned as the conflict and governance variability by region is considered. It is also an advantage that it reduces the subjective element in the analysis, in that it is the hyperprior distribution that is specified, not the hyperparameters themselves. By using Bayesian methods, we will also be able to make use of and collaborate in the qualitative research in the EU-LISTCO consortium, as qualitative findings will help to inform our Bayesian approach and improve our estimates. Equally, our quantitative findings will inform and feed into the qualitative studies of the project. As a result, the quantitative and qualitative empirical works within EU-LISTCO will complement and support each other.

4.3 Tipping Points – Change-point Analysis

One of the main innovations of EU-LISTCO is to identify tipping points where ALS/CO move from being a risk to becoming a threat, i.e., governance breakdown or violent conflict. This is very closely linked to how conflict and violence escalates or de-escalates as well as to how governance becomes effective or ineffective. To address this, we will explore change-point analysis as a further method to analyse tipping points for governance breakdown and violent conflict. This particular type of analysis allows us to detect changes in the normal distribution of a set of time-series data (Killick and Eckley 2014). Thus, we can investigate whether and when there is an increase or decrease of a certain type of political event in a particular region using the data described in section 3. This will help us identify time periods or particular events that escalate the situation and increase the risk level. This analysis will only be conducted on select countries, with particular attention to the five focus countries of special interest to EU-LISTCO (see section 5.3).

4.4 Other Statistical Methods

Random forest approaches to country-level forecasting have been shown to improve predictive performance dramatically compared to general linear models (Colaresi and Mahmood 2017; Muchlinski et al. 2016). This suggests to us that context and conditionalities are important. While the random forest approach can give us high predictive performance, it does not necessarily develop our theoretical knowledge. The theoretical differences in conflict escalation and dynamics between areas of limited statehood and in contested orders generate the expectation that explanatory

factors such as poverty, political inclusion, and different types of violence affect the likelihood of armed conflicts differently. In future iterations of this working paper, we will explore random forest and other alternative modelling strategies to increase predictive performance.

5. INITIAL EMPIRICAL RESULTS

5.1 Conflict Trends

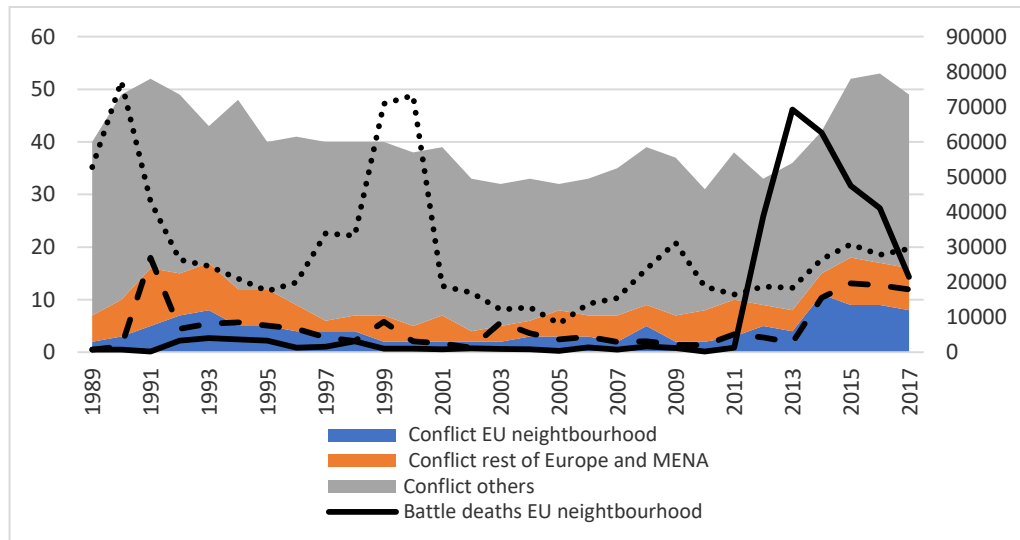
ALS/CO only turn into security threats to the EU and its member states if they deteriorate into governance breakdown and/or violent conflict. Thus, to get an overview of the current threat picture, we will discuss the recent broader conflict trends related to the EU neighbourhoods in particular.

Since the end of the Cold War, the trend in armed conflict has been generally downward (see figure 3). While, in recent years, we have seen upsurges in both the number of conflicts and in the severity of war, the number of conflicts and casualties now seem to be on a downward trend again. This does not suggest, however, that the threat of conflict is likely to disappear any time soon, especially given the rise in non-state conflicts and the increasing relevance of violent non-state actors such as the Islamic State.

According to the UCDP conflict definition (see 3.2.1), the number of armed conflicts in the world in 2017 was 49. Nearly 69,000 people were killed as a direct consequence of state-based armed conflicts in 2017, a decline from the highs of 104,000 in 2014 and 88,000 in 2016. This trend is mainly due to the reduction in violence in Syria. However, violence escalated in both Iraq and Afghanistan during 2017, when Afghanistan witnessed its most violent year and Iraq its second most violent year in the post-Cold War period (Dupuy and Rustad 2018).

In the areas that are relevant for EU-LISTCO (i.e., the EU neighbourhood countries – see section 6) we saw eight conflicts in 2017 (figure 3, blue area), thus about 16% of all conflicts in the world happened in this region. In addition, eight conflicts occurred in the other countries in Europe and the Middle East and North Africa (MENA). However, when we look at the development of battle-related deaths, the past seven years have seen an extreme increase in the EU neighbourhood countries, far exceeding the total of all other countries in the world. This is mainly due to the Syrian conflict, and the conflict in Yemen. While we have seen a decrease over the past few years, the number is alarmingly high when seen from the EU's point of view.

Figure 3: State-based conflict and battle deaths 1989-2017, broken down by region

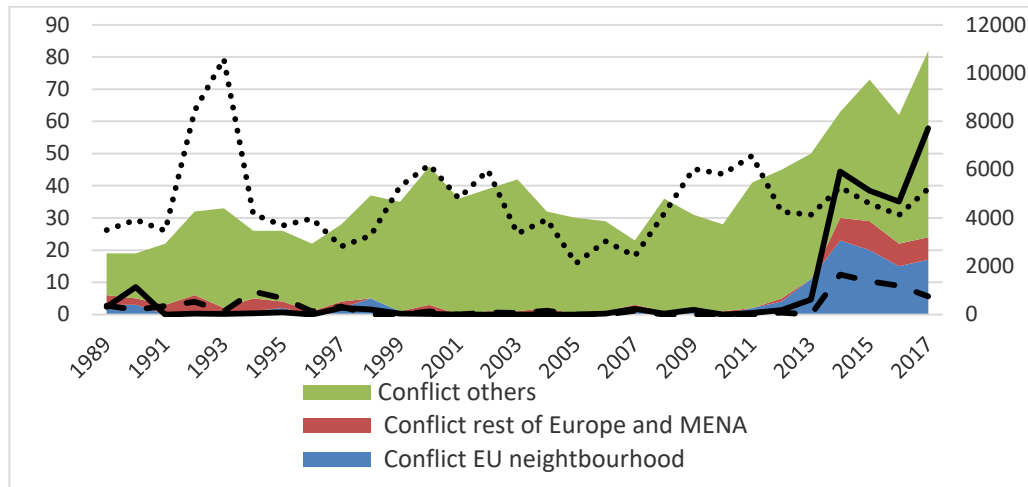


Source: UCDP/PRIO Armed Conflict Data

To understand the conflict landscape and risk fully, however, we cannot look only at state-based conflicts. The UCDP database also includes data on non-state conflicts, i.e., conflicts between two actors where neither is the state (Sundberg et al. 2012). Non-state violence increased dramatically in 2017, as did fatalities from this type of violence. All world regions experienced this increase, with the most lethal and largest number of non-state conflicts occurring in the Middle East.

When we break down non-state conflicts in the same way, we see that the EU’s Eastern and Southern neighbourhoods had seen very few non-state conflicts up until 2013 but experienced a substantial increase after that (see figure 4). More worrisome, however, is that the number of battle-related deaths in the neighbourhood countries have increased significantly over these years. In fact, in 2017 the EU neighbourhood experienced more non-state conflict battle deaths than all other countries in the world combined, though it is important to note that this increase is driven mainly by the ongoing conflict in Syria.

Figure 4: Non-state conflicts and battle deaths 1989-2017, broken down by region



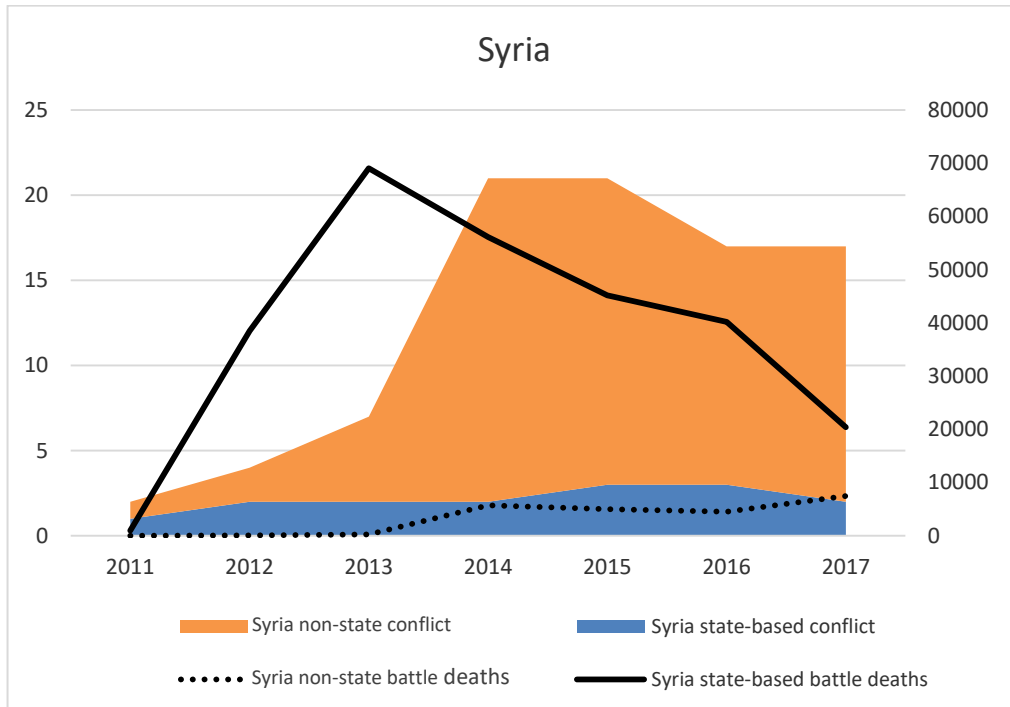
Source: UCDP Non-State Conflict Dataset Version 18.1

To understand how state-based and non-state conflict are linked and how this relates to areas of limited statehood in particular, in figures 5 and 6 we compare the number of state-based conflicts and non-state conflicts in Syria and Libya between 2011-2017. While the magnitude of the conflicts is quite different, we see similar patterns in both conflicts. In the beginning of the period there is mainly state-based conflict with a low level of non-state conflict. As the state-based conflict drags on, we see an increasing number of non-state conflicts, and as the number of battle deaths in state-based conflict decreases, the battle-related deaths in non-state conflicts increases. This is particularly apparent in Syria

The trends in figures 5 and 6 suggest that there is an increase in non-state conflict once state-based violence has persisted for a couple of years. This could be related to the state losing strength over time or losing control over certain areas while focusing on fighting in others. This resonates with the concept of ALS, defined as: “[areas] in which central government authorities and institutions are too weak to set and enforce rules and/or do not control the monopoly over the means of violence” (Börzel and Risse 2018: n.p.).

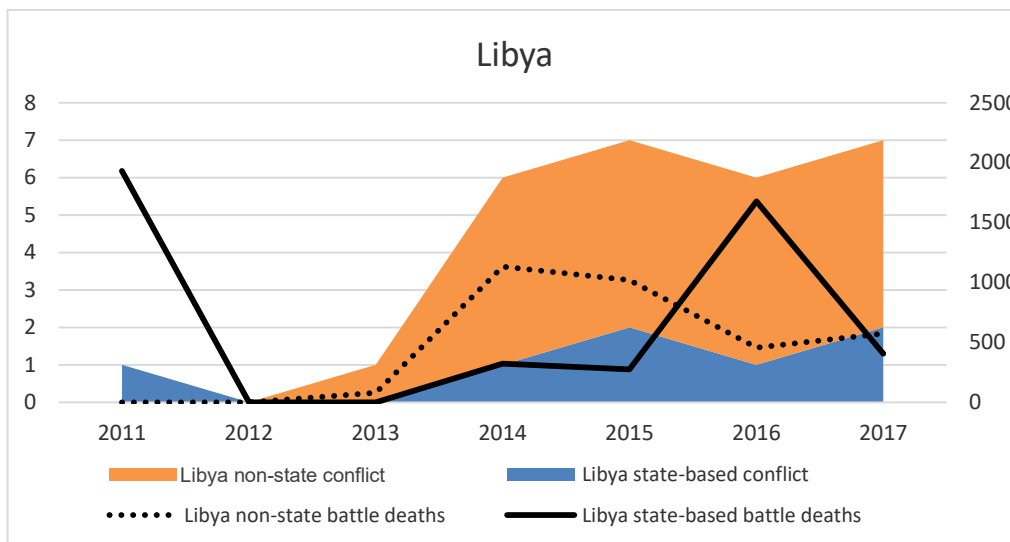
These trends give us an idea of how conflicts can develop. Moreover, they indicate the increasing relevance of understanding conflict in the EU’s neighbourhood. However, to better understand why we see these trends, we need to look at the sub-national level.

Figure 5: State-based conflicts, non-state conflicts and battle deaths in Syria 2011-2017



Source:UCDP/PRIOArmedConflictData Version 18.1andUCDPNon-State ConflictDataset Version 18.1

Figure 6: State-based conflicts, non-state conflicts and battle deaths in Libya 2011-2017

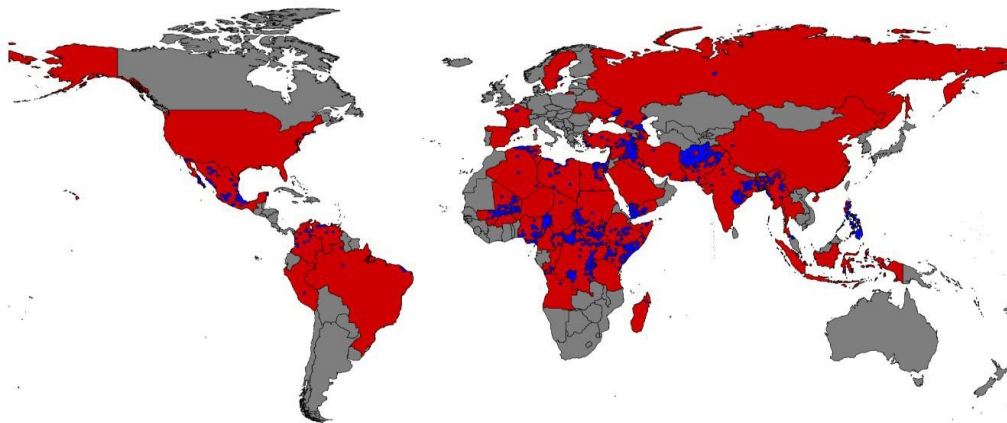


Source:UCDP/PRIOArmedConflictData Version 18.1andUCDPNon-State ConflictDataset Version 18.1

5.2 Local Level Conflict

Up until the end of the 2000s, most of the quantitative conflict research used the state as the unit of analysis. However, this is in many instances problematic. For example, when studying the relationship between diamonds and conflict, a country-level study would find a correlation between these variables in Russia, whereas in reality the diamonds are confined to Siberia while the conflict is located in the Caucasus, and thus there is very little connection between the two. “Treating the country as simply ‘at war’ distracts our attention from the distinct actors and conflictual interactions taking place” (Gleditsch and Weidmann, 2012: 471). As figure 7 shows, there is considerable in-country variation between where conflict takes place.

Figure 7: Conflict countries and conflict events location, 2017



Source: UCDP GED (Croicu and Sundberg 2017)

Russia has experienced conflict in 22 of the last 26 years. However, the scope of these conflicts has primarily been confined to relatively small areas in the North Caucasus. Uganda has mostly seen conflict in the Northern region, ravaged by the Lord’s Resistance Army (LRA). Before ending in 2009, the Sri Lankan civil war was mostly confined to the Northern and Eastern regions, where the Liberation Tigers of Tamil Eelam (LTTE) fought to create an independent Tamil state. Intrastate conflicts differ from interstate conflicts, in that they are primarily fought within the confined borders of a state, and seldom engulf countries in their entirety (Hallberg 2012; Risse and Stollenwerk 2018). Studies also suggest that areas affected by intrastate armed conflict rarely resemble the country at large (Buhaug and Lujala 2005). Understanding why conflicts occur in some parts of a country, while not in others, requires a sub-national focus.

Several scholars in geography and other disciplines have argued that the predominant focus on the state as the common unit of exploration in conflict

research is unfortunate (O’Loughlin, 2000). Agnew (1994) argues that scholars conceiving the state as a fixed unit and a container of society have fallen into a ‘territorial trap’. Others, such as Wimmer and Glick Schiller (2002) criticise what they describe as ‘methodological nationalism’, where the nation-state is conceived as the natural social and political form of the modern world. To escape the territorial trap and explore the sub-state nature of civil wars, both theoretically and empirically, appropriate research designs must be developed. As Cederman and Gleditsch argue, “national aggregates and averages [...] are only loosely linked to the rationale for conflict and the postulated micro-level mechanisms” (2009: 488).

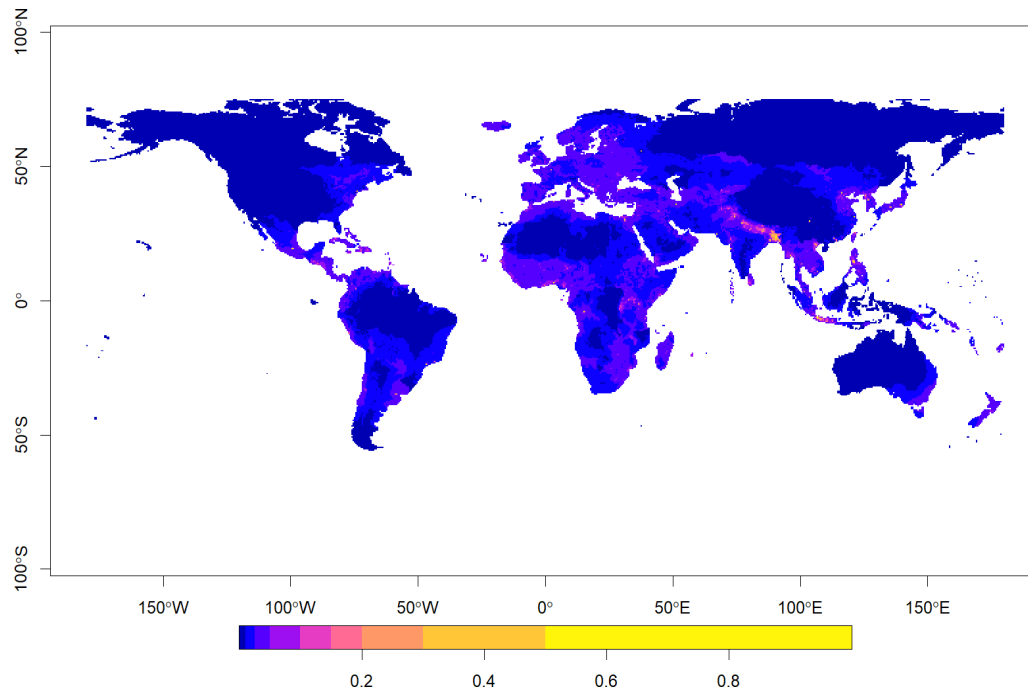
Context and spatially disaggregated studies are on the rise, with a focus on the importance of local economic development (Buhaug et al. 2011), local institutions (Wig and Tollefsen, 2016), local politically excluded groups (Cederman et al. 2011), and natural resources (Lujala et al. 2005), among other factors. As O’Loughlin and Raleigh argue, “The geographic perspective, especially the emphasis on context, scale linkages, diffusion, and spatial analysis, offers a vital and innovative supplement to dominant approaches” (2007: 30).

5.2.1 Results from UCDP GED

We now present the results of the sub-national model exercise and approach described earlier in this paper using logit models (see 4.1). Conflict probability is modelled for every PRIO-GRID cell between 1990 and 2016, trained on observed conflict events, and predicted for events in 2017. The results are presented in the subsequent maps, where the colours suggest the predicted probability of experiencing a GED conflict event, where more yellow colours indicate higher predicted probabilities.

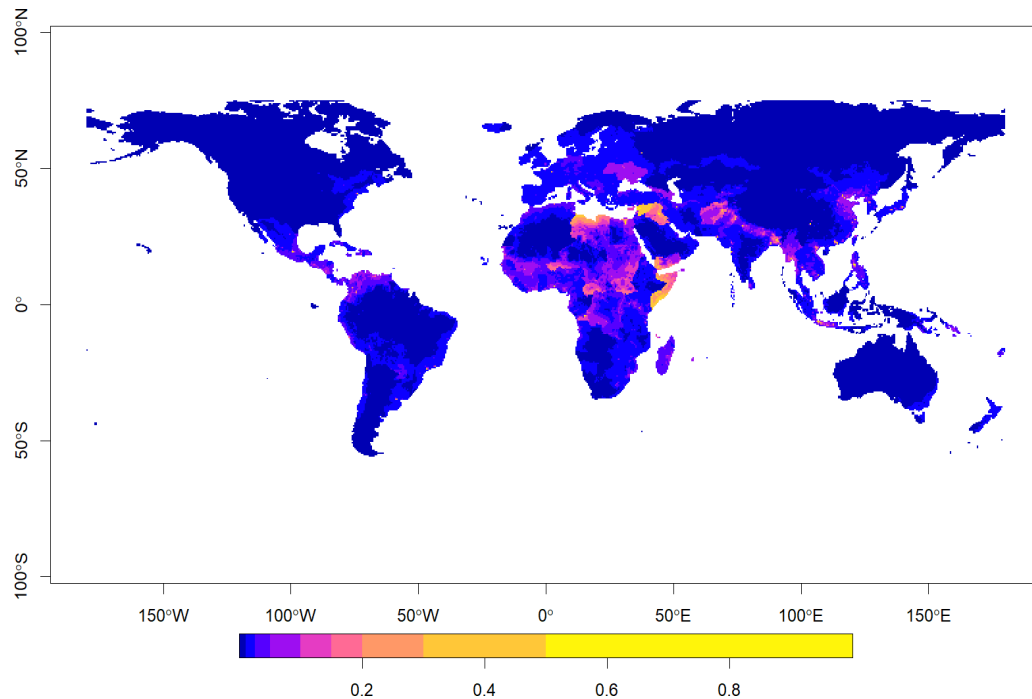
The initial naïve model includes our main geographical variables without taking into account the baseline probability of conflict within a country. Thus, the model is only trained based on the set of sub-national variables, which are the travel time to nearest city, distance to border, excluded minorities, night-time light emission, and population. A clear limitation with this model is that we do not incorporate country-level conflict risk factors (i.e., democracy, GDP per capita) that distinguish the conflict risk in one country from another. Thus, the baseline probability of conflict in a grid cell in Sweden is the same as in Somalia. The results of the modelling exercise are presented in figure 8, showing the probability of conflict events in 2017. However, as we have not accounted for country-specific differences, we disregard these results and improve our model using country-level covariates.

Figure 8: Predictive model for 2017 using GED including travel time to nearest city, distance to border, excluded minorities, night-time light emission, and population



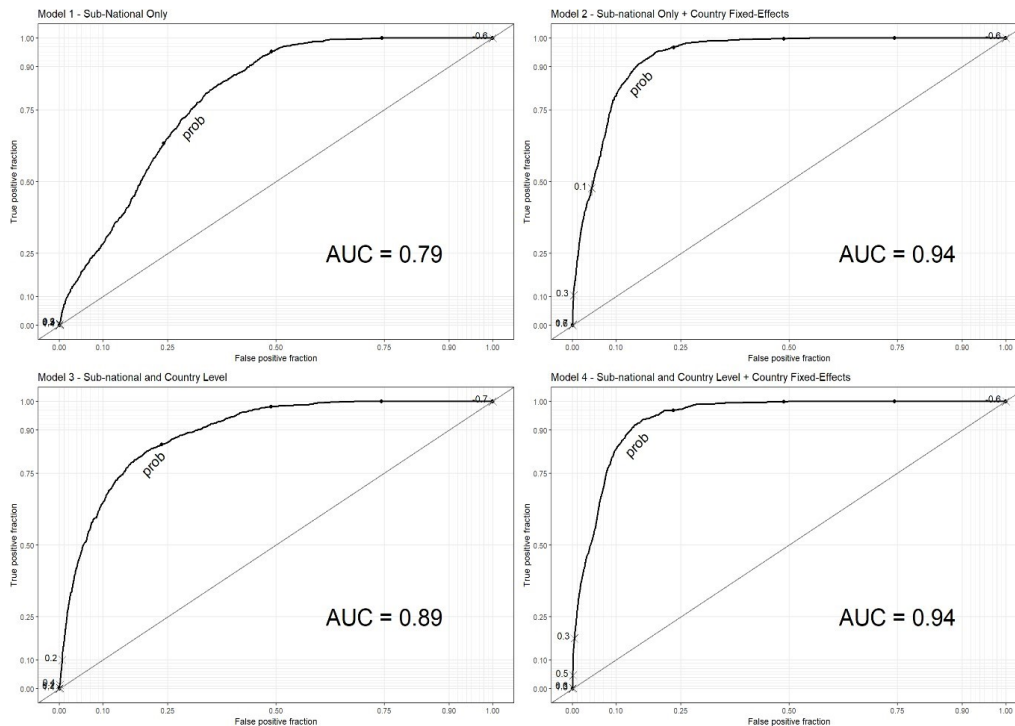
The results presented in figure 9 are based on the same sub-national factors used to produce figure 8, but we now include country-specific covariates; democracy and territorial control. As is evident from the map, the predicted probabilities are more in line with the actual realities of the global conflict patterns. Conflict risk is highest in countries such as Syria, Iraq, Libya, Somalia and Yemen; countries that have recently experienced intense levels of conflict violence. Thus, we are now more capable of identifying the conflict risk following the inclusion of democracy and territorial control. We are also able to separate between levels of in-country risks, evident by looking at Somalia, where we predict a higher risk of conflict in the Southern region of the country, where Al-Shabaab is active.

Figure 9: Predictive model for 2017 using GED including travel time to nearest city, distance to border, excluded minorities, night-time light emission, and population, + country-level factors: democracy and territorial control



We can evaluate this predictive performance using a Receiver Operator Curve plot, that shows the ratio between true positives (where our model predicts a conflict in PRIO-GRID cell and an event occurred there in 2017) and false positives (where our model predicts a conflict in a PRIO-GRID cell but an event did not occur there in 2017). This is called the area under the curve (AUC) in the ROC plots below, where the larger this area is, the better is the predictive power of the model. If the predicted curve had been a diagonal line (following the stippled line), the ratio between true positive and false positive would have been random. As we can see from figure 10, this is not the case for any of our predictions. To summarise our results, model 1 only includes our sub-national predictors resulting in a meagre AUC of 0.79. By including country-level covariates, model 3 performs better with an AUC of 0.89. Meanwhile, both model 2 and 4 include country fixed effects, which effectively control for all unobserved time-invariant factors of the country. These models only explore the in-country variation across time. The results suggest that including both country level and sub-national level covariates into our predictions clearly outperforms the exclusively sub-national models. In the next iterations of the paper, we will proceed with including better data on the sub-national institutions and territorial configurations.

Figure 10: ROC curve plots separating between true positive and false positive fractions



The map in figure 9 above shows that the risk of conflict in the EU's neighbourhood, as predicted by the models for 1992 to 2016, is quite high, particularly for countries like Libya, Syria and Ukraine. More globally, we can observe that the EU is surrounded by areas with the some of the highest conflict probabilities. These findings underline the value and need for in-depth conflict analysis and prediction. EU-LISTCO contributes to this debate and helps scholars as well as practitioners to understand the complex governance and conflict dynamics in the region.

These models illustrate the high value predictions have for understanding conflict dynamics on a global scale, and for the EU's neighbourhood in particular. Over the course of the EU-LISTCO project, we will continue to refine and extend these analyses. Despite being preliminary, these first illustrations give helpful insights into what predictors might be particularly relevant and how the models can be adjusted.

6. ENP COUNTRIES

In this section we will focus on the neighbourhood countries as well as the five focus countries of the EU-LISTCO project. The map in figure 11 shows which countries are considered neighbourhood countries based on the European Neighbourhood Policy (ENP) definition. These are countries the EU provides financial assistance to in return for reforms to government and economic sectors, as well as other advancements in development.

Figure 11: Map showing the European Neighbourhood Partner (ENP) countries

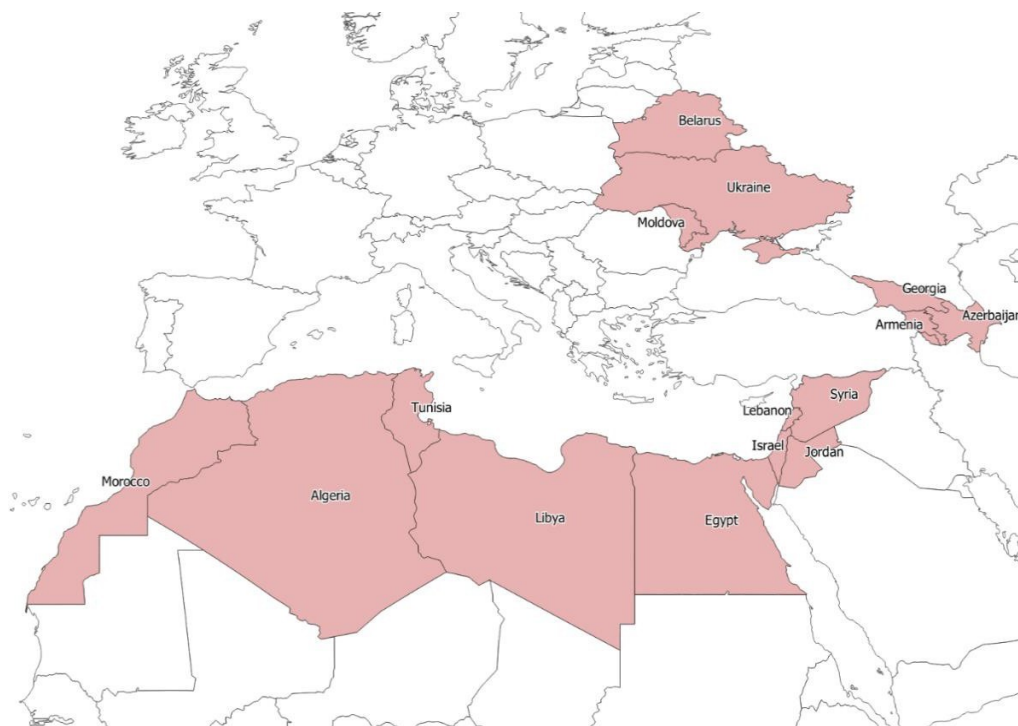
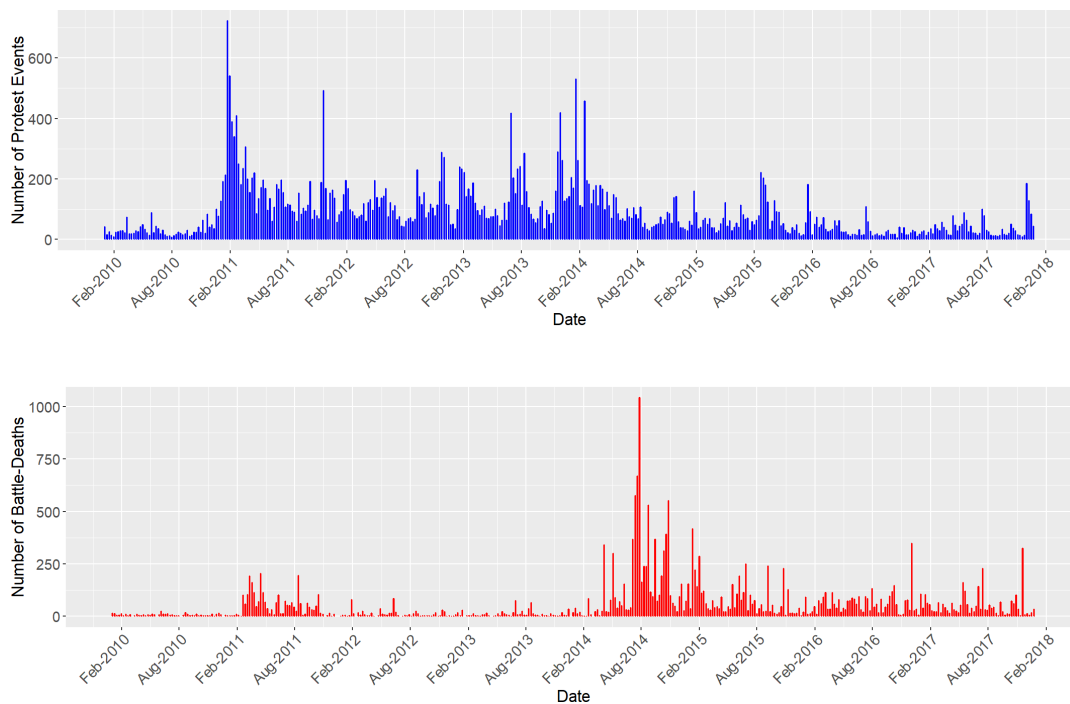


Figure 12 below shows the distribution of protests and number of battle deaths in the region between 2010 and 2017. The data is based on aggregated numbers of ICEWS and battle-related deaths in ENP countries. For GED deaths, remember that Syria and Palestine are missing due to the current conflict event coding. While we should be wary of generalising from the trends in the region, we can see some interesting patterns. We see that there is a spike in protests in 2011, which is linked to the Arab Spring, and then again in 2014, we see another spike in 2013-2014 related to the conflict in Ukraine.

Figure 12: Protests (ICEWS) and battle deaths (UCDP) for the ENP countries 2010-2017



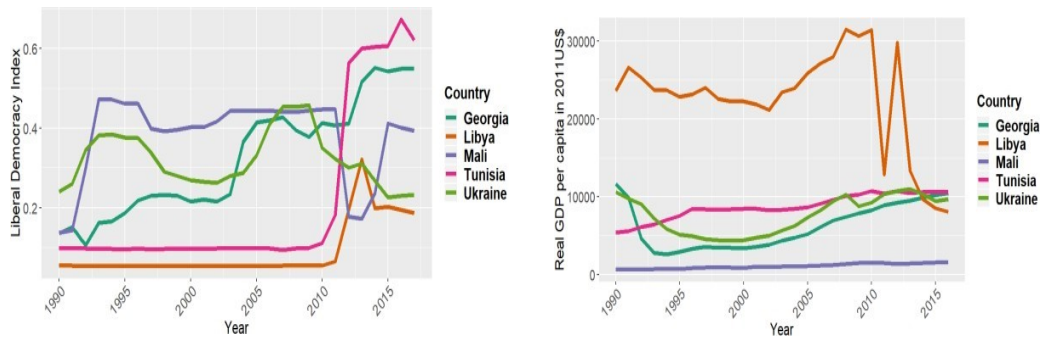
When it comes to battle deaths, we see a clear increase in violence in the region in 2014. This is partly due to several conflicts escalating during this period (such as Ukraine and Syria). While we cannot say that this increase of violence is a result of a specific event, it does suggest that the EU neighbourhood has become more violent and less stable in the past three to four years.

6.1 EU-LISTCO's Focus Countries

Five countries are of particular concern to the EU-LISTCO project: Mali, Tunisia and Libya in the Southern neighbourhood, as well as Ukraine and Georgia in the Eastern neighbourhood. Socio-economically, the countries are diverse in terms of democracy and economic performance, as is illustrated by figure 13. In this section, we examine local trends in political unrest for our five focus countries, focusing on protest and conflict patterns. In the current version of this paper, we address patterns of social unrest across all five focus countries and examine the relationship between political protest and political conflict violence. In subsequent iterations of this paper, we will connect the discussion of conflict patterns in the five focus countries to the main concepts of ALS and CO. Future versions will use state of the art statistical models, such as change-point analysis, to explore the possibility of identifying tipping points both when and where social unrest significantly changed its character. Change-point

analysis can be useful to identify significant events that altered the mode and magnitude of violence, as well as the factors associated with such tipping points. Furthermore, this allows us to advance our understanding of when protest and demonstrations switch and become outbreaks of armed conflict.

Figure 13: Liberal Democracy Index and GDP per capita



Left panel shows liberal democracy index (data from V-Dem institute) for our five focus countries. Right panel shows GDP per capita for our five focus countries (data from the Maddison Project Database, Version 2018)

6.1.1 Southern Neighbourhood

6.1.1.1 Mali

In 2012, the Tuareg rebellion re-emerged, headed by the separatist group National Movement for the Liberation of Azawad (MNLA) and the Islamist group Ansar Dine fighting to implement Sharia Law. Both groups opposed the Mali government. In the first months of 2012, the group conquered sizeable geographical territory across Mali. This development stirred widespread protests, particularly in the capital Bamako, regarding the lack of control by the state. The first spike in figure 14 reflects this upheaval. The territorial advancements by the rebels together with an increased number of demonstrations culminated in an army-led coup d'état in March. The coup marked the end of 20 years of democratic stability (as reflected in figure 15) and created a security vacuum (ALS) of which the Islamist groups took advantage. After the coup, the Tuareg rebels gained an even firmer grip on the Northern regions of Mali and declared the formation of the independent state of Azawad.

After the declaration of independence, the level of violence stabilised at a level higher than pre-2012. It seems that the overturn of democratic rule was an important turning point in Mali. We also see from the maps that the violence in Mali is concentrated not only in Islamic areas but also in the southern parts, suggesting that the government monopoly on violence here is severely reduced.

Figure 14: Protests (upper panel) and battle deaths (lower panel) in Mali 2010-2017

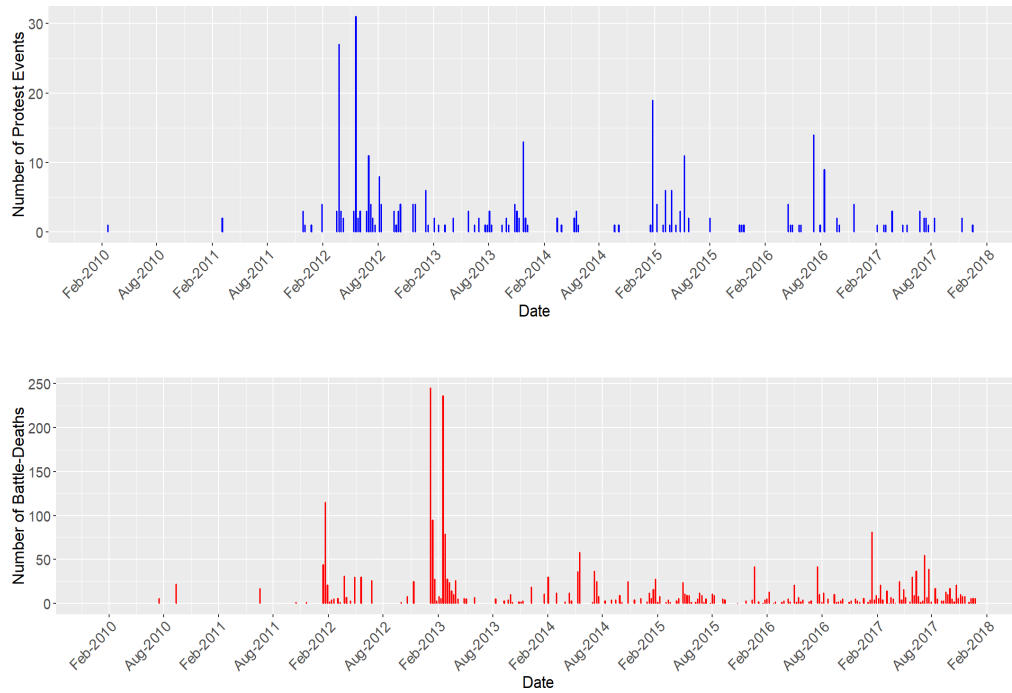
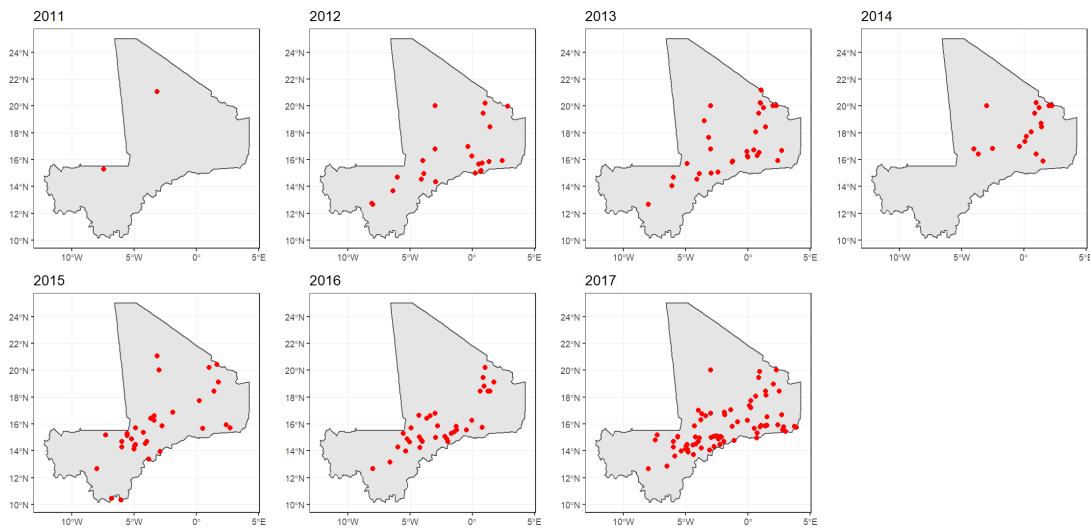


Figure 15: Geographic distribution of conflict events in Mali 2011-2017



6.1.1.2 Tunisia

At the end of 2010, Tunisians took to the streets to demonstrate against the incumbent president, leading to the ousting of then President Zine Abidine Ben Ali in January 2011. This event, clearly evident in figure 16, is considered to have ignited the Arab Spring, a series of protests and demonstrations across the MENA region. In Tunisia, prominent explanations for the demonstrations were dissatisfaction related to unemployment, corruption, and lack of political freedoms. Following the first protests in mid-December 2010, the government responded with repression, resulting in both the killing and injuring of civilians. While rallies continued, the government responded with yet more repressive force, leading to the killing of more than 300 people and a further 2,100 injured. While 300 people were reported killed, our figures only capture people killed in organized violence using the UCDP definition.

Consequently, following massive protests, on 14 January 2011, Ben Ali handed over the presidency to parliamentary speaker Fouad Mebazaa and called for elections to be held. Meanwhile, former Prime Minister Ghannouchi returned to his position, even though the courts declared that he did not have any rightful claim to power. In the wake of the revolution, violence erupted, leading to looting and increased insecurity. Protests also continued throughout January and early February 2011, demanding Ghannouchi step down. On 27 February 2011, Ghannouchi stepped down and handed over to an interim government. The interim government started dissolving control structures such as the secret police, and prepared for elections in October 2011. Although the revolution, its demonstrations, and the use of repressive force led to both killing and injuries, Tunisia did not see the breakdown of institutions and rule of law on the same scale as neighbouring Libya and other countries following the 2011 uprisings. As figure 16 shows, protests have been decreasing in recent years, but demands for reform and more transparency are still heated subjects.

Since the Bizerte crisis in the 1960s, the country had been relatively peaceful until the Arab Spring. Following the revolution, there were 16 registered conflict events in the country (according to the UCDP GED), all related to attacks by the Islamic State (IS), targeting either civilians or Tunisian security forces, with the most serious being the 2013 attack against the Sousse beach resort in which 38 people were killed. More recently, the Tunisian armed forces have been fighting IS in more remote southern border areas resulting in casualties to both IS and Tunisian security forces. figure 17 shows the UCDP GED conflict events registered in Tunisia since 2011.

Figure 16: Protests (upper panel) and battle deaths (lower panel) in Tunisia 2010-2017

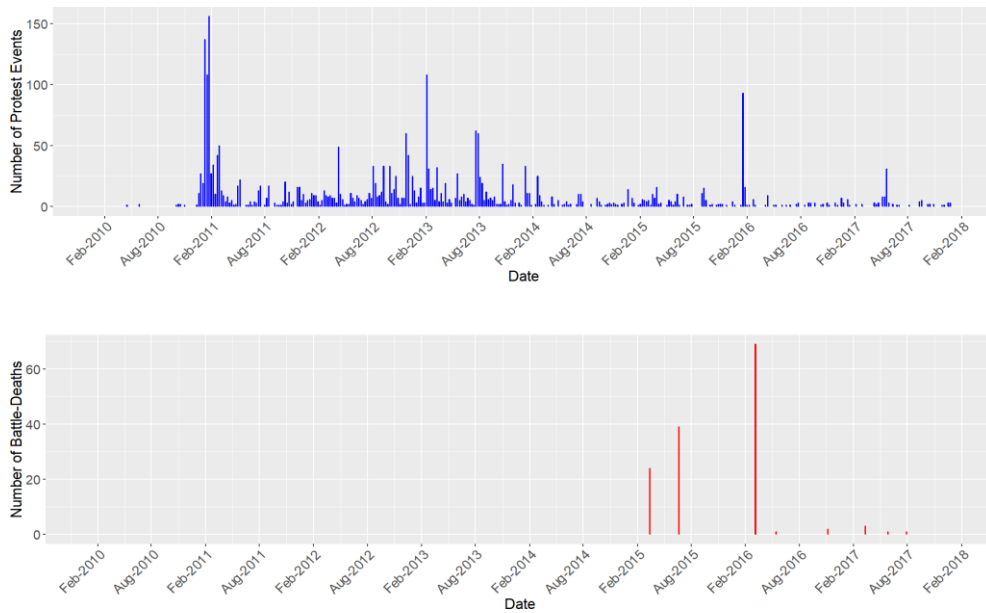
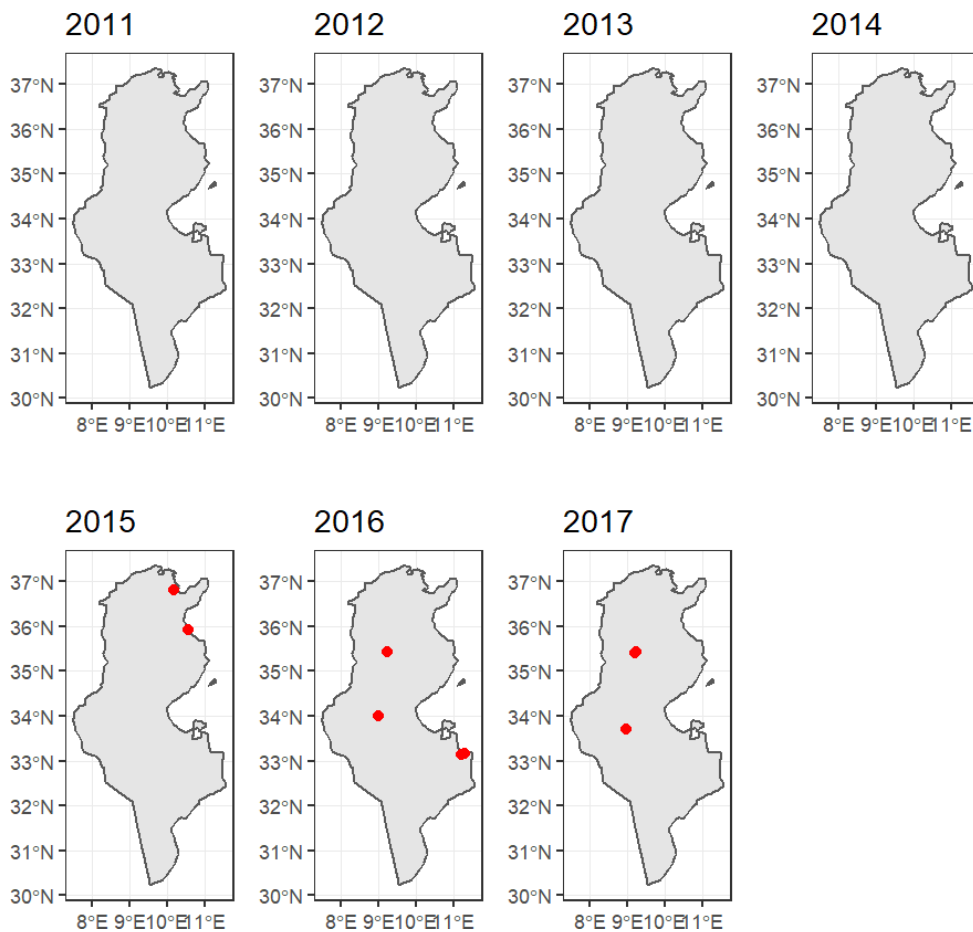


Figure 17: Geographic distribution of conflict events in Tunisia 2011-2017



6.1.1.3 Libya

Following the events of the Tunisian Revolution, the revolutionary movements quickly spread to neighbouring countries. From early 2011, protests arose in Libya following delays in housing and general calls for political reform and demands to end political corruption, and these protests quickly spread and intensified. In the top panel of figure 18, we show the number of protest events for each week. Not surprisingly, we see that there is a spike in the number of events in late January and early February 2011. Shortly after, Libya witnessed the outbreak of civil war. The lower panel of figure 19 focuses on the increase in battle-related deaths in the wake of increased protest behaviour from early 2011. As shown in figure 20, most events were geographically confined to the northern coast, but several incidents have been recorded in more inaccessible areas. In future iterations of this paper, we will explore models that can describe escalation in protest behaviour and how that escalation shapes the risk of conflict onset.

Figure 18: Protests (upper panel) and battle deaths (lower panel) in Libya 2010-2017

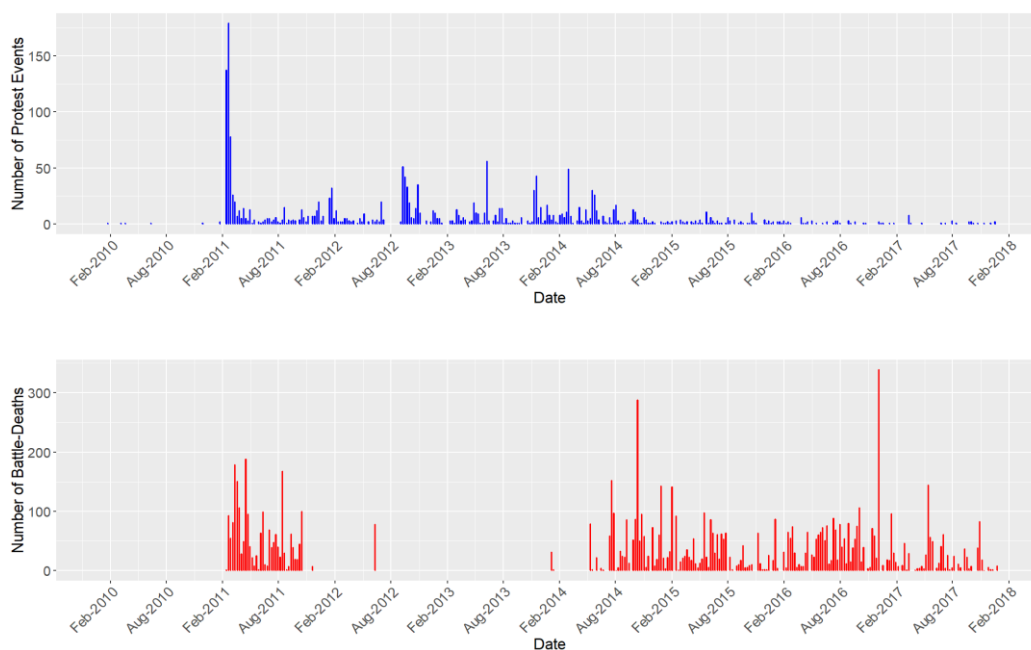


Figure 19: Protests (upper panel) and battle deaths (lower panel) in Libya 2011-2013

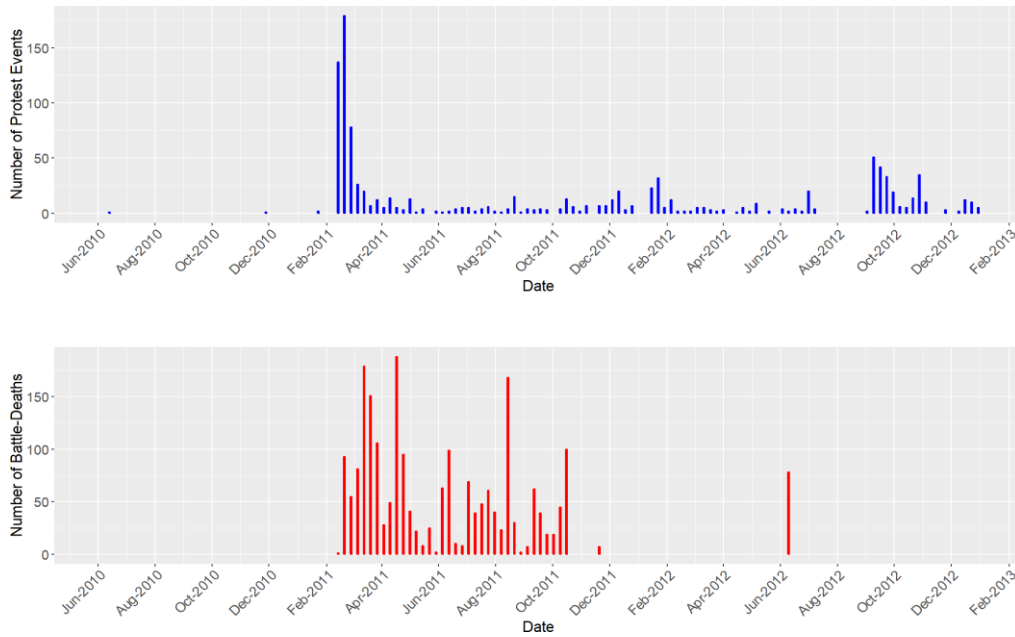
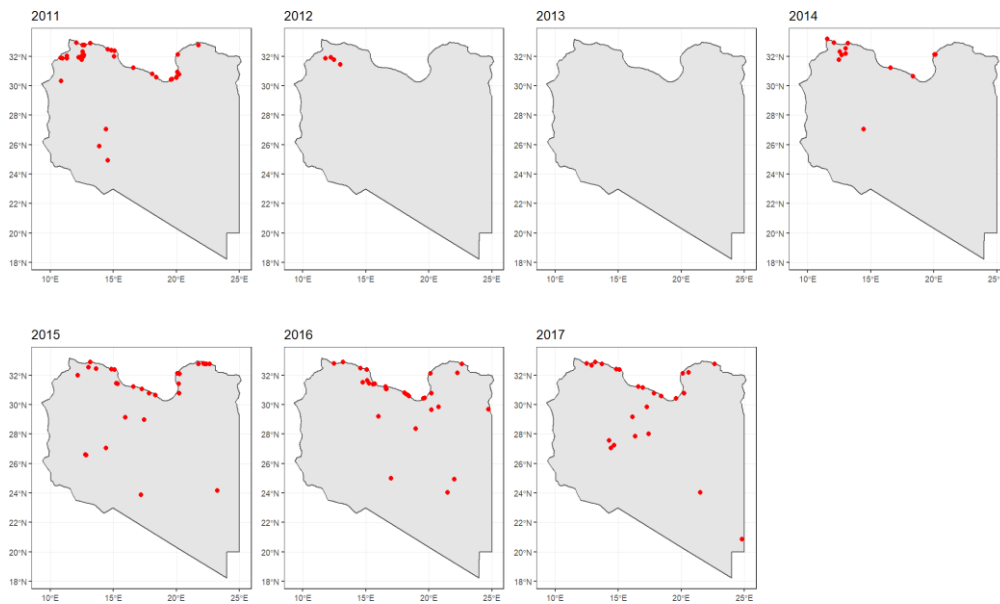


Figure 20: Geographic distribution of conflict events in Libya 2011-2017





Both figure 18 and figure 19 stress the importance of a sub-national perspective in order to understand conflict and governance breakdown adequately. Spatially and temporally disaggregated data allow for insights that a country-year analysis would miss. Even a brief glance at figure 20 reveals that many of the conflict events are clustered in the northern coastal regions of Libya and much less fighting has taken place in the scarcely populated south of the country. This is just one example of a result that would be impossible to gain with a country-level study.

6.1.2 Eastern Neighbourhood

6.1.2.1 Ukraine

The graph in figure 21 clearly shows that the protests in Ukraine in late 2013 preceded the increased violence in 2014. The Euromaidan protests started in November 2013, mainly in Kiev but also in other major cities (see figure 21). In February, there were new rounds of protests which culminated in violence between the protesters and the government. As a result of these protests, President Yanukovich fled the country. We also see a smaller wave of protests in May 2014 when the election for his replacement was held.

While the demonstrations were confined to the population centres and larger cities, this is not where the conflict events happen (see maps), with the exception of the violence in Kiev in February 2014. However, as figure 22 shows, in the Eastern parts of Ukraine, an anti-Maidan (and pro-Russia) campaign developed, leading to increased violence. Thus, the violence in these areas did not emerge as an escalation of the protests, but rather in reaction to them. This could have happened partly because a power vacuum emerged in the Eastern parts when the president fled, and pro-Russian supporters took advantage of the social unrest, which aligns well with the theory of ALS.

Figure 21: Protests (upper panel) and battle deaths (lower panel) in Ukraine 2010-2017

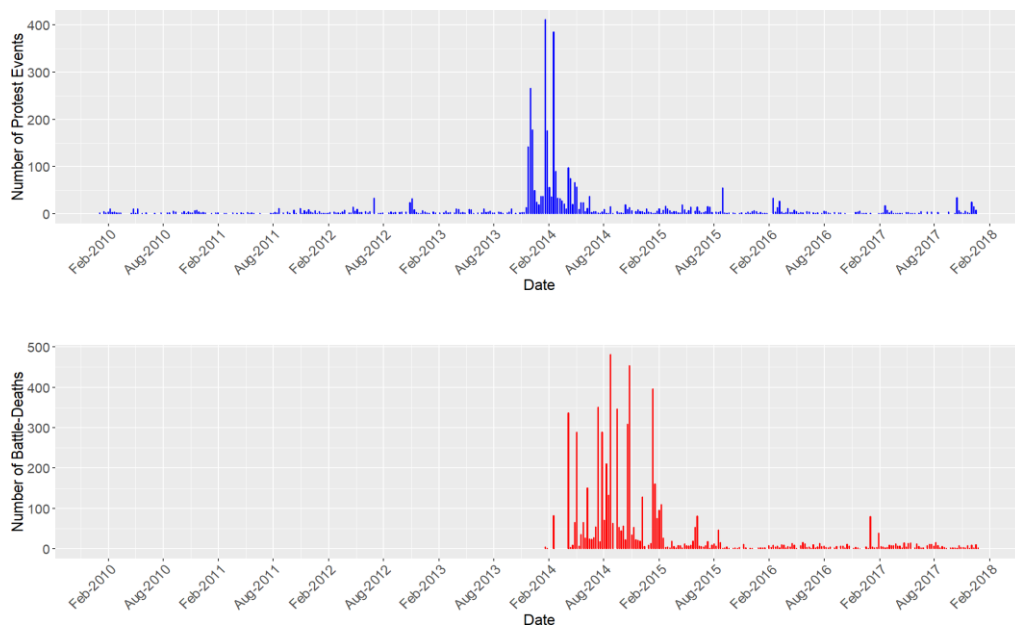
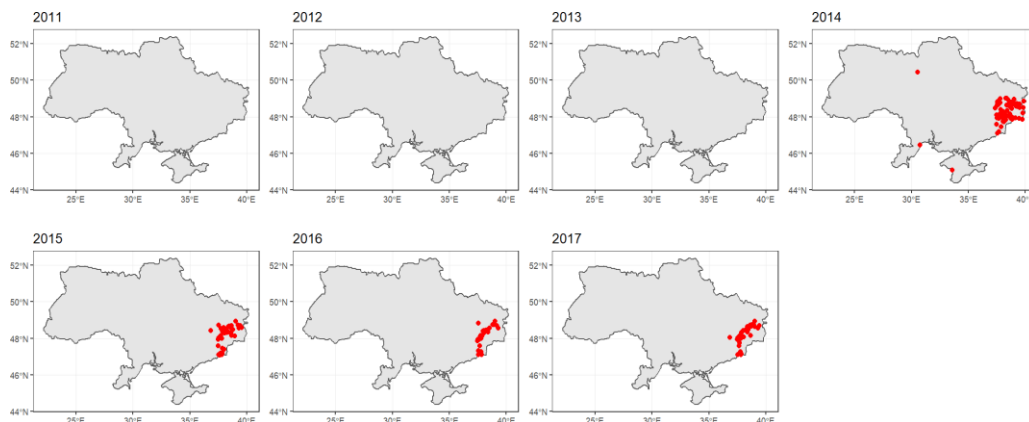


Figure 22: Geographic distribution of conflict events in Ukraine 2011-2017



6.1.2.2 Georgia

Since Georgia gained its independence from Russia in 1991, the country has experienced several forms of social unrest and conflict. Directly following its independence, a coup d'état ousted newly elected President Gamsakhurdia, leading to fierce fighting between his supporters and the anti-government alliance behind the coup. Following the coup, Georgia experienced a fierce civil war, where Gamsakhurdia and supporters attempted to regain power, resulting in several armed

clashes. Meanwhile, ethnic separatist movements in South Ossetia and Abkhazia had emerged and continued to demand increased recognition throughout the 1990s. In 2008, the Russo-Georgian war broke out between Georgia and Russian-backed regions of South Ossetia and Abkhazia. The conflict led to the death of both civilians and military personnel and the expulsion of a large proportion of the Georgian population from the Abkhazia region. Since 2010, there has been sporadic violence in the Abkhaz region. In May 2011, protests broke out in Tbilisi demanding President Saakashvili's resignation. The spike in protest events is clearly picked up in the ICEWS data shown in figure 23. Saakashvili argued that the protests were backed by Russia to spur unrest and violence.

Figure 23: ICEWS protest events and UCDP GED violent conflict in Georgia, 2010-2017

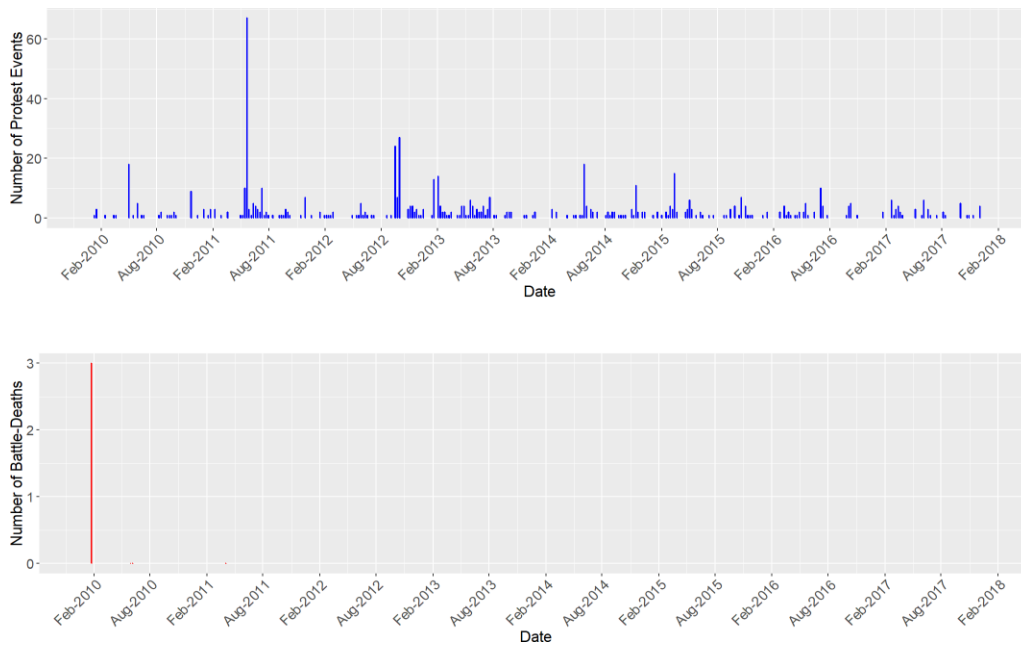
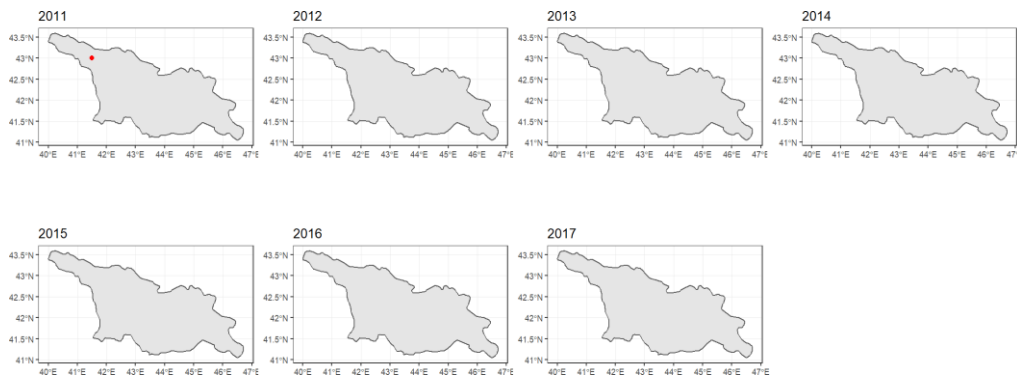


Figure 24: Geographic distribution of conflict events in Georgia 2011-2017



While the evidence presented in this section is preliminary and descriptive in nature, it nevertheless underscores the possibilities and potentials we have developed for national and sub-national conflict and/or governance analysis and forecasting regarding the five focus countries of interest. Over the duration of the EU-LISTCO project we will generate additional insight on all five focus countries to expand and complement the macro-regional analyses of the project. Moreover, we will be able to add insight to the qualitative research on these countries within the research consortium to produce comprehensive empirical evidence on the key research questions of the EU-LISTCO project.

7. CONCLUSION

The key question of this paper was about how the EU can know about, prepare for, and possibly help prevent governance breakdown and violent conflict in its neighbourhood. The goal of this paper was to develop an analytical tool and a subsequent empirical strategy that can be put into practice over the course of the EU-LISTCO project and beyond. We have here presented not only the state of the art on forecasting and the quantitative data sources with which we developed the analytical framework of the project but also diverse methodological tools to evaluate these data. We also demonstrated the use of these tools through initial empirical findings. Through the methods presented, we may eventually be able to predict both violent conflict and governance breakdown in the EU's Southern and Eastern neighbourhood. Hence, our prediction tool allows for important insights that can inform EU policies towards these areas. Moreover, our approach enables us to evaluate from a scientific point of view which theories and factors best predict conflict and governance breakdown, as well as which data and methods are most suitable for robust analysis and predictions.



Additionally, we presented initial empirical results that underline the value of our approach. On the broader regional level our analysis demonstrates that violent conflict and governance breakdown are frequent phenomena in the EU's environment. Moreover, we demonstrate that the five focus countries of the project, Tunisia, Libya, and Mali in the South, and Ukraine and Georgia in the East, are differently affected by violent conflict and governance breakdown. Therefore, we find sufficient variation between these countries to more deeply investigate which factors best predict conflict and governance breakdown. However, as these results are preliminary, we caution against too far-reaching an interpretation. Our approach to prediction and empirical strategy will help us to refine and specify our findings over the course of the research project.

The quantitative prediction of violent conflict and governance breakdown makes several contributions to the EU-LISTCO research project as well as to the scientific and policy debates on the subject in general. First, regarding the broader debate on predicting conflict and governance breakdown, we evaluate which predictive factors and theoretical arguments are most powerful when predicting conflict and governance breakdown. In so doing, we contribute to the debate on how best to understand and analyse violent conflict and governance breakdown on both the national and the sub-national levels. Second, from a policy perspective, we seek to provide the EU and its member states with large-scale predictions of violent conflict and governance breakdown. This enables us to provide scientific evidence to help policy makers make informed decisions for how to react and prevent ALS and CO from turning into violent conflicts and governance breakdown. Third, from a methodological point of view, we gather and evaluate data with innovative methods to help understand which data and methods are best suited for robust and reliable predictions. Thereby, we also point out data gaps and requirements for future data collection efforts. Fourth, we bring a quantitative perspective to the qualitative findings within the EU-LISTCO consortium and draw out possible comparisons between diverse empirical results.

For the EU-LISTCO project and for other future research endeavours, this working paper has pointed out several gaps that need to be addressed. First, finding data that is adequate for predicting violent conflict and governance breakdown is very challenging. This is particularly the case for sub-national and survey data. We therefore need additional efforts to gather and produce more such data with broad geographical and longitudinal coverage. Second, the working paper has indicated that many empirical methods exist to forecast violent conflict and governance breakdown. Examples include Bayesian methods and change-point analysis. However, not all of these methods have been put into practice systematically, leaving



room for improvement and further innovation. Third, much of the existing quantitative work on forecasting has been geographically focused on Africa. Therefore, it is essential to broaden the geographical focus to other world regions, beginning with Europe's Eastern neighbourhood, and then focusing on Latin America, or Asia.

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