Fiedler, Laurenz Magnus:

# Disconnectors and the Disconnected: Understanding National-Level Internet Shutdowns and their Effects on Protests in Sub-Saharan Africa

**Masterarbeit, Wintersemester 2024**

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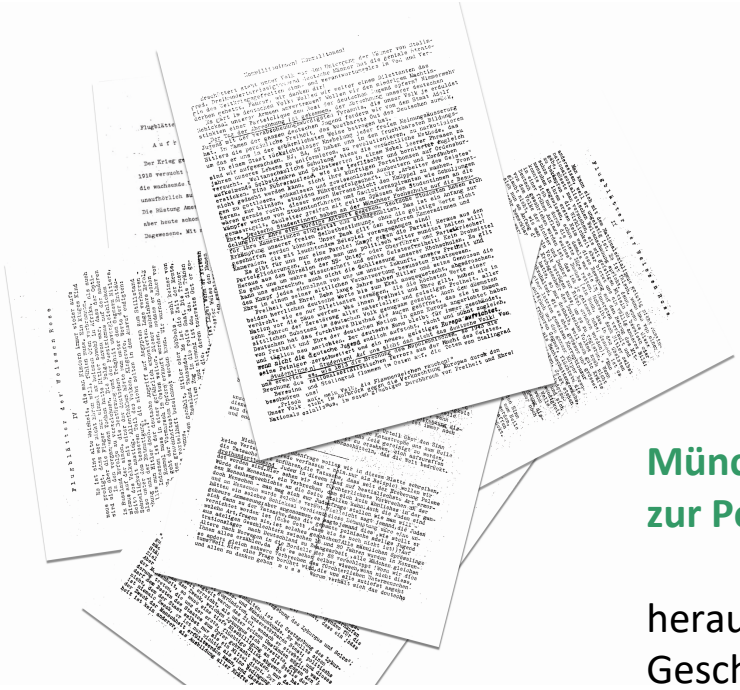

**Münchener Beiträge zur Politikwissenschaft**

herausgegeben vom
Geschwister-Scholl-Institut
für Politikwissenschaft

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**2024**

Laurenz Magnus Fiedler

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Masterarbeit bei
Prof. Dr. Abel Escriba-Folch
2024

**Acknowledgments**

As I close this significant chapter of my academic journey, I find myself reflecting on the support and inspiration that have been pivotal in the completion of this thesis. My heartfelt gratitude goes out to all who have been part of this remarkable yet no doubt challenging journey.

Firstly, I would like to extend my deepest appreciation to my supervisors Professors Abel Escribà-Folch and Petra Stykow. Your guidance, expertise, and unwavering support have been the cornerstones of my research and academic growth over the past few months. Your insights and encouragement have not only shaped this thesis but have also profoundly influenced my personal and professional development.

To my family, your unconditional love and support have been my stronghold. The sacrifices you've made and the belief you've shown in my abilities have been the driving force behind my perseverance. Your constant encouragement and understanding, especially during the most challenging of times, have been invaluable.

To my friends, thank you for being my stress relievers and constant sources of joy and laughter. Your companionship and moral support have made this journey less daunting and more enjoyable. The memories we've created and the support we've shared have been instrumental in keeping me motivated and focused.

As I embark on new beginnings, I am reminded of the words of Hermann Hesse, a German-Swiss poet and novelist, whose poetry has often been a source of comfort and inspiration to me. In such moments of great change, the first verse of his poem *Stufen* resonates deeply:

"Wie jede Blüte welkt und jede Jugend dem Alter weicht, blüht jede Lebensstufe, blüht jede Weisheit und auch jede Tugend zu ihrer Zeit und darf nicht ewig dauern. Es muss das Herz bei jedem Lebensrufe bereit zum Abschied sein und Neubeginne, um sich ohne Trauern in andre, neue Bindungen zu geben. Und jedem Anfang wohnt ein Zauber inne, der uns beschützt und der uns hilft, zu leben."

In closing, I extend my deepest gratitude to everyone who has supported me on this journey – mentioned or unmentioned. As I step into the next chapter of my life, I carry with me the invaluable lessons and cherished memories from this experience. Thank you for being part of my journey and the wind in my sails!

## Table of Contents

## List of Abbreviations

| Abbreviation | Definition |
|---|---|
| ACLED | Armed Conflict Location and Event Data Project |
| AIC | Akaike Information Criterion |
| CAMEO | Conflict and Mediation Event Observation |
| CIPESA | Collaboration on International ICT Policy for East and Southern Africa |
| DRC | Democratic Republic of the Congo |
| FAO | Food and Agriculture Organization |
| GDELT | Global Database of Events, Language and Tone |
| GSMA | Global System for Mobile Communications Association |
| ICEWS | Integrated Crisis Early Warning System |
| ICTs | Information and Communication Technologies |
| IRRs | Incidence Rate Ratios |
| ISM | Internet and Social Media |
| ISPs | Internet Service Providers |
| ITU | International Telecommunication Union |
| LR | Likelihood Ratio |
| ME | Marginal Effects |
| MENA | Middle East and North Africa |
| MMM | More Murder in the Middle |
| NBRM | Negative Binomial Regression Model |
| OxCGRT | Oxford Covid Government Response Tracker |
| PRM | Poisson Regression Model |
| SFLC.IN | Software Freedom Law Center, India |
| SSA | Sub-Saharan Africa |
| STOP | Shutdown Tracker Optimization Project |
| UI | User Interface |
| UN | United Nations |
| WB | World Bank |

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## Abstract

In response to protests fueled by the growing availability of the internet and social media, governments around the world are increasingly resorting to particularly blunt methods of digital repression, notably internet shutdowns. In recent years, in what represents a second watershed moment, Sub-Saharan African countries have increased their use of, typically, nationwide and long-lasting internet shutdowns. Recognizing the existing gap in scholarly research in this (geographic) area, this thesis investigated the intricate relationship between such shutdowns and protest activity - which it coined the shutdown-dissent nexus - at the country-day level. It employed a comprehensive large-n, quantitative analysis, covering the years 2016 to 2022 across 25 Sub-Saharan African countries, using count regression models. This approach addressed both the longitudinal effects of shutdowns and, in a first for the field, disaggregated between different types of shutdowns and their effects. Consistent with previous research, the study found that shutdowns lead to an increase in protest numbers in both the short and the long run. Contrasting previous findings, the presented results suggest a peak-trough-peak relationship between shutdowns and protest numbers over time. Moreover, both service- and throttle-type shutdowns were found to increase protest numbers. Taken together, these findings raise questions about the continued use of such methods of digital repression by governments, as they have been shown to backfire both economically and politically.

**Keywords:** *Protests, Collective Action, Sub-Saharan Africa, Internet Shutdowns/Disruptions, Shutdown-Dissent Nexus, Count Regression Models, Armed Conflict and Location Event Data Project, Access Now*

## 1 Introduction and Motivation

Faced with a wave of nationwide protests calling for his resignation, and in the hopes of bringing them to a quick end, it was in February of 2007 when then-president of Guinea Lansana Conté declared martial law to block most of his country's print- and broadcast media (Committee to Protect Journalists, 2007). In addition to limiting the free flow of information by restricting traditionally used channels of communication, the head of state also decided to order the country's four main internet service providers (ISPs) to shutter all access to the internet and related channels of communication and implemented what has since become known as an *internet shutdown* (Collaboration on International ICT Policy for East and Southern Africa [CIPESA], 2019).[1] Back then, in the first decade of the 21st century, the use of a disruption of the connection to the internet to quell popular mobilization was largely unheard of, and it was only four years later, during the events of the Arab Spring, that this practice became more commonly employed. In 2011, as people across the Middle East and North Africa (MENA) took to the streets to voice their demands for political reform, widely believed to have been bolstered by the availability of the internet and social media (ISM), governments in Egypt, Syria, and Libya responded by disrupting their people's access to such services (Gohdes, 2020; Rydzak et al., 2020). It was at this time, and especially through the use of internet shutdowns by then-Egyptian-president Hosni Mubarak, that the practice rose in popularity, particularly among non-democratic rulers (CIPESA, 2019; Internet Society, 2019a; Marchant & Stremlau, 2019). Making the aforementioned Guianese incident the first-ever recorded internet shutdown on the African continent to date (Rydzak et al., 2020). While governments are, legally speaking, in their right to control and regulate the access to information and communication technologies (ICTs), such as the ISM, in their territories for reasons including the protection of their national security or -sovereignty. Due to their harsh and largely unpredictable consequences, the use of internet shutdowns has been condemned by scholars, journalists, non-governmental organizations, and intergovernmental bodies alike (Bhatia et al., 2023).[2]

As the mentioned cases above and leaked or publicly released shutdown orders suggest, there is a widespread, implicit assumption that shutting down the internet will disincentive further and depress ongoing mobilization (Rydzak et al., 2020). Yet, the current findings in the

[1] Internet shutdowns are defined in this study as *deliberate, significant disruptions of the internet or related channels of electronic communication by state actors, rendering them inaccessible or effectively unusable, within a given geographical area and/or for a predetermined group of citizens*. The specific characteristics of internet shutdowns and the origin of the definition are further explored in the Operationalization and Methodology section.

[2] Access to the internet is increasingly seen as a basic human right, and the United Nations (UN) has passed a resolution in 2016 condemning the use of internet shutdowns. They have been argued to be in violation of international human rights law (Bischof et al., 2023; Marchant & Stremlau, 2019).

scholarly literature do not seem to support this assumption and instead suggest that shutdowns can, at least in the short term, spur mobilization and make it more violent. The presented evidence is subject to several flaws and limitations however, and should consequentially be regarded as rather tentative and limited in its generalizability. Motivated by an interest in improving our current, limited understanding of the use and consequences of internet shutdowns for popular mobilization, this study sets out to both theoretically and empirically explore what it dubs the *shutdown-dissent nexus*. Doing so by taking a closer look at the 58 nationwide internet shutdowns that have been implemented across 25 Sub-Saharan African (SSA) countries between January 1, 2016, and December 31, 2022, and their effects on the daily counts of nonviolent protest events, which in the following will simply be referred to as protests.[3] The research question guiding this endeavor is: *How does the implementation of national-level internet shutdowns affect the dynamics of protests in Sub-Saharan African countries?*

Apart from the aforementioned shortcomings in the academic literature, contemporary, region-specific trends underline the importance of getting a better understanding of the consequences of internet shutdowns for protests in SSA. Firstly, as the most recent data provided by the International Telecommunication Union (ITU) and plotted in Figure 1b shows, access to the internet continues to rise.[4] Although access to the internet might still not be as widespread in the SSA as it is globally, the region boasts the highest internet access growth rate, with the access rate having grown from less than one percent in 2000 to over 30% in 2021 (Internet Society, 2022; World Bank [WB], 2023c).[5] Nowadays, people around the world are increasingly dependent on the internet in their everyday lives, and Africa is no exception (Sanches, 2022). At the same time, while the dependence on the internet is growing and control over access to it is becoming an increasingly powerful tool to control civil society, the number of internet shutdowns implemented continues to climb (Bischof et al., 2023; Selva, 2019). African countries in particular "are among the world's worst violators" (Dahir, 2018, para. 1) when it comes to internet shutdowns, recording the second highest number of such shutdowns when compared to other world regions, as highlighted by Figure 1a. In the seven years under observation, SSA countries implemented the third-highest number of internet shutdowns

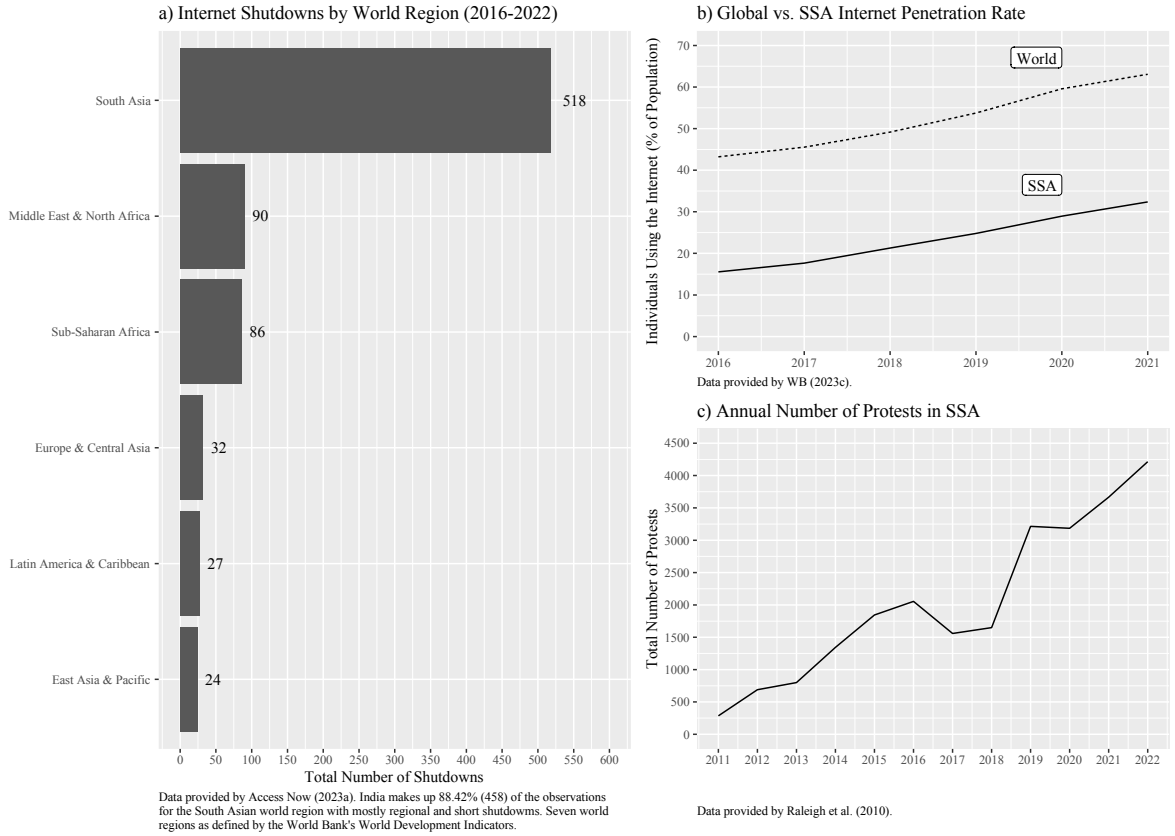
[3] The countries that are being considered here include Benin, Burkina Faso, Burundi, Cameroon, Chad, Republic of the Congo, Democratic Republic of the Congo (DRC), Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Guinea, Liberia, Mauritania, Nigeria, Senegal, Sierra Leone, South Sudan, Sudan, Eswatini (formerly Swaziland), Togo, Uganda, Zambia, and Zimbabwe.

[4] The ITU is a specialized agency of the UN, mainly tasked with facilitating the international connectivity of communication networks and promoting the worldwide access to ICTs like the ISM (ITU, 2023b).

[5] Unless otherwise specified, the use of the term SSA refers to the 25 SSA countries under observation in this study.

globally with 86 total shutdowns. Internet shutdowns are affecting a growing number of people ever more harshly, leading to harms that far exceed the disconnection that the people are most immediately confronted with, including physical-, economic-, and psychological harm (Bischof et al., 2023; Björksten, 2022). Lastly, although the African continent and its inhabitants are stereotypically depicted as rather passive and protest activity is played down as mostly unorganized, the continent has a rich history of impactful protests that reaches back at least as far as the 1950/60s protests for independence (Asante & Helbrecht, 2018; Larmer, 2010). In fact, the continent currently finds itself in the midst of one of the liveliest protest periods that it has experienced in recent history. Despite receiving much less media and scholarly attention

**Figure 1. Internet Shutdowns, Internet Penetration, and Protests in SSA Countries**




than protests in other world regions do, they are no less varied or dynamic (Arnould et al., 2016; L. Mueller, 2018; Sanches, 2022). Figure 1c portrays this rise in the number of protests, showing annual aggregates of protests across SSA.

From an academic perspective, internet shutdowns and their societal consequences represent a thus far poorly understood, dark side of the technological advancements brought about by the proliferation of access to the internet (Earl et al., 2022). Studying this "real-life counterfactual to the free flow of digital communication" (Rydzak, 2018, p. 176) simultaneously ameliorates our understanding of both the effects of a sudden absence of the ISM's technological affordances as well as their role in the formation of protests. The principal

contributions that this study makes to the current literature are threefold. Not only is it the first to perform a rigorous, quantitative study of the effects of shutdowns on protests in the SSA region, a region which has been mostly neglected by scholars in the field thus far (Rydzak et al., 2020). But it also facilitates replication and building on the generated insights by using comprehensive, novel, and importantly, openly accessible data on internet shutdowns. In addition, by using data from 2016 to 2022, this study considers a period that has not been previously considered but where technology and the use of the internet are becoming more and more common. As opposed to the early 2010s when the ISM were only beginning to proliferate and being used as tools for protests. Additionally, 2016 represents a turning point in the use of internet shutdowns in Africa, with their numbers increasing significantly (Stremlau & Dobson, 2022). Lastly, it is the first study in the field of political science that discerns between different types of internet shutdowns, offering hitherto unavailable insights into the intricacies of shutdowns and their effects on popular mobilization. Something completely absent from the current literature, which treats them as largely homogeneous phenomena. Beyond its apparent academic value, the study hopes to also have practical value and to bring wider awareness to the use of such blunt methods of digital repression and empirical evidence as to their societal consequences.

To do so, the reader is first presented with a comprehensive review of the literature on the determinants of protests, traditional and digital repression. This is followed by an elaboration of the theory and hypotheses concerning both the over-time and intra-shutdown variation in its effects on popular mobilization. The last sections contain a detailed review and discussion of the methods and data used to test the formulated hypotheses as well as a presentation of the results. They also present various robustness checks which overwhelmingly bolster the results of the main analysis. The concluding section summarizes the findings and provides an outlook on future improvements and scientific endeavors worth pursuing.

## 2 Literature Review

As mentioned above, the study of the shutdown-dissent nexus has hitherto attracted only scant attention by scholars.[6] By closely studying the relationship between acts of digital repression and collective action responses to such acts of repression, this work speaks to multiple areas in the existing literature. It speaks both to the literature on the repression-dissent nexus as well as the extant literature on the determinants of protests. The present section outlines and presents

[6] The authors refer more generally to the interaction between repression and dissent, but this similarly applies to the closely related study of the shutdown-dissent nexus.

the existing findings in the literature in a comprehensive yet concise manner, highlighting current achievements and remaining gaps, starting with an exploration of the works on protests and their determinants and moving to the works on the study of (digital) repression and dissent.

## 2.1 Protests and their Determinants

Protests, widely understood as a joint, extra-institutional, non-regular physical gathering of people sharing a common goal, have become a ubiquitous part of contemporary politics, beyond advanced industrial democracies, on a global scale (Dalton et al., 2010; Opp, 2009). This includes countries in SSA and Africa more generally, where citizens are used to expressing their interest in a change of the status quo, be it political, economic, or social, through collective mobilization, and are doing so increasingly often (Arnould et al., 2016; Sanches, 2022). Considering the ubiquitous nature of protests and their fundamental role as a means for citizens to articulate their interests, it is unsurprising that a substantial body of literature, spanning diverse methodologies and examining various political regimes, has evolved. The main concerns addressed in the scientific literature include the determinants of protests, the implications of protests, and long-term trends in protests (Quaranta, 2017). It is the former that this study is most concerned with and which the review will consequently focus on. Reviewing the literature on the determinants of protests is deemed to be most useful in helping one pinpoint and explain when protests emerge, which is imperative to get a better understanding of how internet shutdowns are likely to affect them.[7]

### 2.1.1 Motives, Means, and Opportunities

There is a long tradition in the social- and political sciences when it comes to explaining the emergence of protests and over time, three main strands have emerged in the literature: grievances, resource mobilization, and political opportunities (Weidmann & Rød, 2019). Colloquially, as Dorward and Fox (2022) point out, these are better known as, respectively, motives, means, and opportunities. The first strand in the literature, motives, represents the most intuitive and straightforward explanation of the emergence of protests. It is typically traced back to Gurr's (1970) influential work *Why Men Rebel*, in which the author combines

[7] To enhance lexical variety and minimize repetition, the term internet shutdowns will be used interchangeably with the term *internet disruption*. Abbreviations of the aforementioned terms, which omit the repeated prefix, will also be utilized. The terms selected here were chosen over other terms commonly found in the literature on shutdowns, like *kill switch*, *blackout*, or *outages*, because they maintain the right balance between empirical specificity and epistemological usefulness. The other widely used terms convey a false picture of shutdowns, portraying them as either easy to implement, total, or accidental, respectively. This is, as the literature shows, inaccurate however and should thus be avoided (Bischof et al., 2023; Howard, Agarwal, et al., 2011; Marchant & Stremlau, 2020a, 2020b; Vargas-Leon, 2016).

psychological, sociological, historical, and economic accounts in an attempt to unearth the determinants of collective violence. Works that have adopted a motives-centered approach have since mainly focused on grievances resulting from, inter alia, socio-economic inequalities, which are argued to increase the tensions in societies and eventually spur protests. More specifically, it is the frustration and anger resulting from a feeling of being disadvantaged that is said to drive people to decide to protest (Cederman et al., 2011; Gurr, 1970). Although grievance-based explanations have since received much criticism, they continue to be used frequently in the study of political protest with some comparative accounts supporting the idea that popular dissatisfaction can spur mobilization. Using data on a wide range of developing and developed nations, Dalton et al. (2010) conclude that grievances are necessary but not sufficient factors for determining the occurrence of protests. Similarly, an earlier study of the African context by Bratton et al. (2004) was unable to identify strong links between grievances and protests and instead emphasized the importance of institutional procedures and structures. The necessary but insufficient nature of grievances has been pointed out by subsequent studies since (Chenoweth & Ulfelder, 2017). Grievances are latent and ubiquitous and their presence alone can neither explain the timing of protests nor how the aggrieved overcome the collective action problems that inevitably arise (L. Mueller, 2018; Sánchez & Namhata, 2019). Although the motivations strand of the literature speaks to *why* people might decide to rise up, it does not speak to *how* they do so and the hurdles that they face when doing so. This is where the means strand of the literature comes in, which goes beyond grievances and focuses on resources as key to the mobilization of individuals and has adopted Olson's (1965) widely known *free-rider problem* as a basic tenet forming the foundation for their elaborations (McCarthy & Zald, 1977). Their basic belief is that it is difficult to mobilize large groups of risk-averse individuals to partake in collective action because the product of said collective action is a public good. Rational, self-interested individuals consequently do not perceive a need to take part in the collective action as they don't have to to reap its benefits, which they can also acquire by free-riding on the efforts of others (McCarthy & Zald, 1977; L. Mueller, 2018). They are thus expected to not take part in collective action, and "will not act to achieve their common or group interests" (Olson, 1965, p. 2). For collective action to take place and survive, there is a need instead for organizations and/or individuals with sufficient resources, which can either be financial, organizational, relational, or informational (Chenoweth & Ulfelder, 2017). The last of the three strands, the opportunities strand, goes beyond the earlier emphases on either individual motivations or resources and instead emphasizes the importance of specific aspects of the political system in which mobilization occurs (Dorward & Fox, 2022; Meyer, 2004). Its

central belief is that protests are always embedded in specific political and social structures that influence their likelihood because they affect the costs and benefits of protesting – to put it concisely, this strand stresses that protests are not *sui generis* (Dolata, 2018). Among the scholars who emphasize the importance of political opportunities, Tilly (1978) is arguably the most influential, having made the "[perhaps] first systematic statement about the role of political opportunities" (Giugni, 2009, p. 362) for protesters. The author argues that the relationship between the regime type of a country and the likelihood of protests resembles an inverted U shape with autocratic and democratic regimes on the extreme ends. Autocratic regimes, because of their strong repression and tight control over the security apparatus are less likely to experience protests just as democracies, which are said to experience less because they offer alternative channels to express opinions. It is the hybrid systems that are instead expected to feature the highest levels of protests.[8] But, as with the other strands presented before, opportunities alone are insufficient and cannot single-handedly explain the emergence of protest activity. They do not "constitute the necessary and sufficient conditions" for protests (Tilly, 2004, p. 34). It is rather a mixture of different factors and circumstances that, together, explain the emergence of protests.

### 2.1.2 The ISM and Protests

More recently, and building on the three predominant perspectives on the emergence of protests that are widely echoed in the pertinent literature, scholars have begun to devote additional attention to the study of the relationship between the ISM and protests.[9] What started with the cautious explorations of the impacts of the emerging communication technologies in the early 2000s is now, after close to two decades of development and spurred by popular uprisings from Europe over Southeast Asia to the MENA region, flourishing and finds itself in a period of theoretical and empirical advance (Bimber, 2017; Gohdes, 2018; Tufekci & Freelon, 2013). Whereas the scholarship seems to generally agree that the ISM have transformed protests, there remains a debate as to how they have done so and to what avail (Schiffrin, 2017).

The studies in this strand are situated against the backdrop of a broader, ongoing discourse surrounding the role of the novel, digital communication technology in either

[8] This assumption has since been challenged with scholars coming to varying conclusions as to the shape of the relationship. Fergusson and Molina (2019), for example, find a U-shaped relationship between the regime type and protest frequency, while Stein (2017) corroborates Tilly's theoretical expectations of an inverse-U-shaped relationship.

[9] Consult the review article written by Zhuravskaya et al. (2020) for a broader overview over the consequences of the ISM for a wider array of political practices like the behavior of politicians, spread of mis-/disinformation, political polarization, or xenophobia.

promoting the democratization and liberalization of states and their civil societies or contributing to their suppression – the so-called *liberation- versus repression technology* discourse. While earlier contributions to this discourse were riding on a wave of optimism that largely emanated from the events of the Arab Spring, later studies became increasingly pessimistic and pointed to the potential for malicious misuse of the technologies (Schiffrin, 2017). Diamond (2010), while not blind to the potential downsides of the new communication technologies as they are simply tools "open to both noble and nefarious purposes" (p. 71), is one of the foremost proponents of the idea that they can bolster political, social, and economic freedoms. He believed the ISM accelerate global processes of democratization by improving the stand and power of citizens, allowing them to monitor the actions of officials and to mobilize protests more easily. One of the earliest and, no doubt, most prolific critics of this perspective is Morozov (2012) who instead argues that the scholarship wildly underestimates the potential for the ISM to be used by autocratic regimes to surveil their populations and manipulate public opinion using propaganda. He opposes the view that the ISM are a panacea for democratization, doubting their potential to mobilize people to take to the streets and suggests that their availability leads to *click-/slacktivism* instead. Creating a mass of passive participants who use the online realm to follow and support causes but do not participate in real-world activities.[10] Gladwell (2010) and Aday et al. (2010) are similarly pessimistic about the positive effects of the ISM and voice their reservations about their protest mobilizing and democratizing potential. Shirky (2011), providing anecdotal evidence from several protest sites, pushes back on this criticism, arguing that the ISM are used to mobilize and bolster protests and that governments target them because they know of and fear this potential.

Notwithstanding the continuing discourse on the wider positive and negative ramifications of the new technologies, scholars have begun theorizing more deeply about how such new communication technologies affect the formation of protests. These works belong to a new tradition of theoretical thinking in the collective action literature which deemphasizes the importance of organizations for collective action and has been aptly referred to as post-bureaucratic by scholars like Bimber (2017). Such post-bureaucratic accounts argue that the availability of new digital media has shifted the balance in favor of individuals, relegating organizations. One of the key contributions to the theoretical explorations was made by Castells (2012) with his timely book *Networks of Outrage and Hope* in which he sought to provide a

[10] Proponents of the click/slacktivism argument support the idea that the online activity that people engage in will distract them from any real-world, offline activism. By being active online, they are believed to already achieve some sense of self-efficacy and thus lose their interest in partaking in any form of offline activities (Anderson, 2021).

better understanding of modern, networked protests by surveying the Arab Spring uprisings, the Spanish indignados movement, and the Occupy protests. Although these protests differ in many regards, they share an inextricable link to the ISM, whose networks form the basis of the protests and which makes them more individual, spontaneous, decentralized, and aids in their rapid, cross-national proliferation. In addition, thanks to the novel communication technology at the protesters' disposal, protests are said to be less hierarchical and more participatory. There is less need for an identifiable center or organization to coordinate the protests, this role is increasingly taken by the ISM and the people using them. Protests, because of this lack of a clearly identifiable center are also said to rarely be defined by a single demand and instead have multiple demands and countless motivations for reaching them. In a similar vein, inspired by the events of the early 21st century like the Occupy protests and the Arab Spring, Bennett and Segerberg (2012) set out to devise a theoretical framework that serves to explain the new forms of collective mobilization that they perceive around them.[11] Their alternative framework to understanding protests in the 21st century presents a novel logic that is said to underpin popular mobilization, the *logic of connective action*. Said logic applies to the more individual- and digitalized environments of our time, where people are familiar with the use of modern communication technologies. In this framework, similar to what Castells (2012) pointed out, the ISM become the central organizing agent, largely replacing traditional organizations. Participation is argued to instead be self-motivating as taking public action is argued to be closely linked to an act of personal expression. The authors' framework remains open to different forms of networked protest and conceives of three ideal-typical forms, two of which are characterized by the novel logic of connective action and one of which is characterized by the more traditional logic of collective action. These forms exist alongside each other and differ mainly in the extent to which traditional organizations are involved in the formation and continuation of protests.

While the aforementioned works have certainly aided in our comprehension of the ISM's role and impact in protests, they have yet to furnish clear, data-driven insights. This matter has been recognized by scholars, who have utilized different approaches to assess and examine the impact of the ISM on protests. Earlier studies primarily presented correlational, tentative evidence, while more recent and refined studies employ more sophisticated methodologies to produce estimates and results that can be interpreted causally. The following paragraphs concisely present these studies and their findings.

[11] Bennett and Segerberg also published a book in 2013 that expounds on the theory presented in the article using case studies of economic justice and environmental networks in the United Kingdom, Germany, and the United States. Using these cases, they are able to bolster their theoretical arguments.

In a study of the protests in Tahrir Square in Egypt during the 2011 Arab Spring, Tufekci and Wilson (2012) used a survey of protest participants to gauge the influence that the internet and the use of social media have on protesters. An analysis of the responses suggests that both the use of social media for political purposes and at-home access to the internet increase the likelihood that a respondent had participated in the protests. While this study supports the more positive notion of the influence of the ISM on protest activity, it is limited in both its generalizability and claim to internal- and external validity. This is because the researchers couldn't determine the representativeness of their sample and because they only consider the case of Tahrir Square. Breuer et al. (2015) report similarly hopeful, yet tentative, findings from their study of protests in Tunisia. Using interviews, a review of secondary sources, and an online survey among 437 Tunisian internet users, the authors find evidence that a protest-related use of the internet positively affects the likelihood of participating in offline protest activities. According to the authors, the ISM helped people mobilize by providing them with the resources to do so, the grievances were already present. But again, while these findings do provide an indication of the effects of the ISM, generalizing from them would be premature. In another study, Valenzuela (2013) set out to further explore the link between social media use and protest participation by conducting a representative survey of 1,000 Chilean adults during the 2011 education- and energy reform protest in the country. The analysis of the responses suggests that those who were more active in the online realm, sharing their opinions or joining a cause, were also more likely to partake in offline protest activities. This supports a notion reflected upon by Castells (2012) and Bennett and Segerberg (2012, 2013), that the online and offline worlds do not exist as separate but rather intimately intertwined spaces. Aside from the mostly survey-based work presented thus far, several studies, without making strong claims about causality, explore the predictive ability of social media on protests. Steinert-Threlkeld et al. (2015) found a relationship between coordination on Twitter using specific hashtags and the levels of protest on the following day. Doing so by using a data set of 14 million geolocated tweets and thousands of protest events spread across 16 MENA countries. Similarly, Acemoglu et al. (2018), exploring the Egyptian protests in 2011, found a positive link between the number of tweets with a Tahrir Square-related hashtag and the size of the protests.[12] Lastly, in a study of the Chinese social media application Sina Weibo (similar to Twitter) from 2009 to 2012, Qin et al. (2017) used a particularly large data set containing 13.2 billion blog posts and

[12] Interestingly, and while this admittedly was not the focus of their analysis, when they included a dummy for the period of the internet shutdown in Egypt at that time, the results indicate that protest activity was heightened. This points to a backfire effect of the shutdown, which seemingly bolstered protests.

demonstrated that these can be used to accurately predict protests, strikes, and conflicts, a day before they occur.

Despite their contribution to our understanding of the relationship between the ISM and protests, the previous studies are hampered in their ability to provide results that can be interpreted causally. Not only do they not take active steps to rule out the presence of reverse causality, but they also arguably suffer from problems of selection bias as they were conducted in locations where it was already expected and widely believed that the ISM had affected protests. Their samples are also rather limited in both time and geographical coverage.

Improving upon the aforementioned drawbacks, Stein (2017) more closely considered the effects of varying levels of internet- and cell phone access on the annual number of antigovernment mass actions (including both riots and protests) in a large set of countries between 1995 and 2014. Her findings, based on a rigorous, multi-stage generalized structural equation model, suggest that increased access to modern communication technologies is positively related to the number of antigovernment mass actions. More precisely, the levels of access positively affect the number of antigovernment mass actions in the following year. In a separate study with a similar research interest, Ruijgrok (2017) used data from a global sample of countries between 1993 and 2010 and a negative binomial model to estimate the ramifications of the levels of internet access on the annual number of peaceful antigovernment protests by country. Across the varying model specifications, the estimates support the conclusion that higher levels of internet access lead to higher numbers of protests in the subsequent year. Moreover, the effect is mediated by the regime type of a country, with the internet facilitating protests only in autocratic regimes. A later study of fifteen, non-democratic states across the African, Asian, and South American continents by Anderson (2021) provides further support for the previous findings, linking higher levels of internet use to a higher likelihood of protest participation. Contrary to these findings, Weidmann and Rød (2019), in a city-level study of protests in autocratic states, and conceiving of protests as a multi-phased process, found that cities with higher levels of internet coverage experience lower levels of protests when compared to cities with lower levels of internet coverage.[13] These findings suggest that autocratic governments have the upper hand and that they can undermine efforts of dissent, mainly by controlling the flow of information and by using new, ISM-enabled repressive and surveillance techniques. Once a protest is underway, however, as the authors also demonstrate by looking at city-week-level persistence and diffusion of protests, higher

[13] The authors argue that protests have both a starting- and a sustaining phase, which should be considered separately in analyses because they are subject to different pressures. They are, to the author's knowledge, the first to conceive of protests in this manner and to formally disaggregate between and test the different phases.

levels of internet coverage bolster protests and help them to both persist and spread. Similar conclusions are supported by the results presented by Christensen and Garfias (2018) who used a quasi-experimental difference-in-difference design on a global set of countries and find that an increase in cell phone coverage in a country increases the probability of antigovernment mass actions, an effect which they found to be driven by democratic states.[14] Manacorda and Tesei (2020) on the other hand, also using cell phone coverage but focusing solely on the African continent (save Somalia), found support for a more qualified version of the liberation technology argument. While protest levels rise in regions with full cell phone coverage, this effect is mediated by the respective regions' economic performance. Only when the economy is performing poorly is higher cell phone coverage linked to higher levels of protests. In addition, the authors' findings contradict the findings by Weidmann and Rød (2019) and Christensen and Garfias (2018), supporting the notion that mobile phones are particularly effective at bolstering protest levels in less democratic regimes.

Fergusson and Molina (2019), by exploiting the exogenous variation introduced through Facebook's periodic user interface (UI) language updates, studied the effect that the availability of the social media platform has on the incidence of protests in a country. They find, using global data between 2000 and 2015, that updates in Facebook's UI language are linked to higher numbers of protests in the countries in which these languages are spoken. This effect is conditioned by a country's internet access rate, economic condition, and the number of offline opportunities present to coordinate protests. The authors' results do not however suggest that the availability of Facebook has a positive effect on the democraticness of a state. In a study of the Russian counterpart of Facebook, VKontakte, Enikolopov et al. (2020), exploiting the unique spread of the social network to create an instrumental variable, uncovered a positive relationship between higher levels of VKontakte users in a city and the likelihood and size of protests in the corresponding city.[15]

All in all, the studies on the interaction between the ISM and protests indicate that the availability and increased access to the novel, digital communication technology do not cause protests but act instead as enablers. By improving the flow of information and simultaneously

[14] It can be argued that cell phone coverage can serve as a proxy for the level of internet access. This is especially true in countries with limited fixed phone lines and high-speed cable internet access, where mobile phones are the primary means of accessing the ISM (Christensen & Garfias, 2018; Manacorda & Tesei, 2020).

[15] The social media network's presence was however not linked to higher polarization but to higher levels of government support. While this observation might be unique to the Russian case, it does support the notion of the ISM influencing protest occurrence mainly by improving coordination, i.e., serving as enablers.

reducing the costs of coordination, the ISM catalyze protest activity.[16] This becomes most apparent in the study of the, usually overlooked, African continent by Manacorda and Tesei (2020) who find that the effect of access to the ISM, as proxied by cell phone coverage, is conditioned by the economic situation that a country finds itself in. Also, while access to the ISM was largely found to promote the incidence of protests, likelihood of protest participation, and protest size, contemporary studies have yet to come to a shared conclusion regarding the effect of a state's regime type. While some suggest that democracies are more prone to experiencing higher protest activity with increasing levels of internet access, other studies find the opposite and instead suggest that it is autocratic regimes that are most "vulnerable" to the protest-catalyzing attributes of the ISM. Although the more refined, multi-phase approach taken by Weidmann and Rød (2019) could contribute to resolving some of the discrepancies by operationalizing protests as multi-phased actions, the verdict on the effects of the regime type is still out. Furthermore, current findings in the literature do not seem to bear out the liberation technology argument that was first made by Diamond (2010). Notwithstanding their largely positive effects on protest mobilization, the ISM have not been found to promote the democratization of regimes or strengthen democratic regimes in general (Fergusson & Molina, 2019). Instead, by promoting the occurrence of protests, the ISM indirectly contribute to political instability, which can lead to positive or negative changes regarding the democraticness of a country (Stein, 2017). This is in line with findings by Rød and Weidmann (2015), who found that democratic shifts are less likely to happen in countries with high levels of internet penetration.

## 2.2 (Digital) Repression and Dissent

Having scrutinized the scientific literature on the interrelation between the ISM and protests, this section will now turn to the academic works on repression and dissent, better known as the writings on the *repression-dissent nexus*.[17] Linking both the insights from the literature on protests and the literature on internet shutdowns and their consequences. Repression research has been around since the 1960s and in the more than six decades since, scholars of the political

[16] Studies on the effects of the ISM on acts of organized, collective violence bring forth similar theoretical arguments pertaining the coordination-facilitating aspects of the ISM. The scholarship is however more divided when it comes to the findings with a study by Shapiro and Weidmann (2015) suggesting that, in the Iranian case, higher access levels lead to lower incidences of collective violence. Other studies by Pierskalla and Hollenbach (2013), Bailard (2015), and Warren (2015), on the other hand, suggest that the access to the novel, digital communication technology promotes the occurrence of collective violence. The formal model presented by Shapiro and Siegel (2015) and the dual mechanisms presented in it, namely that the technology can bolster both efforts by anti- and pro-government forces, can contribute to resolving this but has yet to be rigorously tested.

[17] In the respective literature, the terms *repression-dissent nexus*, *dissent-repression nexus*, and *dissent-repression relationship* are used interchangeably (e.g., Chenoweth et al., 2017; Escribà-Folch, 2013).

sciences have contributed to an ever-growing collection of works, producing a variety of valuable insights (Davenport, 2007a). Only more recently, however, mainly thanks to greater theoretical specificity and methodological sophistication, has the field seen great innovation (Davenport & Inman, 2012). Most of the research on repression can be categorized into two groups: the first uses repression as the dependent variable, seeking to provide a deeper understanding of why it occurs, while the second employs it as the independent variable, focusing on understanding its consequences (Carey, 2006; Earl et al., 2022). The following paragraphs will provide a concise overview of the works on traditional forms of repression, highlighting present-day consensus and controversies. Moreover, the latter part of this subsection will move beyond the works on traditional forms and toward the study of the digital forms of repression, including the works on shutdowns and their effects on protests.

### 2.2.1 Repression-Dissent Nexus

Repression, which encompasses a diverse array of actions from overt to covert, violent to non-violent, state to state-affiliated, be they successful or not, has attracted widespread attention in the scholarship and there have been many attempts at formulating a parsimonious definition for it (Davenport & Inman, 2012). Together with its direct counterpart accommodation, it is one of the tactics that have been employed since the birth of the nation-state, and that governments can and do choose from when they are being challenged internally (Davenport, 2007b; deMeritt, 2016). Despite the wide range of actions, from restrictions of free speech to widespread state terror in the form of genocide, complicating a comprehensive definition, the scholarship largely agrees on key defining features of repression which are summarized in the definition provided by Davenport and Inman (Carey, 2006; 2012). The authors define repression as the "actual or threatened use of physical sanctions against an individual or organization, within the territorial jurisdiction of the state, for the purpose of imposing a cost on the target as well as deterring specific activities and/or beliefs perceived to be challenging to government personnel, practices or institutions" (p. 620). At its core, repressive action thus aims to increase the costs and subsequently deter from action that the state perceives as challenging to the status quo. Dissent, on the other hand, can also take many forms depending on the underlying level of organization and violence, including demonstrations, strikes, riots, guerrilla attacks, and revolutions (Carey, 2010). It is aimed at challenging the status quo, in contrast to repression.

In the extensive body of research on repression and dissent, three primary findings have received widespread and repeated support. The first is the *Law of Coercive Responsiveness*

which states that dissent always elicits repression in some form or another.[18] States are, by definition, interested in maintaining order, securing their political survival, and having a monopoly on the use of force. Any challenges to their monopoly or their officials' political survival will consequently be met with repression. This is because, as deMeritt (2016) emphasizes: "[Internal dissent] represents a very real and immediate threat to the status quo" (p. 3), especially in autocratic or hybrid regimes (Weidmann & Rød, 2019). While early work on this suggested that the relationship is unconditional, later work has found that the use of repression is conditioned by the regime type of a state. Carey (2006) for example found that democratic regimes are less likely to apply continuous repression. Other work suggests that the responses are conditioned by the decision-making context and the sequencing (Shellman, 2006). Furthermore, recent scholarly work has begun to disentangle the types of dissent and the reactions that they provoke from governments, mainly arguing that different types of dissent pose different levels of threat and should thus evoke varying governmental responses. The level of threat has been found to be more decisive than the regime type, and different works have found that repression becomes more likely the more violent, multidimensional, or organized it gets (Burgener, 2021; Carey, 2010; deMeritt, 2016).

The second consensus finding in the literature pertains to a state's type of regime, which is said to affect both the scope and intensity of repression and is referred to as the *Domestic Democratic Peace* (Chenoweth et al., 2017).[19] For long, as suggested by conventional wisdom, especially in the early phases of the study on repression, scholars believed there to be a negative and linear relationship between the regime type and the use of repression. As states become more democratic, they were believed to rely less on repressive techniques (Davenport & Armstrong, 2004; Davenport & Inman, 2012).[20] While many studies have since confirmed that the scope and intensity of repression are conditioned by the regime type, there is less agreement about the functional form of that relationship. With subsequent, more rigorous studies calling the assumed negative, linear relationship into question. In the current literature, there are two distinct assumptions regarding the functional form which have found some support. The first is the *More Murder in the Middle* (MMM) assumption, which was first outlined by Fein (1995),

[18] Also referred to as the *Threat-Response Theory* (e.g., deMeritt, 2016). The consistency of this finding is, to put it in the words of Davenport (2007a, p. 8), "quite astonishing in a discipline where very few relationships withstand close scrutiny", and is so fundamental that it has become part of how repression is defined (deMeritt, 2016).

[19] Because the findings in the repression literature closely resemble the findings from the international relations literature, namely the democratic peace, it was this term that Davenport (2004) chose.

[20] In fact, for over 35 years, quantitative research in the field has been overwhelmingly supportive of the idea that democracy is the cure for repression (Davenport, 2007b). Which comes as no surprise as most of the thinking on this was originally motivated by and tied to the desire to democratize autocratic regimes (Davenport & Armstrong, 2004).

and states that it is particularly in states that are in the "intermediate stages of democracy" (p. 174) where repression tends to be employed more liberally. The MMM assumption describes an inverted-U-shaped relationship where coherent regimes, meaning the ones that are either uniformly open or uniformly closed, employ repression less frequently than their incoherent counterparts (Davenport & Armstrong, 2004). This is argued to be the result of the clear signals that coherent regime structures convey. In democracies, repression is said to be less used because leaders can be held accountable for their actions and because there are other channels available for citizens to voice their dissent. In autocratic regimes, the public is believed to be more fearful of dissenting in the first place as it expects the slightest opposition to be met with a disproportionate response. In incoherent, hybrid systems on the other hand, the institutional structures are believed to send mixed messages leaving both the leaders and citizens in the dark about their options as the mechanisms for sanctioning leaders are not fully developed while the citizens have the abilities to express dissent publicly. This mismatch leads leaders of these systems to resort to repression of any kind of demand (Regan & Henderson, 2002). The second assumption resembles a further refinement of the functional form proposed by the MMM assumption and was first proposed by Davenport and Armstrong (2004). While the previously mentioned research mostly suggests that "any and all" (Davenport & Armstrong, 2004, p. 5) improvements in the institutions and behavior of democracy lead to a reduction in the use of repression, the authors argue that only once a particular combination of institutions and behavioral factors is in place, will authorities be deterred from implementing repression. Their results, acquired using two decades' worth of data and statistical methods that are more flexible when it comes to identifying influences with varying functional forms, bear out these expectations. Only once states cross a specific threshold of democraticness will the authorities perceive a constraint on the use of repression. What we currently know about the regime type and repression is this, as succinctly summarized by Carey (2010, p. 178): "[T]he risk of [repression] is highest in regimes that are neither fully autocratic nor fully democratic, and lowest in the most democratic regimes."

A third consensus finding in the literature is that the ramifications of repression differ over time. Findings in the literature more often than not support what has been dubbed a *backfire effect*, where excessive repression in the short term leads to demobilization while in the long term, it promotes remobilization (Chenoweth et al., 2017). In contrast to the first consensus finding that dissent evokes repression, decades' worth of research shows that there is very little consensus about its consequences. Scholars have found "[v]irtually every conceivable relationship" (Earl et al., 2022, p. 10) with its impact being negative, positive, and

sometimes simply not present. These findings combined, that dissent elicits repression, but the effect of repression remains rather uncertain, is what the literature has come to refer to as the *Punishment Puzzle* (Davenport, 2007a).

Overall, the literature that examines the relationship between repression and dissent is far from conclusive, which likely stems from the "use of different samples, cases, levels of analysis, different dependent variables, and alternative measures of repression" (Escribà-Folch, 2013, p. 545) and there remains much to be done. An emerging area that requires more attention is the study of novel means of repression that take place in the digital realm or use digital technologies (Chenoweth et al., 2017; Earl et al., 2022).

### 2.2.2 Toward Digital Repression: The Shutdown-Dissent Nexus

Years after the Arab Spring uprisings, which were largely attributed to the rise and spread of the ISM, the region offers a rather sobering picture with states having reverted to autocratic or military rule marked by higher levels of repression when compared to pre-2011 levels (Freedom House, 2023b; Josua & Edel, 2021). More intriguingly, however, it was during these uprisings, in an era characterized by digital euphoria, that the ISM most clearly showed their double-edged nature. Faced with the novel threat of digitally mediated protests and spurred by the use of a shutdown by the Egyptian government, it was in 2011 that other governments in the region and beyond began to embrace and increase the use of internet shutdowns. The adoption and spread of the ISM thus, evidently, had both positive and negative consequences. While they arguably stimulated collective mobilization, they simultaneously provided governments with new means of repression and surveillance (Earl et al., 2022; Gohdes, 2015).[21] This has led to increased attention on new forms of repression, and the coinage of a new term, *digital repression*, meaning "actions directed at a target to raise the target's costs for digital social movement activity and/or the use of social media to raise the costs for social movement activity, wherever that contestation is taking place" (Earl et al., 2022, p. 1). It was in the 2010s when the cross-disciplinary study of internet shutdowns, often considered the most extreme and reckless form of digital repression, started to develop and when scholars began to take a closer look at them (Freyburg & Garbe, 2018). The existing literature mainly examines three aspects of internet disruptions: their implementation and causes, justifications for their use, and their consequences.

[21] While the rapid technological advancements and the protesters' newfound capabilities initially caught governments by surprise, they quickly adapted to the situation and developed new techniques to regain control (Farrell, 2012).

Regarding the former, a recent study by Bischof et al. (2023) found that national-level disruptions, when compared to unintentional internet outages, are significantly more likely to occur during politically relevant events like protests, elections, or coups. This finding corroborates the idea that governments employ shutdowns intentionally in the hopes of quelling ongoing contention and maintaining control. Looking into the implementation of shutdowns, a study of SSA countries by Freyburg and Garbe (2018) assesses the conditions promoting their use. Using a qualitative comparative approach and data from 2014 to 2016, they find that majority ownership of the ISP is neither necessary nor sufficient for the government to implement a shutdown. It is, most importantly, the mix of the regime type (autocracy), the presence of electoral violence, and ISP ownership characteristics that influence the outcome. This was further underlined by the included case studies of Uganda and the Republic of the Congo and in another study of the Zimbabwean case conducted by Mare (2020). The latter study demonstrated that governments can exert control over private ISPs either through enforcing licensing obligations by for example threatening with the revocation of a license or by applying political pressure through harassment, victimization, or the threat of imprisonment. Although being a majority owner can enhance this control, it is not required to implement a shutdown.[22]

With what is likely the first comprehensive effort to collect a large data set of state interferences with the ISM, not limited to internet shutdowns, Howard, Agarwal, et al. (2011) uncovered an overall increase between 1995 and 2010 as well as a shift in the perpetrators from mainly democratic to autocratic states. Using their data, the authors also more closely considered the justifications used by governments when implementing such interferences, finding that the main reason brought forth is national security. Be it the protection of their political leaders and state institutions, mitigating dissidence, preserving cultural and religious morals, or racial harmony, the main motive offered was the safeguarding of national security. These findings are largely mirrored by later data collection efforts, which find that governments, including those in the SSA, "ordered shutdowns for many of the same reasons they have for years, some using the same tired justifications" (Rosson et al., 2023, p. 4). The main reasons used include national security and public safety, with other reasons including stopping the proliferation of fake news, and illegal content or to prevent cheating during school exams (Díaz Hernández & Anthonio, 2022).

[22] More technical explanations of the requirements to shut down the internet are provided by Vargas-Leon (2016) and Jigsaw (2021).

Moving past the justifications used by government actors, it is particularly the economic effects and the effects on social phenomena, namely protests, that have received more widespread scholarly attention. The studies on the economic consequences of internet shutdowns represent a non-negligible part of the research on shutdowns and have been, because of their bleak prognoses, widely cited to caution against the use of such blunt instruments of internet censorship.[23] West (2016) studies the consequences of shutdowns that occurred in a range of countries between July 2015 and June 2016 and estimates their total costs. His estimates suggest that the 81 disruptions across 19 countries led to an estimated total loss of US$ 2.4 billion in the countries' GDPs. A study by Deloitte (2016) considers the temporal effects of shutdowns and throttles more closely and estimates that, conditioned by the internet access rate, the damage caused by a shutdown ranges from US$ 0.6 to 23.6 million a day per 10 million inhabitants. Moreover, the costs of shutdowns are found to increase with time and throttling the internet speed by 30% or 50% was estimated to lead to daily losses between 0.09% and 0.15% of a country's GDP per 10 million inhabitants respectively.[24] Focusing on the Indian case between 2015 and 2017, Leberknight and Raveendran (2018) estimate that Indian states lost between US$ 1.27 to 243.94 million as a result of the shutdowns that they implemented. Going beyond previous work by including more indirect factors like efficiency gain losses, a study by CIPESA (2017), centering on 10 SSA countries between 2015 and 2017, estimates that the shutdowns cost the countries in question around US$ 237 million. In addition, the study points out the particular importance of ISM-related sectors to the African economies and highlights the month-long ripple effects that such shutdowns tend to have.[25]

Hitherto, research on the shutdown-dissent nexus, which links shutdowns to forms and dynamics of social mobilization "is scant and comprises mostly isolated cases with little cross-national comparison" (Rydzak et al., 2020, p. 4268). The extant studies, eight in total, can be broadly divided into two types of studies. The first are case studies using a mix of quantitative

[23] NetBlocks (2023), an organization working as a global internet monitor, has developed the so-called Cost of Shutdown Tool, which can be used to quickly and easily estimate the costs of an internet shutdown based on the established methodologies devised and provided by the papers published by CIPESA and the Brookings Institution. This gives journalists, researchers, and interested citizens the ability to roughly estimate the costs of an internet disruption for a selected country.

[24] Their estimates, given the data constraints that they were facing, are based on the simplifying assumption that a unit reduction in broadband speed has a homogenous economic impact. They nonetheless provide a good baseline estimation of the varying effects of throttling for countries' GDPs.

[25] The first three studies mainly look at the effects on GDP while the fourth improves on this by including more indirect measures of the effects. Overall, these are mostly conservative estimates and the actual costs, as West (2016) points out are likely higher. Also, beyond these economic consequences, scholars have pointed out that governments pay costs for violating international laws and norms against human rights abuses which can mean losing out on aid payments, foreign direct investments etc. (Christensen & Garfias, 2018). Since shutdowns have often been linked to the violation of basic human rights, there are thus additional, reputational costs that governments incur.

or qualitative approaches to examine the consequences of shutdowns in selected countries. The other group of studies are cross-country, large-n analyses that employ a number of quantitative methods to provide a more general understanding of shutdowns and their consequences.

In her study, which was among the first to consider the societal consequences of shutdowns, Anita Gohdes (2015) takes a closer look at the national-level shutdowns implemented by the Assad government during the early days of the Syrian Civil War, assessing their effect on the levels of government-perpetrated violence. Her findings suggest that the Syrian government used the implemented shutdowns to bolster its forces' likelihood of success. By stripping the opposition of the ISM's affordances, the government forces gain a temporary coordination advantage, which is reflected by the stark increases in killed combatants and non-combatants during episodes of shutdowns. Although this study is not directly linked to protests, it does show why governments use shutdowns and the effects they can have on the population, which is a weakening of its potential to coordinate. The findings in this study, given that they originate from a unique case, are difficult to generalize however and this effect has not been tested more broadly yet.

Moving beyond government-perpetrated violence, Hassanpour (2014), scrutinizes protest activity during the 2011, six-day-long internet shutdown in Egypt. The case of Egypt is particularly interesting because protests led to the ouster of then-president Mubarak, which is counter-intuitive since one would expect protests to be weakened by the implemented internet shutdown. By carefully tracing the events during the shutdown, the author presents evidence showing that it catalyzed protests and eventually sped up the fall of the government. Supportive of his *dispersion hypothesis*, Hassanpour's gathered data suggests that the shutdown both increased the number of protests in the capital city of Cairo and promoted their proliferation throughout the city, which eventually overwhelmed the regime's security apparatus. There were "too many protests in too many places" (p. 20) as contemporary witnesses reported. Because the shutdown disrupted the regular channels of communication, the author argues, it forced people to engage in face-to-face contact and be physically present on the streets to find out about what was going on. This is what drove the mobilization and why the author argues that the ISM can also impede the formation of protests, by fostering the creation of links between a risk-averse majority and "reinforcing the conservatism of the majority" (Hassanpour, 2017, p. 6). In a later book that the same author published in 2017, he also considered the case of violent incidents in Damascus, Syria, and, using precise geolocated protest data, was able to corroborate his earlier findings in a different context. Together, these findings suggest an interesting, counter-intuitive dynamic during episodes of internet shutdowns. Shutdowns

seemingly spur protests and violent incidences and lead to their dispersion, making them harder to control for government forces. The findings are however limited in their external validity as they focus on only two cases during very tumultuous, extraordinary times. Also, they are theoretically limited to urban environments and the analyses only account for a very limited set of potential confounders. Lastly, the author does not employ any formal method to account for likely problems regarding reverse causality, weakening his claims to causality.

In a study centering on Nigeria and the local disruption of mobile phone connectivity implemented to counter ongoing Boko Haram activity in the three northeastern states of Adamawa, Borno, and Yobe. Jacob and Akpan (2015) use group discussions and in-depth expert interviews to gather insights into its security, economic, and social implications. Overall, while the shutdown might have helped Nigerian security forces gain the upper hand in the short term, the authors argue that it has brought about more bad than good. For one, it has led to the insurgents becoming more than an eclectic bunch, instead developing into a closed, and centralized organization that the government struggles to crack down on. Moreover, the interruption of mobile communication services was generally regarded by the citizens as futile and harmful. Although other forms of communication were sought, there was a prevalent feeling of being severed from the larger Nigerian social fabric. Numerous individuals reported significant business losses, heightened anxiety, and a diminished capacity to circumvent the violence instigated by Boko Haram.

Bhatia et al. (2023) analyze the national-level disruption that was implemented by the Sudanese government in 2019 when the country was rocked by anti-government protests over the worsening political- and economic conditions in the country. To assess the shutdown's impact on the Sudanese protests, the authors conducted 19 interviews, used 31 user-generated videos, and gathered insights from Khartoum-based civil society organizations. They concluded that although shutdowns support state narratives and limit user-generated content in autocratic regimes like Sudan, they are ineffective in demotivating protesters or hindering their physical mobilization. Instead, these shutdowns inadvertently encourage novel forms of offline organization. Moreover, the Sudanese instance illustrates that shutdowns are not entirely foolproof, as protesters consistently find ways to bypass them through methods including, but not limited to VPNs and ad hoc Bluetooth networks.

Transcending the limitations inherent in case studies, Rydzak (2018) was the first to conduct a large-n, extensive analysis of internet shutdowns and protests using a global sample of 198 countries and data from 2011 to 2016. In his doctoral dissertation, the author set out to explore internet shutdowns globally and to consider both country-level conditions promoting

their use as well as their effects on protest numbers and intra-protest dynamics.[26] Moreover, he also devised and tested his so-called *disconnective action theory*, which conceives of the internet as a hybrid, socio-organizational resource. Expecting internet shutdowns to increase the incidence of protests, varying over time, by generalizing grievances and removing an avenue through which dissent is commonly expressed. Concerning the consequences of internet shutdowns, using a country-day level of analysis and negative binomial regression models, the author found evidence that shutdowns increase the number of protests in the short term. In the long term, during what the author dubs *digital sieges*, the incidence of protests declines, however.[27] The observed dynamics of protest activities appear to follow a pattern reminiscent of a peak-and-trough cycle. Initially, there is an escalation in protest incidents, attributable to the immediate eruption of grievances. However, this surge is followed by a gradual decline over an extended period, primarily due to the erosion of long-term organizational capacities necessary for sustaining such movements. Expanding the scope of inquiry beyond the broader implications of internet shutdowns on protest dynamics, the author delves into the nuances of intra-protest behavior and its susceptibility to such shutdowns. Concentrating on the context of Indian states in 2016, the research uncovers indications that internet shutdowns tend to foster violent forms of collective action. However, this trend is notably altered when these shutdowns are coupled with conventional repressive measures, which appear to have a pacifying effect on the ongoing collective mobilization.[28] The study presents several limitations that merit closer attention. Firstly, the study faces the problem of endogeneity, which the author has only partially managed to address. Secondly, while this issue is less pronounced in the study of India, the global analysis is plagued by an issue with ecological fallacy. This is due to the author including all types of shutdowns, from local to national, in the analysis of their effects on national aggregates of protest numbers, without formally accounting for the geographical mismatch between where shutdowns and protests occur. Lastly, the focus on the Indian case, which is an extreme outlier and is based on just one year's worth of data, makes it difficult to apply the findings more broadly.

[26] Considering the former, he found evidence supporting the existence of a *digital threshold* that stipulates that the tendency to use internet interferences increases with the growth in internet access until the latter growth reaches an annual rate of 7.13%, after which they begin to decline in frequency. To test this relationship, the author used the data on internet interferences for 176 countries between 1995 and 2011 gathered by Howard, Agarwal, et al. (2011). When restricting the sample to internet shutdowns only, the above relationship could not be found.

[27] The author defines a digital siege as an internet shutdown that lasts for more than seven days. This same temporal threshold is employed to distinguish between short- and long-term effects of such shutdowns. However, the rationale for selecting this particular duration as the operational cutoff point is not discussed in his work.

[28] Rydzak (2019) represents a published working paper version of the chapter on India that can be found in the 2018 dissertation.

Motivated by the lack of research on shutdowns and collective action in the African context, particularly SSA, Rydzak et al. (2020) set out to visually explore the shutdown-dissent nexus. By considering ten shutdown events that have transpired in Algeria, Cameroon, Chad, the DRC, Ethiopia, and Sudan, between 2017 and 2019, the authors attempt to visually inspect the effect of implemented shutdowns on both the numbers and violence of protests. Using data on protests and riots from the Armed Conflict Location and Event Data Project (ACLED), similar to Rydzak (2018) who used Integrated Crisis Early Warning System (ICEWS) and ACLED data, the created visualizations suggest that shutdowns seem to be ineffective at quelling protests. They find either a continuation of the dynamics before a shutdown or a subsequent spike in the protest activity. In addition, the authors also present a case study of a Sudanese shutdown implemented under the al-Bashir regime, highlighting the importance of the presence of brick-and-mortar organizations as fallback mechanisms. They argue that it was thanks to the Sudanese Professionals Association, an amalgamation of 17 unions from across the professional spectrum, that the protests were able to go on, and simultaneously remain overwhelmingly peaceful. The authors' findings are impaired by their selection on the dependent variable, as they only selected cases where protests were already ongoing. Moreover, their failure to distinguish between partial and full shutdowns in their analysis may further compromise the validity of their findings, underscoring the need for more refined methods in subsequent research.

In light of the findings in the literature on the consequences of internet shutdowns, they can be described, from a government's perspective, as *Pyrrhic victories* at best. Both their short- and long-term consequences are undesirable. Although they might depress protest activity in the long run, they do so only while putting enormous strains on a country's economy. Further, the existing literature on their effects on protests unanimously shows that, instead of quelling mobilization, they seem to provoke at least a short-term spike in it. Shutdowns do not stop mobilization but instead provoke it to further decentralize or turn more violent, both of which are undesirable effects that increase the governments' costs at keeping such protests in check. Given the ostensible futility of internet shutdowns in achieving their intended objectives, the question of why governments around the globe use them increasingly often, quickly arises. This *Puzzle of Repressive Persistence* which was coined by Davenport and Loyle (2012) in the context of traditional repression, thus similarly applies to the use of a tool of digital repression like internet disruptions. Furthermore, the lack of studies considering the SSA region, also clearly highlights a gap in the current research. This not only applies to the research on the effects of internet shutdowns but similarly to the literature on the ISM and protests. While

acknowledging the differences that the context can make for the effect of a shutdown, extant studies largely disregard the African context, focusing on the MENA region or India instead. The cross-country evidence, including the SSA region, remains rather inconclusive as it is marred by issues of endogeneity and ecological fallacy. What remains is evidence from many single cases, where generalization is complicated also due to the limited observation frames. Lastly, although the differences between disruptions, not only concerning their geographical scope, have been acknowledged by scholars (e.g., Marchant & Stremlau, 2020a), the scholarship has thus far failed to account for other types of variations in shutdowns. Current studies, except for some studies on the economic consequences of shutdowns, consider them to be homogenous events and do not specifically distinguish between them.

## 3 Theorizing the Shutdown-Dissent Nexus

This theoretical section will continue by presenting and elaborating upon the theoretical mechanisms that underpin the shutdown-dissent nexus. Considering internet shutdowns to be the independent variable and focusing on their effects on dissent, the dependent variable. To do so, it is divided into two subsections, with the first presenting the key, protest-influencing affordances of the ISM and outlining how these affect popular mobilization. The second subsection builds on this information and presents the hypotheses and underlying theorization about what is expected to happen when state authorities suddenly disrupt access to the ISM on a national scale, that is, when a country's population is forcibly returned to the offline age. The hypotheses that are presented more closely consider both the temporal effects of internet shutdowns on protests and in what resembles a complete novelty in the field, also consider variations in shutdown characteristics like their *speed* and *depth*.[29]

### 3.1 Protests in the Internet Age

Although many observers of recent protest events from the Arab Spring to the Occupy protests have emphasized the important role that new technologies like the ISM have played in enabling them, protests far predate their invention and widespread utilization. The African continent in

[29] The terminology used here to refer to different types of shutdown variations was used and elaborated upon by Marchant and Stremlau (2019, 2020a). Speed refers to the difference between an actual disconnection and the slowing down or throttling of the connection to the internet, which is also commonly referred to as throttling. The latter term, depth, is used to distinguish between shutdowns that target the ISM at large and shutdowns that only target specific services, that is, typically social media applications. The latter are referred to as service-based shutdowns.

particular has a rich history of protests that reaches back at least seven decades to the consequential anti-colonial and independence protests (Branch & Mampilly, 2015).

While there might be doubts as to the prominence of the new technologies in African protest dynamics, research on this has been able to demonstrate that they are just as influential in the African as they appear to be in the Western context or other parts of the world for that matter (Mateos & Erro, 2021; Sanches, 2022). Especially the young have seemingly become adept at using the novel tools to their advantage (Ajisafe et al., 2021; Bosch, 2017; Luescher et al., 2017). The new technologies have changed protest dynamics in SSA and beyond, and it is nowadays difficult to find a major protest that does not feature online elements (L. Mueller, 2020). In fact, the most recent data available from the ITU (2023c) put the wider region's average internet penetration rate at north of 35%, compared to just under 10% in 2011. Although at first glance, this might seem rather low as, on average, less than half of the region's population regularly accesses the internet, the internet is more widely accessible in SSA now (and has been for years) than it has been in the countries rocked by the widely known Twitter/Facebook Uprisings/Revolutions/Protests of the Arab Spring, with a 2011 average internet penetration rate of 28% across the MENA region (Little, 2016; L. Mueller, 2020). This underlines that there is no need to have a fully connected population for the internet to play a critical role in countries' protests. This underscores that it is not necessary to have a fully connected population for the internet to play a critical role in countries' protests. Those who are connected, usually the young and technologically savvy, can spread the information they receive via the internet through other means of personal communication (C. Neumayer & Stald, 2014).

Undoubtedly, the ISM have become increasingly intertwined with day-to-day political interactions including protests, and their availability and common use have transformed the latter, making it ever-more important and challenging to identify how they have done so (Farrell, 2012; Schiffrin, 2017).

### 3.1.1 ISM as Advances in Communication Technology

Similar to other advances in communication technologies, from the printing press to the telephone and SMS, the internet and associated social networking applications are widely believed to have altered how people "communicate, collaborate and demonstrate" (Kelly Garrett, 2006, p. 202; Shirky, 2011). But before delving into an elaboration of how the ISM are altering the dynamics of protests and to be able to specify the *affordances* that they can be

argued to provide for them, it is important to highlight how they differ from the other, previous advances in ICTs.[30]

With the invention of the internet and its subsequent evolution into Web 2.0 around the turn of the century, which introduced social networking sites and applications that made the internet more interactive, the media and communication landscape previously available to protest organizations, organizers, and societies at large underwent a radical and profound transformation (Dolata, 2018). In contrast to the previously available communication technologies like the radio, telephone, or SMS, the ISM are said to provide fundamentally new ways of interpersonal communication. Not only do they facilitate the widespread and rapid (almost instantaneous) dissemination of information by significantly reducing its cost while increasing its speed, but they also make it easier for a broader audience to access this information and share it across social, spatial, and temporal boundaries (Goldstein & Rotich, 2008; Ruijgrok, 2017; Selva, 2019; Shirky, 2008). Thus, they have been argued by scholars like Jungherr et al. (2020) to offer more "bang for the buck" (p. 133) than any of the preceding communication technologies. Radio and television, for example, only allow information to be broadcast from a central node to all devices that are turned on, within range, and tuned to a predetermined frequency (Lupia & Sin, 2003). By contrast, communication technologies such as the telephone or SMS allow users to contact other users and exchange information as long as they have the other user's number. Moreover, the latter only permits the sending of short (160 characters), read-only messages that require proactive forwarding if the information contained is to be shared further.[31] Whereas the aforementioned communication platforms permit, respectively, one-to-many or one-to-one styles of communication, the internet, especially following its evolution to the Web 2.0, can additionally accommodate a many-to-many style of communication (Jungherr et al., 2020; Warren, 2015). Its billions of worldwide users can, at minimal cost, share information with one another, allowing for the co-production and co-distribution of content (Bennett, 2014; Stein, 2017). They can interact in a bidirectional rather than unidirectional manner, simultaneously receiving and producing content (Weidmann & Rød, 2019). Moreover, because of its horizontal network structure, users can maintain multiple communication streams concurrently, giving them access to more varied types of information (Anderson, 2021). In contrast to previous communication technologies, the

[30] Affordances is a commonly used term in the topically relevant literature and refers to what the ISM "facilitate or make possible" (Tufekci, 2017, p. xxiv).

[31] MMS, a technological evolution that followed SMS, allows users to send images, videos and more using the basic SMS infrastructure. While MMS adds new capabilities, it is still limited in utility by things like smaller file size and the need to be in the contact list of the other person (Costello, 2021).

contents that can be shared via the ISM are not limited to but include sound, video, images, and text, all of which can be shared at the simple touch of a button/screen.

Thanks to advances in mobile communication technology and as smartphones have found their way into almost every pocket, the ISM reach even the most remote places on the globe and are accessible on the go (Castells, 2012; Manacorda & Tesei, 2020; Tufekci, 2017). In SSA, the adoption of smartphones continues to rise, and it has risen from 27% in 2016 to 49% in 2022, with a growth spurt to 61% projected until 2025 by the Global System for Mobile Communications Association (GSMA, 2017, 2022). Their current and growing importance in SSA countries is thus undeniable.[32]

Particularly because of the previously mentioned breadth and speed in the exchange of information that the ISM allow for, they have been touted as a new, alternative channel of communication that is harder to control by government actors than centralized communication technologies such as the radio or television (Gohdes, 2015). This harder-to-control nature makes them exceptionally useful for organizers of protests, particularly in autocratic regimes, because it facilitates the circumvention of state censorship (Howard, Duffy, et al., 2011; Ruijgrok, 2017). Their potential as an unfettered means of communication is, however, as the ongoing, larger debate on the ISM as a liberation- versus repression technology demonstrates, contested in academia. Governments, as internet shutdowns and other practices of digital repression and censorship highlight, do not tend to sit by idly. There is mounting evidence that they, behind the scenes, continue to develop and refine "a whole arsenal of tools to surveil, manipulate, and censor the [free,] digital flow of information" (Gohdes, 2020, p. 1).

Certainly, the ISM are not super tools but rather exist in and are shaped by their environment, but they change people's abilities and have both action-enabling and action-expanding characteristics (Tufekci, 2017; Tufekci & Freelon, 2013). This means that by providing organizers and potential participants of protests with novel abilities, they are said to increase both the breadth of political options available to voice an opinion and act as catalysts for collective action at the same time (Dolata, 2018). However, in themselves, communication technologies, including the ISM, do not lead to protests. They cannot, as Castells (2012) succinctly put it, be the source of "social causation" (p. 228), and are instead considered to be

[32] The smartphone adoption figures represent the growth in the use of smartphones as a growth in the share of total internet connections that are made using these devices.

a contextual factor that expands the opportunities for collective action without necessarily instigating it (Bimber, 2017).[33]

### 3.1.2 ISM as Coordination Goods

There is a long tradition in the social and political sciences of explaining protests and their causes. But so far, with the exception of North Africa, most of the scholarly debate over global protests has only considered Africa in a passing mention (Mateos & Erro, 2021; Pilati, 2011). Protests on the continent have, based on widely prevailing stereotypes and clichés, often been dismissed as unorganized riots that do not merit closer investigation, which is perplexing given their apparent diversity and number (Branch & Mampilly, 2015).

The three most influential models used by political scientists to explain the emergence of protests are the three classical approaches known colloquially as motives, means, and opportunities (Dorward & Fox, 2022). Altogether, they provide what political scientists consider the theoretical bedrock for the emergence of protests and it is here where an exploration of the effects of the ISM on protest emergence should start. In line with the previous scholarly works, the central actors involved in protests and which should be considered from a theoretical point of view are the protest organizations, organizers, participants, and governments (Jungherr et al., 2020; Rydzak, 2018).

Having outlined the central, protest-relevant advances of the ISM in contrast to previous communication technologies, the following paragraphs seek to build on this knowledge and take a more theory-driven approach to how the ISM can enable and inhibit collective action. At the core of this theory-driven understanding lies the conception of the protester as a rational, self-interested individual as put forth by the widely used and influential theory of collective action.[34] Intriguingly, such self-interested individuals, are expected to prefer to abstain from protests because, if successful, such protests yield a public good, meaning that individuals can reap the benefits of protests without needing to participate in them. Individuals are expected to free-ride unless the group size is small or there is coercion or selective incentives provided by

[33] While it is certainly important that the choice of actions has been expanded into the digital realm as well, which includes things like email campaigns, online petitions, discussion forums, and discourses around hashtags. The physical realm and the synergetic interaction between both are what this theoretical section and the overall paper are most interested in. This is because it is mainly through the offline, physical presence that protests can and do affect change (Bennett & Segerberg, 2013; Castells, 2012). The digital space, importantly, does not replace the offline space but is said to augment it instead (Anderson, 2021).

[34] The theory of collective action was originally formulated by Mancur Olson (1965), who used sound microeconomic foundations and transformed them into a larger vision of when individuals are capable of acting collectively. *Logic*, as the work is informally referred to, and its considerations have played a non-negligible role in the wider field of protest studies and have influenced works that have otherwise largely abandoned its rationalist assumptions (Bennett & Segerberg, 2012).

resource-rich, brick-and-mortar organizations (Lupia & Sin, 2003). In the contemporary literature, the ISM are argued to help in easing two of the central problems at the heart of the collective action, which are the *problem of cooperation* and the *problem of coordination*.

The former describes the difficulties that are involved in getting people to contribute to and participate in collective action, transforming them from free riders to active participants of protests. In addition to the no-effort provision of the public good, there are further incentives that keep citizens from partaking in protests. This includes the uncertainty of the protests' success in achieving their goals. When participating in a protest, the participant cannot be certain as to the outcome and if a protest fails to achieve a certain outcome, he/she incurs the costs of participation without reaping any reward (Bennett & Segerberg, 2012). Likewise, a majority of the people in a country are assumed to be risk-averse, meaning that they shy away from taking otherwise preventable risks, particularly the government retaliation that they might face when taking to the streets to protest (Hassanpour, 2014). This problem of cooperation is classically solved by resource-rich, brick-and-mortar organizations that are hierarchically oriented and use their resources to create common group identities, coerce, or provide selective incentives for participation. They matter as mechanisms for coordination and the mobilization of resources (Hassanpour, 2017).

In times when the ISM are widespread and have become integral to people's daily lives, such as in SSA, the underlying logic of this problem is altered. The technologies become key tools of organization, rivaling the importance of traditional, hierarchical protest organizations in their ability to mobilize protest. Contemporary protests, in environments where people are familiar with "practices of social networking in everyday life, and when they have access to technologies from mobile phones to computers" (Bennett & Segerberg, 2012, p. 252), are shaped not only by the more familiar logic of collective action but also by the logic of connective action. From the standpoint of the more traditional collective action, the new technologies ease the problem of cooperation by, inter alia, allowing people to share information at a low cost, helping protest organizations and organizers in their efforts to cost-effectively reach out to many individuals and in recruiting them (Jungherr et al., 2020; Rød & Weidmann, 2015; Ruijgrok, 2017). This can be done across social, temporal, and spatial boundaries, making it easier to scale up protests and reach critical mass more quickly, which in turn can motivate others to join in and make it harder to suppress protests (Anderson, 2021; De

Mesquita & Smith, 2010).[35] Also, by lowering the costs of communication, the new technologies lower the so-called *Coasean floor*, which is the point at which the costs of acting collectively exceed the benefits of doing so (Shirky, 2008). Moreover, access to the new technologies allows people to peek beyond their immediate physical surroundings more easily, giving them a better idea about not only the preferences held by others but also about the actions that are taken by them. It increases the observability, and in doing so assists would-be protesters in gauging the wider sentiment in society and the likelihood that a protest will succeed (Jungherr et al., 2020). The information shared via the new technologies can also help would-be protesters to better assess the location, type, and severity of repression that they are likely to encounter (Castells, 2012). Which could either reduce or increase the people's fear of joining, depending on the prevailing levels of repression (Little, 2016). In more autocratic regimes, the increased observability, as argued by Stein (2017), undermines the spiral of silence, which is the tendency of citizens of an autocracy to believe themselves to hold the minority's opinion.[36] Challenging the government narrative has also become easier and the increased exposure to government failures, civic debates, and alternative information provides a fertile ground for protest mobilization and assists in persuading people to join the protests (Jungherr et al., 2020). Lastly, access to the ISM has been said to make it easier to punish and find potential free-riders and reward participation more efficiently (Bailard, 2015). From the standpoint of the logic of connective action, the problem of cooperation in its traditional sense is said to dissipate and lose importance. Political action, at least when it is based on this logic, becomes self-motivating as citizens freely share their convictions. The ISM aid in the formation of collective action by providing the infrastructure that connects people and through which the more personalized calls to action can be widely and easily shared. Such personal calls to action or *personal action frames*, remove the burden for individuals to adopt more self-changing social identities. Because of this more open nature, the protests that form are more individualized and invite participation from participants with many different opinions and backgrounds (Bennett & Segerberg, 2012; Castells, 2012). All in all, the availability of new technologies is argued to ease or entirely remove the hurdles to protesting posed by the problem of cooperation. It can thus be, in turn, argued to facilitate the emergence of protests.

[35] Government repression that is occurring on the ground can easily be shared, by sharing photos or videos online, with both domestic and international audiences, heightening the pressure on the government, and as evidence suggests, increasing the former's likelihood to refrain from repressing (Christensen & Garfias, 2018; Freyburg & Garbe, 2018). In turn, because of the increased inhibition by the government to repress the population, the costs of protesting should decrease.

[36] In some works, this is also referred to as *preference falsification* (e.g., Tufekci & Wilson, 2012).

The problem of coordination presents another hurdle to the formation and persistence of collective action. The question that it raises is one of how a group of people can be coordinated to act together. Because even aggrieved, risk-acceptant citizens will not be able to take part in a protest if they are unaware of where it is supposed to take place or if anything is taking place at all (Jungherr et al., 2020). Together, the ISM have been argued to aid in the coordination of protests, easing issues related to coordinating the offline action of large masses by facilitating the coordination both before and during a protest (Hassanpour, 2014; Ruijgrok, 2017). In addition, they ease the coordination both in a horizontal dimension, making it easier for different groups to act together and identify common grievances, and in a vertical dimension, enhancing the communication between the organizers and participants of protests (Rydzak, 2018). Evidence from the Chinese case, where the information landscape is under tight governmental control, underlines the importance of the new ICTs in facilitating collective action through the facilitation of coordination. Government censors have been found to actively restrict and remove posts that are direct calls to action, while mostly neglecting the ones where users voice their grievances (King et al., 2013, 2014). The government seemingly fears the digital calls to action more than the simple voicing of grievances.

Resulting from the low costs of communication, their speed, and their large range, the ISM expedite the dissemination of information about the when, where, who, what, and how of protests (Bailard, 2015; Little, 2016). Further, social networking sites, collaboration tools, and messaging and video-conferencing applications that use the internet give the organizers and would-be participants the chance to emulate face-to-face meetings to collaboratively plan a protest without the need to be physically close to one another (Freyburg & Garbe, 2018; Jungherr et al., 2020). Protest organizations, organizers, and citizens, in general, are granted the ability to not only easily plan offline collective action online but to also distribute that crucial information with unprecedented speed and at an unprecedented scale. Beyond assisting the planning and sharing of information about protests, the new communication technologies also give the involved actors an improved way of coordinating ongoing protest action. During the protests, their use can act as “noiseless bullhorns” (Jungherr et al., 2020, p. 139), helping to steer the protests on the go. Aside from helping the organizers of protests to pass down instructions, protesters on the ground can simultaneously feed real-time information back to the organizers, enabling them to make informed decisions (Bailard, 2015; Rydzak, 2018). The improved coordination and live, on-the-fly updates on the situation at the protest sites can help the protests to more efficiently evade government measures and restrictions and thus survive longer by leveling the playing field between state actors and protesters (Castells, 2012; Howard,

Agarwal, et al., 2011).[37] Before the widespread use of the ISM, scholars often pointed to the coordination advantage that state actors like the police or military enjoy when compared to protesters (Gohdes, 2015; Steinert-Threlkeld, 2017). With access to them, government reprisals are feared less and as protests survive longer, they can draw more attention to themselves. With the invention and diffusion of the smartphone in the first decade of the 21st century, the ISM's utility for coordinating protests was significantly increased. Their faster processors, constant internet access, built-in camera, and GPS components, allow users to share, inter alia, videos, photos, and precise locations all while remaining mobile (C. Neumayer & Stald, 2014). Applications like Google Maps or ride-sharing services that utilize these functionalities add to the potency for the coordination (Gohdes, 2015).[38]

All in all, the access to and availability of the ISM can be conceived of as a "hybrid, socio-organizational resource" (Rydzak, 2018, p. 94). They are both a resource in themselves while concurrently allowing access to other resources and tools. Giving their users the chance to stay in touch with others, like loved ones, while also providing otherwise unmatched organizational/logistical abilities. The ISM are what De Mesquita and Smith (2010) dub *coordination goods*, certain types of public goods that determine the ability of citizens to coordinate and organize, in turn influencing the likelihood that protests will succeed and the likelihood of people joining them. Although one has to remain "necessarily ambiguous" (Jungherr et al., 2020, p. 148) when it comes to the theorized consequences of the widespread availability of the ISM for protests, given governments' interests in and capabilities of interfering in it, there seems to be no doubt that they have altered the underlying logics of protesting and have affected the practice sustainably.[39]

[37] The authors use anecdotal evidence from Egypt and the G20 protests in the US to show how the protesters were able to use their newfound abilities to coordinate to avoid government reprisals.

[38] While the author uses the example of combatants in Syria, the use of technologies like Google Maps is not restricted to the region or actors and can be realistically argued to help protesters and protest organizers.

[39] Just like their citizens, governments themselves are also active users of the ISM, which they can use to enhance their surveillance and monitoring capabilities as well as to suppress the activities of and contents spread by protesters, protest organizers or organizations (Earl et al., 2022). By monitoring activity on the ISM, governments have access to a plethora of information on their users and can use this information, inter alia, to improve the precision of their repression (Gohdes, 2020). They can utilize content like videos and images shared via the ISM to identify and track down participants of protests, and subsequently harass or arrest them (Jungherr et al., 2020; C. Neumayer & Stald, 2014). In addition to this, governments can use the ISM to bolster their information outreach campaigns to crowd out dissenting voices, disrupt the coordination of protesters, and strengthen their political agendas (e.g., China's use of its 50-Cent Army) (Jungherr et al., 2020). Lastly, as the governments are the ones in charge of managing and approving the establishment and proliferation of the ISM's physical infrastructure, they are in a unique position to influence it. They have been shown to use their influence to censor the information that is available online and restrict access to or remove, for example, subversive content or content that violates cultural and religious morals (Howard, Agarwal, et al., 2011; Jungherr et al., 2020).

## 3.2 Protests in a Disconnected Environment

This subsection takes a closer look at the moments when state officials decide to put "obstacles in the way of collective behavior" (Selva, 2019, p. 2) of unexpecting citizens by limiting or removing their access to the ISM on a national scale, and how citizens respond to such disconnections. As the existing literature demonstrates, pinpointing the effects of internet shutdowns on protests is not easy. While they are likely an effective tool against large-scale coordination in the long run, governments also run the risk of provoking a more decentralized, violent backlash, all while incurring non-negligible economic losses and tarnishing their international reputation.

The theory presented below will be based on the previous theoretical explorations of the interaction between the ISM and protests as well as the insights provided by Rydzak's (2018) disconnective action theory. The subsequent paragraphs will be structured as follows: Firstly, hypotheses and detailed theoretical explanations of what one would expect to happen to the overall number of protests in the short- and long-term during an internet shutdown, are presented. Secondly, in what represents a theoretical and empirical novelty in the field, hypotheses on how variations in the speed and depth of national-level internet shutdowns affect the protest levels, are offered.[40]

### 3.2.1 Longitudinal Effects of Shutdowns on Protest Numbers

To date, the evidence on the impact of internet shutdowns on popular mobilization remains mostly tentative and case bound. While the existing studies seem to largely agree that internet shutdowns are ineffective tools when governments seek to disrupt the mobilization of the masses, the temporal variability in their effects has thus far only been considered by Rydzak (2018, 2019). Apart from the aforementioned studies, shutdowns are treated as singular events and their strongly varying durations are not considered. Seen as how the author provides evidence supporting the existence of temporal variation in the ramifications of disruptions, and in the interest of providing sound theoretical expectations, this variation has to be considered and formulated. The consistent finding of temporal variability in the literature on traditional repression and its consequences further underlines its relevance and the ensuing need to consider it (Chenoweth et al., 2017). Given the lack of a comprehensive theoretical framework to explain and predict the consequences of internet shutdowns for protests, and the mostly case-

[40] In previous works, the terms short- and long-term were defined arbitrarily as either a week or two weeks and more. As this study seeks to provide a more detailed analysis of the over-time effects of shutdowns, using a continuous operationalization of their duration instead, and since their definition is heavily context-dependent, it is decided not to provide a rigid, clear-cut definition here.

specific evidence presented in the field, a degree of uncertainty as to the expected direction of the effects remains. To best account for this uncertainty, it was decided to present the following hypotheses in the form of rival hypotheses which are based on the different, theory-guided expectations of how internet shutdowns affect protests.

When presented with the findings in the literature on the effects of the ISM on protests, and when conceiving of these ICTs as a kind of hybrid, socio-organizational resource, their sudden absence should lead to a decline in ongoing mobilization and present a hurdle to not yet formed collective action. Stripping a majority of the population, without prior warning, of the ISM's affordances, conventional wisdom, and a resource-oriented perspective would suggest, should lead to an overall decline in protest numbers. This is because organization becomes more costly for protest organizers to reach out to a large number of people, losing a tool to easily recruit them and making it harder to reach critical mass. Furthermore, shutdowns force people to shift to other, unaffected but less effective methods of communication including the telephone, SMS, or in-person exchanges. Although such means also grant the ability to organize and coordinate collective action, their utility is limited since they cannot hope to match the speed and range of communication via the ISM, lacking its characteristic potential for quick and large-scale mobilization. With the increase in the organizational costs of collective action, the Coasean floor is raised and much of the collective action that would've previously been possible is now considered cost-inefficient, meaning that the costs of mobilizing are higher than the expected benefits of such mobilization. In addition, challenging the government narrative becomes more difficult as the more resilient channel of communication cannot be accessed by a majority of the people, leading to a shift in the information environment that benefits the official channels of information distribution, which are expected to depress mobilization by discouraging from it (Bhatia et al., 2023). On the side of the would-be protesters, it becomes more difficult to gauge the power distribution between the government and the protesters, and thus to estimate the likelihood that the protests will succeed in achieving their goals. In addition, would-be protesters have a harder time observing not only what other would-be protesters think, but most importantly, what they do. This uncertainty could motivate people to either take to the streets or to stay at home, but since a majority of the population is assumed to be risk-averse, uncertainty will more likely promote abstention. Taking into consideration forms of action that are less dependent on traditional, brick-and-mortar organizations, and instead rely mainly on the ISM as their key organizational resource, their sudden absence is sure to disrupt possibilities to mobilize. Removing people's abilities to easily exchange personal beliefs and for these exchanges to be scaled to what would turn into mobilization on the streets.

Similarly, as the ISM can be conceived of as an organizational resource, their absence impairs the ability to coordinate and organize protests, making it harder to distribute information easily and widely about the when, where, how, and who. This is expected to depress protest levels since even the more risk-acceptant citizens won't be able to partake in collective action as they find it more difficult to inquire whether and where it is taking place. Coordinating ongoing protests also becomes more difficult, making them less flexible and unable to adapt quickly to changing circumstances. Government forces regain the advantage of coordination and protests become more vulnerable to state repression. Moreover, as suggested by Siegel's (2011) findings, internet shutdowns could lead to a decrease in protest incidence because they contain the spread of grievances. By disrupting the ties to other people, the anger and fear generated by the repressive act or the repressive acts accompanying it, do not generate large-scale backlash.

Lastly, the sudden and unpredictable nature of a shutdown itself resembles a shock and leaves the disconnected in a disoriented state, one which they will have to learn to cope with first. Anecdotal evidence from the 2011 shutdown in Egypt, termed *The Great Disconnection* by Castells (2012), implies that they do adapt and sometimes rather quickly. "Protesters had pierced the internet blockade within hours, and remained in charge of their messages" (Tufekci, 2017, p. xxiv). Evidence from Sudan and Nigeria corroborates such findings, showing how swiftly protesters seemingly adapt to the disruption of the ISM by using a variety of methods like VPNs, ad hoc mesh networks, or by, 'simply', traveling to border regions (Bhatia et al., 2023; Jacob & Akpan, 2015; Stremlau & Dobson, 2022).[41] Although the presented anecdotal evidence suggests that, at times, protesters can adapt rather quickly and that they will do so eventually. In the short term, the nationwide disruption of the ISM is expected to depress protest activity in the respective country by limiting access to and raising the costs of using the socio-organizational resource that is the ISM.[42] From this follows the first hypothesis:

**Hypothesis 1a (Short-Term Discouragement):** *In the short term, government-implemented, national-level internet shutdowns are related to a decrease in the frequency of protests.*

Previously provided evidence from the literature on shutdowns and dissent has come to a different conclusion. Findings from this strand of the literature suggest instead, that during

[41] Stremlau and Dobson (2022) further elaborate on the methods used to circumvent the restrictions put in place by an internet disruption.

[42] Internet shutdowns are not complete or total because implementing a wholesale disconnection of an entire population is technically too challenging. Instead, they significantly increase the costs involved in accessing and using the ISM. Effectively limiting access to the ISM to a handful of citizens that either have the technological expertise or the necessary social connections to circumvent them (Steinert-Threlkeld, 2017).

internet shutdowns, in the short term (usually a week or a couple of days), the frequency of decentralized and violent protests will surge. Although the evidence provided is largely case-specific, limited to the Indian, Syrian, or Egyptian cases, or only corroborates its findings tentatively, it should not be disregarded prematurely (Hassanpour, 2014, 2017; Rydzak, 2018, 2019). Conclusions from the African context stipulate the same, protest-promoting/-continuing dynamics, but are solely based on a visual investigation of ten shutdowns in six countries (Rydzak et al., 2020). So how can these, seemingly counter-intuitive findings be explained and reconciled theoretically?

Apart from being a hybrid, socio-organizational resource that facilitates the coordination and organization of protests, the ISM also grant their users and the wider country access to material benefits that result from efficiency and competitiveness gains in the economic sector (CIPESA, 2017). As the internet penetration has grown across the globe and in SSA, more and more aspects of everyday life become reliant on it, expanding its applications far beyond the personal (Deloitte, 2016). Not having access to the ISM cuts people off from more than just being able to stay in touch with their families, friends, or colleagues. It limits their access to information and education, impedes the delivery of healthcare services, and depresses the affected country's economy. Businesses from small to big rely on these technologies to make deals and order supplies. Furthermore, shutdowns have been found to also impact mobile money services and ATMs, effectively grinding daily commerce to a halt (Gohdes, 2016; Jigsaw, 2021). Their importance for the performance of the African economies cannot be understated, as it has been shown to be greater than in many European and Asian countries, where the ISM-related sectors do not contribute, on average, 5% to the countries' GDPs (CIPESA, 2017). Consequently, during an internet shutdown, people become increasingly aggrieved and frustrated with the situation they find themselves in, and the economic harm that it is causing. Moreover, the disruption of access to the ISM for large swaths of the population also removes an avenue through which such grievances could have been expressed, leading to their accumulation (Rydzak, 2018). The indiscriminate and overt nature of, especially, nationwide internet shutdowns add to this frustration because people of all political orientations, interests in politics, and/or levels of support for the government are affected. As the literature on repression shows, the potential for overt repression to fuel anger and, in turn, backlash, rather than deter collective action, is greater than the reverse (Earl et al., 2022). This is because, as Ruijgrok (2017) pointed out, the decision to protest is not always entirely rational. Instead, emotions and emotional cues can also play an important role in spurring protest activity.

Furthermore, as previous studies have argued based on anecdotal evidence from Tahrir Square, the sudden disruption of the ISM and consequential disorientation and confusion caused by the shutdown can also drive people to leave their houses in search of answers. Once there, joining an ongoing protest or starting one is a small step (e.g., Tufekci, 2017). Rydzak's (2018) findings support the idea of a more spontaneous mobilization taking place in the course of an internet shutdown. All of this pent-up anger paired with the confusion caused by the shutdown can also be expected to, in the short run, and despite the raised organizational hurdles, drive people to take to the streets and spur protest activity. By removing a channel for dissent and generalizing grievances, as it is neatly put in Rydzak's (2018) disconnective action theory, shutdowns could provoke a short-term increase in the number of protests as opposed to the government-intended suppression of such events. From this follows the first rival hypothesis:

**Hypothesis 1b (Short-Term Flare-Up):** *In the short term, government-implemented, national-level internet shutdowns are related to an increase in the frequency of protests.*

National-level internet shutdowns are more than just ephemeral disruptions of a population's access to the ISM. They show considerable variation over time with some lasting mere hours while other events, so-called digital sieges, can remain in effect for years on end.[43] It is therefore important to consider not only their short-term repercussions but also how their effects vary longitudinally. This is particularly important in the African case, where shutdowns tend to be fewer in number but longer in duration than in other regions where they are frequent but fleeting (Marchant & Stremlau, 2020a). In the period from 2016 to 2022, a look at the data reveals that national-level shutdowns in SSA have varied strongly in their duration with just over 43% of the total 58 lasting over a week and the longest recorded one lasting over a year.[44]

In instances when a country's government decides to implement a digital siege, it increases both the burdens on its population and on itself. While the protesters might view the government's decision to maintain the shutdown as a signal of resolve and its unwillingness to back down, a government can only maintain the shutdown at increasing costs to its economy and international standing (Gohdes, 2015). Moreover, the damage to the economy and its development inadvertently caused by a shutdown is all but momentary, and a disruption's ripple effects caused by, inter alia, a loss of investor confidence, the unsettling of supply chains, and

[43] Data provided by Access Now (2023a) records a shutdown in the Pakistani region of South Waziristan that lasted a total of 3,412 days or over nine years.
[44] Longest recorded internet shutdown in the data set, limited to national-level, government-ordered shutdowns in SSA countries, lasted a total of 473 days and was implemented by the Chadian government starting in 2018. 25 out of the 58 national-level internet shutdowns in SSA, i.e., 43.1%, last eight days or longer.

systemic efficiency dampeners, can linger on for months (CIPESA, 2017; West, 2016). The best possible outcome in this scenario, for a government, would thus be what can only be referred to as a Pyrrhic victory. While it may succeed in its goal of suppressing dissent, it suffers severe economic and reputational losses that grow with each passing day. This signal of government resolve to continue a shutdown, despite incurring high costs, ought to discourage protesters, and the increasing economic hardship, paired with the widespread absence of the ISM should depress dissent in the longer term (Rydzak, 2018). The economic burdens that, in the short term could lead to an increase in the number of protests by fueling grievances, could become overwhelming and discourage citizens from partaking in protests, depressing the levels of protest in the long term.

A closer study of citizen behavior during shutdowns in countries like Nigeria, Sudan, or Egypt, suggests however that citizens do adjust to the situation they find themselves in and learn to cope with the lack of access, eventually finding solutions to circumvent it. The longer such a shutdown lasts, the more likely it is that citizens will find a way around it (Gohdes, 2015). This means that, over time, more and more citizens are expected to regain the ability to use the ISM, making a shutdown increasingly ineffective. However, although they may be able to bypass the shutdown, their circumvention may not be as effective as having unrestricted access to the ISM. The conditioning effect of time is thus ambiguous, and one could plausibly expect both a surge over time and a depressing effect of shutdowns. This leaves two conceivable explanations from which the following rival hypotheses follow:

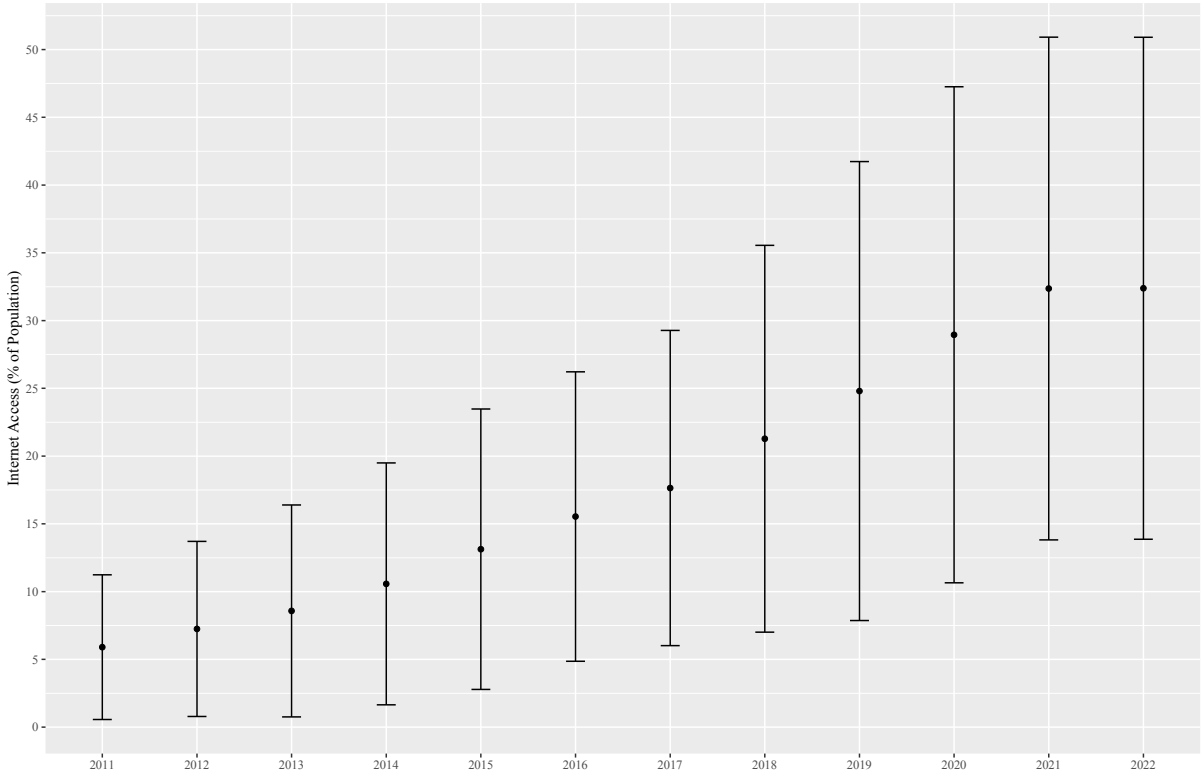
**Hypothesis 2a (Long-Term Deterrence):** *In the long-term, government-implemented, national-level internet shutdowns are related to a decrease in the frequency of protests.*

**Hypothesis 2b (Long-Term Surge):** *In the long-term, government-implemented, national-level internet shutdowns are related to an increase in the frequency of protests.*

Seen as how the relationship between the internet shutdown and protests does not exist in a vacuum, there are two additional conditioning variables, on top of the time, that have been emphasized by previous works. Both are, as Rydzak et al. (2020) determined, are also central in the African context and are expected to determine both the short- and long-term effects of internet shutdowns. The key conditioning variables are the internet penetration rate of a country and the protests' underlying organizational capacity.

The internet penetration or -access rate, typically measured as the percentage of a country's population that has accessed the internet within the last three months resembles a key conditioning variable as varying levels of access to it are expected to change the effect that a

**Figure 2. Comparing Internet Penetration Levels Across SSA Countries (2011-2022)**




The calculations were made by the author. The dot represents the yearly mean, and the whiskers represents the corresponding yearly standard deviation. Only SSA countries that have experienced a national-level shutdown are included. Data provided by World Bank (2023c).

shutdown will have on protests in a country. Given the stark cross-country variation in internet penetration across SSA countries, see Figure 2, that have experienced a nationwide shutdown and its theoretical relevance, neglecting this variable is likely to lead to an omitted variable bias. A look at the line plot shows that while internet penetration has risen in SSA countries that have experienced at least one shutdown between 2016 and 2022, the gap between countries has also widened. The whiskers, which indicate the yearly standard deviation, grow bigger with time.

In general, as there have not been any robust tests of the relationship yet, the formulated expectations have to remain open. In the short term, rising levels of internet penetration are expected to exacerbate the effects formulated in the previous hypotheses. From a resource perspective, with increasing internet penetration levels, one would expect to see the levels of protest decline because there is a higher dependency on the resource internet and its absence is more detrimental. From a material and more grievance-oriented perspective, one would expect the levels of protest to rise further as the dependence and more frequent use of the internet within the country heightens the frustration and immediate economic hardship experienced. In the long term, it can be expected that an increase in the internet penetration rate will further discourage protests since a higher previous dependence on the internet makes its long-term absence more damaging. However, an increase in internet penetration may not necessarily lead

to a decrease in protest levels, as protesters are often able to adapt to shutdowns and find ways to circumvent them. Previous findings from Rydzak (2018) support a negative effect of an increase in internet penetration both in the short- and long-term.

**Hypothesis 3 (Internet Penetration)**: *Higher levels of internet penetration, in both the short- and long-term, augment the effects that government-implemented, national-level shutdowns have.*

Moving to the organizational capacity of protests, this factor has been argued in previous works to resemble an important fallback mechanism that can help protesters continue mobilizing in the face of an internet shutdown. As a case study of Sudanese protests during shutdowns in 2018 and 2019 demonstrates, an organizational backbone, in this case, a larger collective of organizations grouped as the Sudanese Professionals Association, helped keep the protests peaceful and maintained them throughout the shutdowns (Rydzak et al., 2020). Protest history can serve as a proxy for this, as the protesters, protest organizations, and protest organizers experiencing this sudden shutdown can fall back on mechanisms and tactics they have used before, they have experience when it comes to protesting, which is expected to help them better cope with the unanticipated shutdown of access to the ISM (Rydzak, 2018). Although previous work has argued that protests during internet shutdowns are likely to be "less structured and more informally assembled" (Rydzak, 2018, p. 143) and that, by limiting access to the ISM and their organizational potentials, shutdowns spur leaderless and violent forms of protests (Hassanpour, 2014; Rydzak, 2019). More familiarity with protests and their practices is expected to be beneficial for protest action, particularly when a population is plunged into a situation of uncertainty. Experience in protesting and established mechanisms for doing so should help protesters and protest organizations/organizers cope with the disruption and remain active, as the case of the Sudanese protests clearly illustrates (Rydzak et al., 2020). Also, examples from case studies in multiple African countries show that the legacy of previous mobilization can help to legitimize current protests, amplify their messages, and mobilize more efficiently (Sanches, 2022). Studies looking into protests also more generally show that previous mobilization should facilitate ongoing mobilization (Stein, 2017). Both in the short and long term, an increase in the prevalent organizational capacity is expected to have a positive effect on the protest numbers. They are argued to help protesters mobilize in the face of an absence of the hybrid, socio-organizational resource and in the long term help them to continue mobilizing despite the increasing costs of a shutdown.

**Hypothesis 4 (Organizational Capacity):** *Regardless of the internet shutdowns' durations, higher levels of organizational capacity are related to higher frequencies of protests.*

In the subsequent paragraphs, the present work will move beyond the existing works and their theoretical explorations and consider variations in shutdowns beyond their temporal variation.

### 3.2.2 Internet Shutdown Variations and Overall Protest Numbers

Although a look at the existing literature on shutdowns and their consequences for collective action suggests that shutdowns are homogenous events, this treatment completely disregards the existing variation in shutdowns, which has been pointed to by the likes of Marchant and Stremlau (2019, 2020a). Internet shutdowns can differ from one another in more than just their duration and geographical scope. They can also differ in the type of access platforms that are targeted, with some shutdowns selectively affecting mobile or broadband access points while others target both simultaneously. Shutdowns can also differ regarding whether the internet and social media applications are targeted as a whole or whether the latter are targeted specifically. Furthermore, internet disruptions do not always resemble disconnections from the ISM but can also be implemented by throttling the speeds of those services to varying degrees. In this paper, to get a better and deeper understanding of internet shutdowns and their consequences for protests, and because the comprehensive data set that is used here allows for such an analysis, variations on the left-hand side of the shutdown-dissent nexus are considered. Two factors were selected here for closer examination, the depth of a shutdown and its speed. The former considers whether a shutdown affected only specific services like social media applications or the ISM more broadly, while the latter distinguishes between shutdowns that disconnect the population and so-called throttles, where the population is not disconnected but its connection speed is reduced instead.

Considering the depth of shutdowns has become more important over time as governments have become increasingly proficient at using them in a manner that increases their purported effectiveness against collective action while minimizing their negative consequences for their economies (Rosson et al., 2023). As the international pressure against the use of full disconnections is rising, and to minimize negative externalities from a loss in their international reputation, governments are beginning to change their tactics (Ryan-Mosley, 2021). Thus, instead of shuttering the connection to the internet at large, countries are beginning to take a more targeted approach. They shut down the connection to specific sites, platforms, tools, or applications, mainly targeting social media applications like Facebook, X (formerly Twitter),

WhatsApp, or Instagram, which are also widely used on the African continent (CIPESA, 2017; Rydzak et al., 2020). Based on the previous theoretical elaborations and hypothesized effects, more targeted shutdowns of social media applications, so-called service-based shutdowns, are expected to spur the mobilization of protests when compared to a situation without an ongoing shutdown. While they are less disruptive to a country's wider economy, as revenues generated from app-specific services continue to be comparatively small in Africa with many apps used in Africa being hosted outside of the continent (CIPESA, 2017). Instant messaging services and social media applications are commonly used by particularly small- and mid-sized businesses to promote their products, receive and make orders, and maintain customer business relations. Shutting down such services, even temporarily, can thus lead to a loss of revenue and poorer services for such companies, leaving them worse off (Deloitte, 2016). Creating grievances not only among the people losing business but also among the customers who are negatively affected. Considering that shutdowns tend to be unannounced by governments, a service-based shutdown presents a non-negligible, sudden change in the conduct of everyday life. As the reactions to the shutdown of mobile telephony in Nigeria have shown, the uncertainty created by such a disruption leaves people feeling uneasy and in cases fearing for their livelihoods when they lose their business and source of income (Jacob & Akpan, 2015). Also, while such shutdowns are, as pointed out by Stremlau and Dobson (2022), easier to circumvent than their full counterparts, they still affect and shutter an avenue to share grievances. Although grievances may not accumulate as severely as they would with complete shutdowns due to the availability of alternative communication channels on the internet and limited negative economic externalities, the sudden and targeted disruption of social media platforms that people rely on to stay connected and vent their frustrations is likely to fuel the buildup of grievances. All in all, while service-based shutdowns are not as disruptive as full shutdowns, they are nonetheless expected to lead to an increase in the number of protests when compared to a situation without a shutdown. This is because the sudden disruption of everyday life is expected to create grievances that accumulate faster because of the removal of a popular avenue to voice them. Although with social media applications, a key tool for mobilization is being disrupted, it is expected that citizens will more easily find other ways to continue to mobilize.[45] Thus follows the fifth, penultimate hypothesis:

[45] Caveat of the analysis here is that it is only able to consider between these two types and it is more difficult to pinpoint the exact services that are targeted. While the more recent iterations of the data set (2019-2022) provide that information, further disaggregating between them would overcomplicate the later analysis and present theorization. This study aims to lay the groundwork, which can and should be expanded upon by future work.

**Hypothesis 5 (Targeting Services):** *Service-based shutdowns are, when compared to periods without an internet disruption, related to an increase in the frequency of protests.*

Relatedly, national-level internet shutdowns are not always attempts at disconnecting a population entirely. In some instances, governments instead limit the speed with which citizens are able to access the ISM. This is done out of a similar interest by these governments in keeping a low profile internationally, since throttles are more difficult to detect than their more high profile and overt counterparts (Wahome, 2023). Bearing in mind the previous theoretical elaborations, when a country's government throttles the access to the ISM, this is expected to promote the occurrence of protests in comparison to a situation where a government does not implement a shutdown or throttle. This is because throttles, despite being expected to create fewer grievances than their full counterparts, are still expected to present a significant disruption to people's everyday lives. By slowing down the speed of connection to the ISM, they increase the costs of accessing such services, making it more cumbersome or impossible for people to do so. Also, throttles, as the study by Deloitte (2016) demonstrates, damage a country's economy, with the damage increasing as the throttling worsens. To sum up, while throttles are not expected to produce as many grievances as full shutdowns, they are also less detrimental to the mobilization of protests as the connection to the ISM is only slowed instead of shuttered. By creating a situation that leaves the population encumbered and frustrated by limiting its access to the ISM, governments promote grievances while still allowing reduced access to the organizational resource that is the ISM. Thus, it is expected that throttles will feature higher levels of protest activity than situations where access to the ISM is unencumbered.[46] From this follows the final hypothesis:

**Hypothesis 6 (Throttling Speeds):** *Throttles are, when compared to periods without an internet disruption, related to an increase in the frequency of protests.*

Within this section, readers have been presented with the theoretical explanations and hypotheses that link internet shutdowns, their durations, and variations, to the emergence of protests. This was done by combining current insights from scholarly works on the ISM and their affordances, and the existing works on (digital) repression. Most importantly, this theoretical section goes beyond the homogenous limitations that plague contemporary

[46] Again, as with the depth of internet shutdowns, while the comprehensive data set allows one to distinguish between throttles and full internet shutdowns, it does not provide more detailed insights into the extent of throttling. This should be looked at in the future since there are different levels and governments can throttle the access to an extent where the internet becomes virtually unusable, making them hard to distinguish from full shutdowns.

scholarship and presents exploratory hypotheses and theoretical explanations for different variations of shutdowns and their effects. Based on these theoretical insights, the next section will detail the proposed method of analysis and operationalization of the relevant variables as well as present the key control variables that have to be taken into consideration when studying protests in the SSA context.

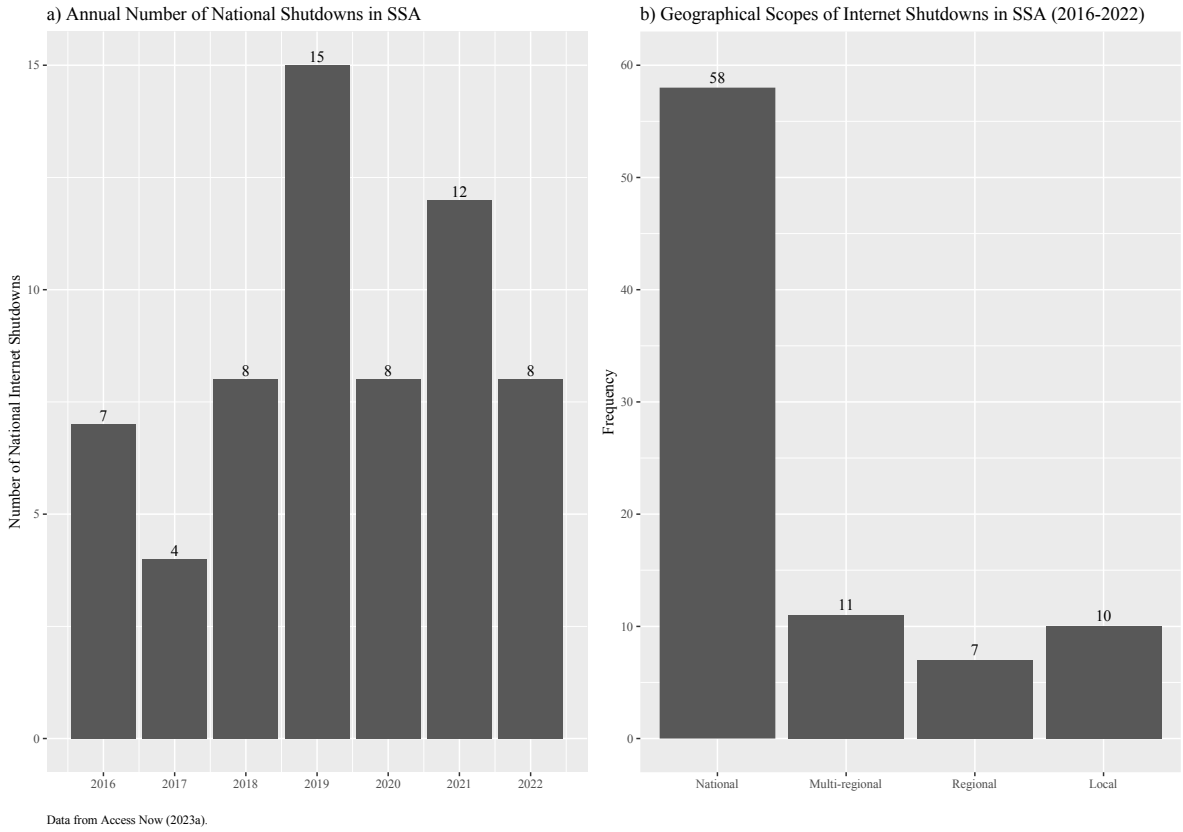
## 4 Operationalization and Methodology

Based on the previously outlined theory and stated hypotheses, this section follows by clearly delineating how the previously presented variables will be operationalized and the relationships tested. Moreover, the methodological improvements and shortcomings in contrast to previous works are discussed in more detail.

### 4.1 Time Period and Case Selection

As previously mentioned, this study takes a closer look at internet disruptions and their effects on protest activity in SSA between the years 2016 and 2022, a period marked by pivotal developments in both digital communication and -repression. Although the seven-year time frame is chosen primarily subject to data availability constraints related to the data on disruptions itself, the selected years represent a critical juncture for examination due to several key factors. Firstly, during and before the period of observation, the SSA countries under observation experienced a continuous and strong growth in access to the internet, as illustrated by Figure 1b presented in the introduction. Between 2016 and 2022 the internet access rate more than doubled from 15.54% to 32.36%. Also, the first year under observation is marked by a particularly strong growth in the user numbers of smartphones across the region, bringing the advanced capabilities of these devices to a larger number of people (Rydzak et al., 2020). This growth, as reports by the GSMA (2017, 2022) show, continues throughout the period under observation and is expected to continue beyond it. Secondly, the time frame stands out as a

**Figure 3. Number and Geographical Scope of Shutdowns in SSA**



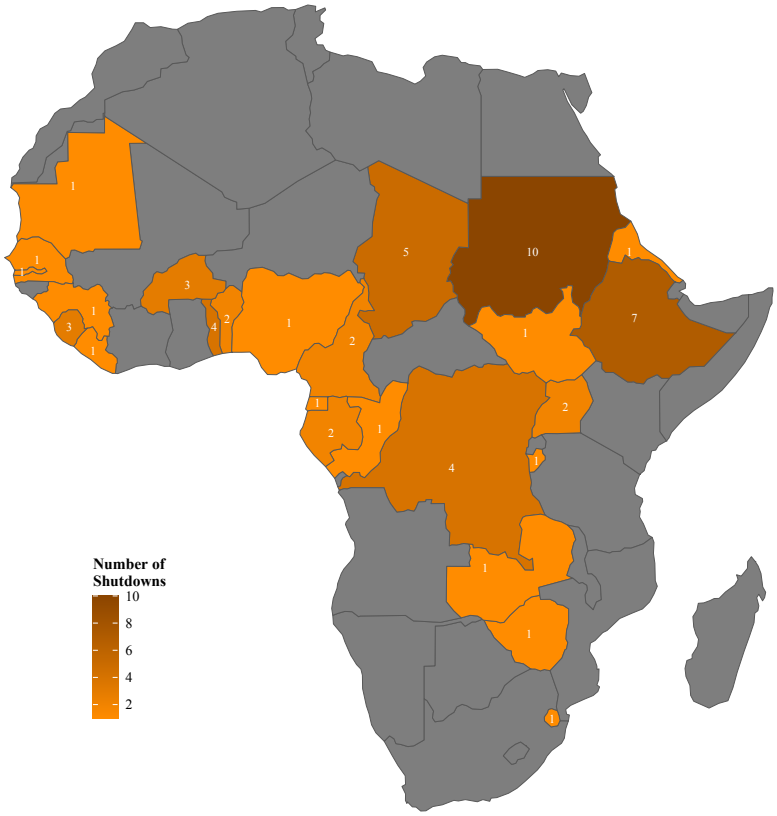

novel focus in large-n, quantitative research within this field. Existing studies of similar scope, as the literature review shows, have yet to expand their analyses beyond 2016, thus leaving a gap in the understanding of recent trends and patterns. Most importantly, the year 2016 has been identified as a second watershed moment in the context of internet shutdowns in Africa. Stremlau and Dobson (2022) pointed out that, similar to 2011, the year 2016 saw a pronounced surge in the frequency of shutdowns across the continent. The frequency of national-level shutdowns in SSA has increased over the years, albeit unevenly. In 2019 and 2021, there were momentary surges driven mainly by shutdowns due to political instability and protests in Ethiopia and Sudan, as shown in Figure 3a.[47]

The study at hand covers all countries in the SSA region that have experienced at least one government-ordered, national-level shutdown event within the specified time frame. This leaves 25 out of the total 48 countries in the SSA region, which have experienced 58 national shutdowns between 2016 and 2022.[48] More than half of the region's countries have experienced

[47] A careful examination, Figure 3a reveals a discrepancy in the total count of shutdowns, indicating 62 instances instead of the recorded and previously mentioned total of 58. This variance arises from the methodology employed in aggregating the data for the figure, wherein shutdowns that span multiple years are counted in each year they occur. Consequently, there are a total of four multi-annual, national-level shutdowns in the SSA.
[48] This information is based on the classification by the WB (2023e), which identifies 48 countries as constituents of the SSA region.

at least one national-level shutdown, indicating that they have become a widespread practice. The map of the African continent displayed in Figure 4 below illustrates the countries that have implemented shutdowns between 2016 and 2022. The total number of shutdowns is shown both in absolute numbers and through shading, with darker shades of orange representing higher numbers.[49] With their ten and seven total implemented shutdowns over the years, Sudan and Ethiopia, stand out when compared to other states in the region, a majority of which has implemented 'only' one shutdown. The countries included in this analysis are Benin, Burkina Faso, Burundi, Cameroon, Chad, the Republic of the Congo, the DRC, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Guinea, Liberia, Mauritania, Nigeria, Senegal, Sierra Leone, South Sudan, Sudan, Eswatini (formerly Swaziland), Togo, Uganda, Zambia, and Zimbabwe. The focus on national-level shutdowns is selected for two main reasons. The first being that using national-level shutdowns facilitates the later analysis and removes issues with ecological fallacy that Rydzak's (2018) study suffers from, since one can be sure that the shutdown affected all protests in a country. Secondly, in the SSA region, as a glimpse at Figure 3b reveals, national-level shutdowns are by far the most frequent types of shutdowns. In the period under observation, they are more frequent than shutdowns of all other geographical scopes in the region combined, with over two-thirds of the shutdowns recorded in the region being implemented nationwide. As Marchant and Stremlau (2020a) point out, this is a continental peculiarity with other

**Figure 4. SSA Internet Shutdown Map (2016-2022)**




The respective country polygons were created using data provided by the Natural Earth project, using their R Package 'rnaturalearth'. Boundaries of sovereign states are drawn according to their de facto status rather than their de jure status. This means that the borders shown reflect which country is in charge on the ground, not on paper.

[49] Figure A1 in the Appendix contains yearly maps of the number of national-level shutdowns that have been implemented in the SSA region, giving more fine-grained insights into the use of shutdowns by country over time.

regions and countries being more prone to implementing regional-level, ephemeral shutdowns.[50] Looking at the data, the total duration of national-level shutdowns in SSA is 1,715 days or approximately five years. Out of the 58 total, national-level shutdowns, 25 last eight days or longer. The, by far, longest shutdowns in the SSA, according to the data used, took place in Chad (473 days), the DRC (364 days), and Nigeria (224 days), with the shutdown in the DRC lasting for nearly the whole of 2017 and the one in Chad lasting from early 2018 to mid-2019.

## 4.2 Operationalization and Data Overview

Since the study focuses on the intricate effects of internet disruptions, a country-day level of analysis has been adopted. This approach, aligning with established practices in the field, enables precise monitoring of the daily impacts of shutdowns. By concentrating on day-to-day developments rather than broader time frames, it is possible to capture their immediate effects more accurately. The available data is well-suited for this detailed approach, as will be further elaborated upon in the subsequent overview of the selected data for operationalization.

### 4.2.1 Dependent Variable: Protest Numbers

Turning now to the operationalization of the individual variables, starting with the dependent variable – protest numbers. In line with the common data collection efforts, protests are understood here as strictly nonviolent forms of collective mobilization. While previous efforts such as the one by Rydzak (2019) have also taken into consideration riots, which are their violent counterparts and are also typically recorded by protest data sets, it is decided to focus exclusively on protests here. This is because riots are inherently different from protests and tend not to rely as heavily on specific forms of organizations or coordination, but are rather spontaneous and "do not require a committed core group" (Carey, 2010, p. 171; Chenoweth et al., 2017). Considering them would thus require additional, different theoretical explanations, which is reserved for future work.

Protest data are political event data, which "denote 'who did what to whom (and where/when)'" (Bagozzi et al., 2021, p. 7). Their core components are thus the actors involved in the event in question, and the action being performed by one actor, affecting the other. They are typically sourced from local or international news wire reports, sometimes with the aid of

[50] Figure A2 in the Appendix, using the newest data available on disruptions, corroborates this and shows a comparison of world regions by the types of shutdowns that they use. SSA and the MENA region clearly stand out when it comes to their use of national-level shutdowns. In South Asia, local or regional level shutdowns are much more frequent on the other hand.

computer algorithms. In the study of protests, the event level is a popular unit of analysis as it allows for a detailed, case-by-case analysis of a variety of aspects related to protests (Quaranta, 2017). As the study of protests has attracted widespread attention in academia, naturally, there are a number of data collection and preparation efforts that provide a wealth of data on protests. Most of the current efforts fall either into the machine-coded or human-coded categories (Weidmann & Rød, 2019). The most commonly used and renowned event-level data sets for protests include the ACLED data set, a human-coded effort, as well as the ICEWS and the Global Database of Events, Language and Tone (GDELT) data sets, which are machine-coded (Boschee et al., 2015; Leetaru & Schrodt, 2013; Raleigh et al., 2010).[51]

ACLED collects data on political violence events like riots, and other significant non-violent political activities like protests, globally. Its extensive database, updated weekly since 1997, covers over 200 countries, recording information on, inter alia, the event type, participants, locations, and dates (ACLED, 2022, 2023a). The data is collected by trained researchers from sources such as public media, vetted social media accounts, and reports from governmental and non-governmental organizations (ACLED, 2023b). Additionally, before publication, the data has to pass a multi-stage review process (ACLED, 2023a). In contrast, the ICEWS and GDELT are constructed fully through automated processing of worldwide news media in various languages, including print, broadcast, and online sources. Such news media reports are used to extract and identify protests and other politically-relevant events, which are categorized using the Conflict and Mediation Event Observation (CAMEO) coding scheme (Ferreira et al., 2021; Wang et al., 2016; Ward et al., 2013).[52] They are attempts at real-time, global event data collection and have received widespread scholarly attention thanks to their large scale and real-time, automated updating (Wang et al., 2016).

The data sets in question are primarily distinguished by their methodologies for data acquisition and the breadth of their source corpora. In the case of the ACLED data set, provided by Raleigh et al. (2010), the inclusion of a broader array of sources beyond traditional news

[51] Additional data sets documenting protest events, while pertinent, are not detailed here due to constraints related to temporal coverage, case specificity, or data access. These include the Cross-National Time-Series Data (Banks & Wilson, 2023), the European Protest and Coercion Data (Francisco, n.d.), the Mass Mobilization Protest Data (Clark & Regan, 2016), and the Social Conflict Analysis Database (Salehyan et al., 2012). Furthermore, the Mass Mobilization in Autocracies Database, stemming from Weidmann and Rød's (2019) hybrid coding methodology, is similarly limited to data up until 2019 and focuses exclusively on autocratic regimes, as discussed by Strauch et al. (2022). Another data set is the Political Event Classification, Attributes, and Types data set that replaces the ICEWS data set, which has been discontinued as of April 11, 2023. The novel data set is however not suited for this analysis because it only covers events as far back as 2018 (Scarborough et al., 2023).

[52] The news media reports are parsed individually and the information they contain is divided into a subject, verb, and object structure. The action of the subject on the object indicated in the text is then categorized using the CAMEO scheme (Wang et al., 2016). CAMEO is widely used in the political sciences as a coding system that provides a list of approximately 15,000 actions and 60,000 political actors (Manacorda & Tesei, 2020). CAMEO has 20 event types, with protests being event type number 14 (Schrodt & Yilmaz, 2007).

media is a notable feature. This study opts for the ACLED data set due to its robust and well-grounded methodology, coupled with its reduced propensity for recording false positives, namely, incorrectly categorizing non-protest events as protests. Conversely, data sets that rely on automated coding, such as ICEWS and GDELT, while less prone to overlook events (thereby reducing false negatives), do not exhibit the same level of precision in event categorization. This limitation often results in a larger aggregation of events within these data sets but with increased susceptibility to issues concerning validity and reliability. Such data sets are more inclined to misclassify events and record duplicative entries (Wang et al., 2016). To test the robustness of the findings generated using the ACLED data, data from the ICEWS are used. This is in line with what previous studies, beyond the shutdown-dissent nexus, have done (e.g., Manacorda & Tesei, 2020). ICEWS is chosen over GDELT because a previous comparison of both has highlighted that the former is more robust and suffers less from issues with validity than the latter (Wang et al., 2016). Moreover, GDELT errs on the side of inclusion and has a less restrictive filter than ICEWS, meaning that it is likely to include more false positives than the latter (Christensen & Garfias, 2018).

In the ACLED data set, protests are defined as "an in-person public demonstration of three or more participants in which the participants do not engage in violence, though violence may be used against them" (ACLED, 2023a, p. 13). The ICEWS, while also distinguishing between protests and riots, relies on the definitions provided by the CAMEO coding scheme instead. Although the data sets differ in the operationalization of protest events, the ICEWS is filtered in a way that ensures the highest possible level of similarity. The CAMEO codes for protests that are included are 141 and 144, as well as all of their subcategories. This excludes events like hunger strikes, riots, and other types of strikes and boycotts which are also not understood as protests according to the ACLED definition. It is when people "[d]issent collectively, publicly show negative feelings or opinions; rally, gather to protest a policy, action or actor(s)" (Schrodt & Yilmaz, 2007, pp. 69–75), that actions are considered to be protests here. Notably, there are no minimum size requirements for protests in the ICEWS data set, which counts any plurality of people as such.

As the focus of this analysis is on national-level shutdowns, the dependent variable will subsequently be operationalized as an aggregated count of daily protest events by country. Although this, undoubtedly, leads to the loss of a sizeable amount of intra-country variation in the dynamics of protests, since such events are typically not evenly spread across a country. It is a necessary step to match the study's as well as the independent variable's level of analysis. This methodological choice acknowledges a key limitation but ensures consistency and

provides a more accurate assessment of shutdowns' impacts on entire populations, something which the previous study by Rydzak (2018) could not ensure. A disaggregation of protests as well as shutdown events, by geographical scope, is the next logical step and should be explored in future work.

### 4.2.2 Independent Variable(s): Internet Shutdowns and their Variations

Taking into consideration the relative scarcity of data sources on internet shutdowns, operationalizing them presents a particular challenge in this emerging area of research. Howard, Agarwal, et al. (2011) were the first, to the author's knowledge, to compile a comprehensive data set on internet interferences by states, covering the period from 1995 to 2010. However, their focus was not limited to internet disruptions exclusively, and the lack of a standardized, publicly available data collection methodology complicates any attempts at extending it beyond 2010.

Given the apparent time constraints and the inherent difficulty of collecting data on shutdowns, as governments scarcely openly admit to having implemented a shutdown, which makes such an effort impractical at best. This study will utilize data gathered as part of the Shutdown Tracker Optimization Project (STOP), managed by the international nonprofit digital rights advocacy group Access Now (2023a). It is currently the most comprehensive, publicly available data set on internet shutdowns, and as such, the STOP data have been used by both academics as well as journalists. The project, which was initiated in 2016, aims to document and provide context to instances of internet shutdowns and the most recent, complete version available records instances between 2016 and 2022. To gather the data, the staff relies on a variety of sources which are of both qualitative and quantitative nature. They include information provided by the internet traffic measurement community, news and media outlets, government reports, and local partners, and anonymous insider information, including from government officials (Bischof et al., 2023). In addition, gathered data is also harmonized with the information provided by databases like Oracle, Google Transparency Data, Facebook Transparency Reports, Internet Society Pulse, and Censored Planet (Access Now, 2023b). While Access Now endeavors to make this data set as complete as possible, it is important to acknowledge its inherent limitations and the potential for future revisions. Nonetheless, it remains the only comprehensive data set that is publicly available and the reliability and quality of the data have been assured through direct discussions with the organization's staff responsible for the data management, and close scrutiny while working with and preprocessing the data.

In the present work, internet shutdowns are defined as *deliberate, significant disruptions of the internet or related channels of electronic communication by state actors, rendering them inaccessible or effectively unusable, within a given geographical area and/or for a predetermined group of citizens.* This definition ensures the comparability with previous works and their operationalizations as well as the current and ongoing data collection efforts and was chosen as a result of this. It was inspired by and modeled after definitions provided by Rydzak et al. (2020) and Access Now (2023b), but improves upon them in three important ways.[53]

First, it clearly states the target of internet shutdowns while ensuring that the definition best reflects the underlying data, which is key to maintaining the internal validity of this study. This is in contrast to the definition used by Rydzak et al. (2020), which is rather broad, stating that shutdowns target "entire channels of electronic communication" (p. 4265). Second, adding that shutdowns are deliberately perpetrated by state actors, that is, official government actors, further increases the definition's precision. It follows examples from the Software Freedom Law Center, India (SFLC.IN, 2023) and the Internet Society (2019b) who include such wording in their definitions. Adding this to the conceptual definition is deemed important because it most closely reflects what this study is interested in, which is government-perpetrated shutdowns. Although the data that is being used for this study also records internet shutdown incidences that are "solely caused or executed by non-state actors" (Access Now, 2023b, p. 2), such cases can be removed from the data since it also contains information on the actual perpetrator.[54] Careful preprocessing of the data ensures that the shutdowns included in the analysis are not caused by third parties, non-state actors, or by failures of a country's internet infrastructure. Third, the definition remains open about the intended use of internet shutdowns, which would arguably make it more imprecise since the focus here lies not on their intended use but rather on their consequences. Also, internet shutdowns are not necessarily implemented for a single purpose only and can instead have multiple intended uses. While Access Now (2023b) acknowledges this in its definition, adding that shutdowns are "often [implemented] to exert control over the flow of information" (p. 2), such an addendum does nothing to improve

[53] Access Now (2023b) defines internet shutdowns as "intentional disruption of the internet or electronic communications rendering them inaccessible or effectively unusable, for a specific population or within a location, often to exert control over the flow of information" (p. 2).

[54] Whereas the data recorded by Access Now (2023a) includes both government-ordered and non-state ordered shutdown events, over 95% of the recorded events between 2016 and 2022, i.e., only 50 of the 1,090 total recorded events were caused by non-state actors.

the definition's precision and is more redundant than useful, which is why it was decided to be removed from the present definition.[55]

The STOP data offers detailed, daily-level data on shutdown characteristics, including but not limited to their duration, geographical scope, justifications, and actual causes, as well as the type of shutdown, that is, whether the shutdown is targeted at specific internet-based services or whether it only throttles access to the ISM. The extensive data set thus allows for a more nuanced analysis of internet shutdowns which previous analyses were not privy to.

In the subsequent analysis, the independent variable is represented in three distinct manners. Firstly, it is conceptualized as a binary variable, marking merely the occurrence or non-occurrence of an internet shutdown on any given day. Secondly, to explore the over-time dynamics suggested by the hypotheses, and in what resembles an improvement (in accuracy) over current work, the duration of a shutdown in days is included as an independent variable. This helps to achieve a more detailed understanding of the temporal dynamics of internet shutdowns, beyond the effects of their implementation itself. Finally, for a more detailed examination of how various types of shutdowns influence protests, each shutdown is classified by its specific nature: whether it is a throttling, a service-based-, or a full shutdown. This is achieved through the creation of three-level categorical variables which, for each of the variations, codes no shutdowns on a country day as zero, full shutdowns as one, and the implementation of a variation as two. In the analysis, the variations are then compared in their effects to days that have not experienced a shutdown.[56]

### 4.2.3 Conditioning Variable: Internet Penetration

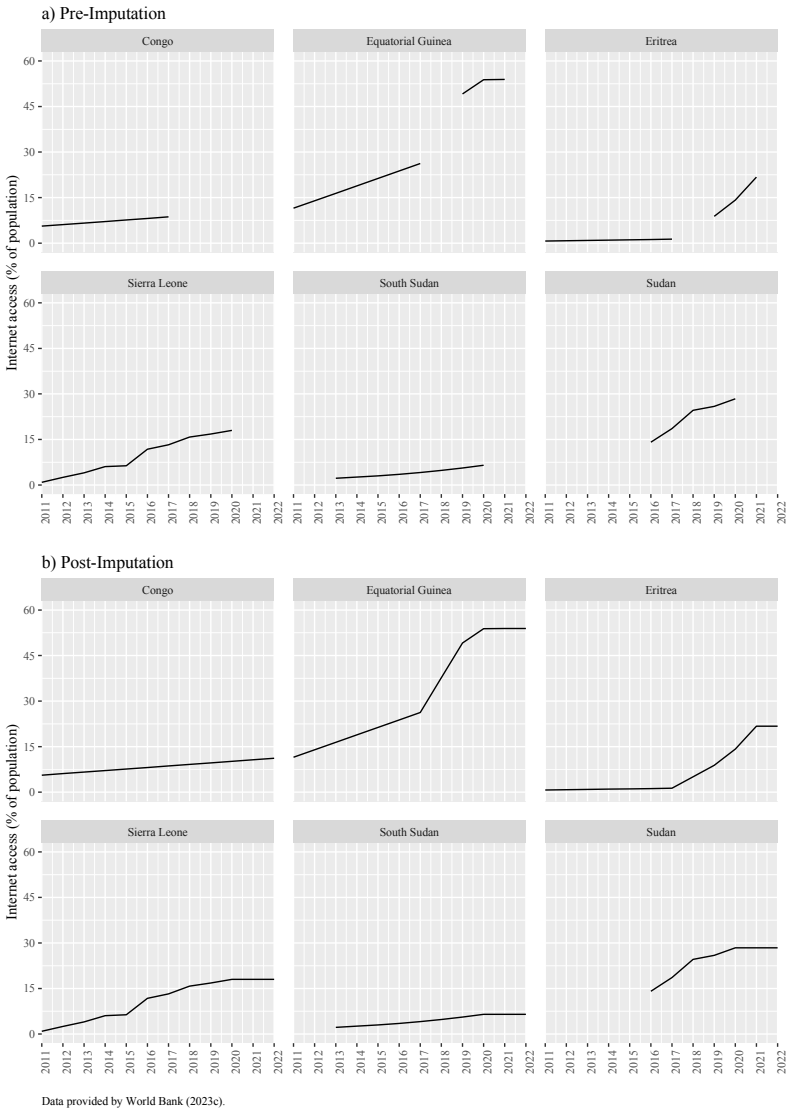
In this study, the variable internet penetration, similar to several other control variables to be introduced later, cannot be quantified on a daily level, unlike the independent and dependent variables. This limitation is acknowledged, yet the adoption of an annual data format for measuring internet penetration was deemed the most feasible approach. As established in the existing body of literature and affirmed by widely accepted views, the rate of internet

[55] The data set has recorded instances of internet shutdowns for which the end date is not yet specified. Such instances have two likely origins - either they are still ongoing, or the end date could not be determined precisely. To maintain precision in the analyses, such instances have been removed from the data set used for the analyses here. Out of the total of 1,040 shutdown events recorded globally, 262 events were removed due to a missing end date. This amounts to roughly 25% of the complete data set.

[56] On five occasions, the STOP data failed to provide any comprehensive details about the scope of the disruptions. After conducting a meticulous examination of the source material, cross-referencing it with other reliable sources, and discussing the findings with Access Now representatives, four of these occurrences were effectively addressed. However, there is one particular instance where the scope of the event remains uncertain. The instance in question is a shutdown that occurred in Togo in late 2018. For more information on this, consult the additional data material that was also submitted.

penetration is an indispensable variable. It plays a crucial role in understanding the effects of internet shutdowns on protests. This variable effectively acts as a proxy for gauging a population's reliance on the ISM on a day-to-day basis. To incorporate it into the analysis, the study utilizes statistics from the ITU (2023c), which are made publicly accessible through the WB (2023c). The specific metric used is *individuals using the internet (% of population)*, which tracks the percentage of individuals in a country who have accessed the internet in the past three months using various devices like computers, mobile phones, digital TVs, gaming consoles, and other internet-capable devices.

**Figure 5. Internet Penetration Data Imputation**




It is important to note, however, that the data collection methods employed have inherent limitations due to the challenges associated with gathering accurate internet usage data. The ITU largely relies on the cooperation of local statistical offices in different countries, from which it requests and receives such data. It has no control, however, over whether these offices respond to the questionnaires, as responding is not mandatory and there is no enforcement mechanism in place (ITU, 2023a). As of the most recent data release, the ITU's data set does not include information for the year 2022 for the SSA countries of interest, and it also lacks data for certain years for some individual countries. Given these gaps in data and considering the vital importance of internet penetration information in this analysis, a strategic decision is made to impute the missing data.

This imputation is critical for ensuring that the analysis remains comprehensive and robust, despite the challenges posed by the incomplete nature of the ITU's data collection efforts.

Figure 5 illustrates internet access trends across various problematic countries, both before and after data imputation. This visual representation was crucial for assessing the appropriateness of the imputation methods used and to check whether the imputed values' fit is appropriate. For the missing data for the year 2022, and specific data for 2021 in the countries of Sudan, South Sudan, and Sierra Leone, a conservative method known as *last observation carried forward* was implemented. This technique involves using the most recent available data point to fill in missing subsequent values. The choice of this method over more speculative approaches, which attempt to predict future values based on past trends, was deliberate. Such approaches can lead to less accurate results, especially in contexts where future trends are not guaranteed to follow historical patterns. By opting for this more cautious approach, the study aimed to ensure that the imputed values did not introduce unwarranted inaccuracies into the analysis. For the Republic of the Congo, a linear model was fitted due to its consistent trend and substantial missing data. In cases like Eritrea and Equatorial Guinea, where 2018 values are missing, the gap is filled by averaging the difference between the respective adjacent values. The post-imputation line plots indicate that the imputed data aligns well with existing trends, suggesting the chosen imputation methods were appropriate.[57]

### 4.2.4 Conditioning Variable: Organizational Capacity

Another key conditioning variable, as introduced by the theoretical section above, is the organizational capacity of protests. Current research, and particularly recent evidence from SSA, suggests that during shutdowns, the organizational capacity of protesters can positively influence the emergence of protests (Rydzak et al., 2020).

One way of operationalizing such organizational capacity is by using the associated actor column in the ACLED data set, which identifies the actors involved in protest events, and can allow for inferences as to the extent to which organizations were present at or leading the events. While this would be the most straightforward way of factoring in the organizational capacity present, a glance at the respective column in the ACLED data set reveals that, depending on the column, between 34% and 87% of the values are missing. Most of the observations for the SSA region are thus missing and would require replacement. As collecting the data and hand-coding it is deemed to be unfeasible given the available resources and time

[57] Values for Sudan pre-2016, and South Sudan pre-2013 are not imputed as this period is not relevant for the later analysis. The whole set of countries and their annual internet access trends are plotted in Figure A3 in the Appendix.

constraints, another way is chosen to proxy for the protests' organizational capacity. It will instead be operationalized using a country's protest history. Arguably, a population that has more experience with protesting is more likely to be better equipped to do so. This is supported by literature, such as Stein (2017), which suggests that previous mobilizations enhance the likelihood of subsequent ones. The concept of a *protest lag* is a recurring theme in related studies, where both short-term dynamics, capturing immediate mobilization influences, and long-term considerations of a country's protest history are factored into the analysis. Case studies across various African countries reinforce the idea that a legacy of mobilization contributes to the legitimization, amplification, and effective mobilization of protests (Sanches, 2022). More experience with protesting, which results from frequent protesting, is expected to lead to higher levels of organizational capacity among the protesters, protest organizers, and protest organizations.

Consequently, this research adopts a methodology to gauge a country's protest history as an indicator of its organizational protest capacity. This is operationalized through a running 365-day tally, as recommended by Rydzak (2018), which aggregates the number of protests in the 365 days preceding the present day. It is constructed from daily protest data, utilizing either ACLED or ICEWS data sets depending on the analytical model employed.

#### 4.2.5 Other Control Variables

Throughout the following paragraphs, the literature-derived control variables, which are also included in the later analysis are outlined.

Controlling for a country's regime type is a must given its purported effects on the emergence of protests, which it influences by altering the environment and consequently opportunities for such. When controlling for a country's regime type, one should be wary of which of the several available data sets and with it, definitions of regime types to choose. Since this study is mainly interested in the flow of information in a given country and more specifically how restricted/free that flow is, using a plain procedural definition would not suffice. Instead, what is important is the freedom of information and assembly as altered by "the existence of a set of civil liberties" (Ruijgrok, 2017, p. 506). Countries with strong civil liberties are expected to feature higher levels of protests because these civil liberties constrain the governments' abilities to repress protests, provide protest organizers with more freedom to organize protests, and allow supporters to participate without having to fear retaliatory acts. When protests are prohibited, the chances are fair that courts will overrule political attempts to prohibit rallies. Without such civil liberties to safeguard protests, they are expected to be less

likely to emerge (E. Neumayer et al., 2021). Although the selection of a measure has been demonstrated by previous studies to, despite typically high levels of correlation, lead to substantially different conclusions, few scholars properly justify their choice of measure (Vaccaro, 2021). Among the large number of different measures available, few stand out based on their academic importance, measurement scale, availability, and coverage. These include the Center for Systemic Peace's Polity IV measure (Marshall & Gurr, 2020), Freedom House's Civil Liberties and Political Rights index (Freedom House, 2023a), Vanhanen's Competition and Participation measure (Vanhanen, 2019), and V-Dem's Polyarchy index (Coppedge, Gerring, Knutsen, Lindberg, Teorell, Altman, Bernhard, Cornell, Fish, Gastaldi, Gjerløw, Glynn, Good God, et al., 2023). Out of these, it is the latter that is selected here to be used to operationalize the regime type of a country. As its name suggests, it builds on Robert Dahl's understanding of a political system with democratic institutions and is calculated as a combination of five different indices that measure the existing freedom of association, -expression, suffrage, presence of clean election, and to what extent officials are elected. It ranges from zero to one with higher values indicating a more democratic state. The data is collected and coded by country experts and research assistants, published annually, and ranges back to 1789 (Coppedge, Gerring, Knutsen, Lindberg, Teorell, Altman, Bernhard, Cornell, Fish, Gastaldi, Gjerløw, Glynn, Grahn, et al., 2023). The official name of the index in question is *v2x_polyarchy*. It is chosen over the others for two main reasons. One is that it has been demonstrated, in an extensive comparative analysis by Vaccaro (2021), to yield not only the most precise estimations but to also capture most of the inter-country variation in democraticness. Moreover, when compared to the other relevant measures, its distribution shows that it does not suffer from problems of agglomeration at either the democratic or the autocratic end. Second, using this indicator is theoretically justified because it not only factors in institutional characteristics such as the fairness and freedom of elections or the recruitment of the executive but also considers aspects related to a population's civil rights, like the freedom of association. Countries that score higher on the continuous zero-to-one index have extensive suffrage, and political and civil society organizations can operate freely. Elections are clean and affect the composition of the country's executive. There is freedom of expression and an independent media capable of representing alternative views on matters of political relevance (Coppedge, Gerring, Knutsen, Lindberg, Teorell, Altman, Bernhard, Cornell, Fish, Gastaldi, Gjerløw, Glynn, Grahn, et al., 2023).

In Africa, the youth are a central part of mobilizations and they have been argued by multiple studies to affect contentious politics. While ordinary citizens from all social strata have

and are participating in protests across the African continent, it is particularly young people who have been and who are mobilizing. Examples from recent protests in Africa like the anti-government protests in Angola, the DRC, or Ethiopia were driven primarily by young people (Sanches, 2022). It is the youth that has been at the forefront of demonstrations for decades (Maganga, 2020). Moreover, Africa is the youngest continent with young people constituting the biggest proportion of the African population. From an academic perspective, countries with larger youth bulges, namely, shares of the population between the ages of 15 and 24, have been argued and found to be more prone to experiencing episodes of contentious political activity (Ruijgrok, 2017). Young people are also the principal users of the ISM and are well-versed in using it to mobilize and organize activities (Maganga, 2020; Rydzak, 2018). To operationalize this variable, it is decided to use annual data on the percentage of a population in the relevant countries that are between the ages of 15 and 24 years of age. This data is provided by the United Nations Population Division (2023) and available for all countries included in the analysis as well as the entire period under consideration.

Another control variable that needs to be included when studying the protest dynamics in SSA is the countries' level of urbanization. Both data explorations and analysis provide evidence supporting the idea that protests on the African continent are urban phenomena. A recent analysis of protest events underlines the importance of considering this factor. While protest events have, overall, increased strongly in number across the African continent. The data analyzed by Dorward and Fox (2023) shows that in both the MENA and the SSA regions, protests increasingly occur in urban areas. Also, protests in the latest African protest wave have been found to be predominantly urban (Mateos & Erro, 2021). While Africa remains one of the least urbanized world regions, its urbanization rate is projected to grow among the fastest, and there are large inter-country and inter-regional differences, with North Africa being more urbanized (Kanos & Heitzig, 2020). Against this backdrop of urbanization across the African continent, it becomes ever more important to consider this factor. Theoretically, increasing levels of urbanization are argued to increase social proximity, which has been argued to lower the coordination costs of organizing protests, but could also bring antagonistic social groups closer together, emphasizing relative inequalities and fueling grievances. Additionally, large urban populations may represent particularly favorable recruitment pools for protests (Dorward & Fox, 2023; Ruijgrok, 2017). The indicator selected to operationalize this variable is the annual *urban population (% of total population)* as provided by the WB (2023d). An urban population refers to the share of a country's population that resides in urban areas, and it is

calculated using the WB population estimates and the urban population figures provided by countries' national statistical offices (WB, 2023d).[58]

Across the SSA region, protests are often taken to be materially motivated and have been referred to as bread- or food riots before. While this narrative remains incomplete and does not tell the whole story, the region's general economic well-being and political condition make it important to consider fluctuations in commodity prices as an influential factor as grievances towards consumption and material issues remain key drivers of protests across the continent (L. Mueller, 2018; Sanches, 2022). As a continent, Africa has the highest share of food in total consumption and in imports. Moreover, according to data from the UN Food and Agriculture Organization (FAO), about 35% of people in SSA are faced with severe food insecurity. As the debt burden of African countries has doubled in the 2010s, their financial margin to respond to fluctuations in commodity prices has shrunk, making them particularly sensitive to sudden price hikes, which could leave many people without the means to buy sufficient amounts of food if governments are unable to dampen the effect (Lemaire & Vertier, 2023). To factor in the changes in commodity prices, which could directly affect grievances in countries in SSA, it is decided to use the UN FAO's real Food Price Index (Food and Agricultural Organization of the United Nations, 2023).[59] Said index tracks the monthly changes in international prices of a basket of food commodities, namely, meat, dairy, cereals, vegetable oils, and sugar, compared to a baseline price established in the three years between 2014 and 2016. The scale was adjusted so that zero reflects the baseline with values above zero indicating an increase in the commodity prices, and negative values indicating a decline in commodity prices.

The wider economic situation that a country finds itself in can be an important predictor of the occurrence of protests. This was recently demonstrated by a study conducted by Manacorda and Tesei (2020) where the authors found the economic condition to be a key conditioning variable for the emergence of protests. It was particularly during times of economic downturn that more protests occurred than when a country's economy was performing well. To operationalize this factor, a country's annual GDP growth rate can be used,

[58] A potential caveat when using this data is that one has to be particularly careful when interpreting the figures for different countries. This is because the countries differ in the way they classify populations as either urban or rural. The population of a city or metropolitan area strongly depends on the respective boundaries chosen (WB, 2023d).

[59] There exist two indices - a nominal and a real one. The key disparity lies in the fact that the latter is attuned to account for the fluctuations in the value of money (that is, inflation) and hence provides a more precise picture of the changes in purchasing power, as opposed to the changes in prices alone (Food and Agricultural Organization of the United Nations, 2023). Consequently, the real version proves to be more valuable for research endeavors like the present.

which can give one an estimate of the year-on-year performance of a country's economy.[60] Data on this is provided by the WB, which provides public access to the annual percentage growth rates of countries' GDPs at market prices in local currencies (WB, 2023a).

Relatedly, countries' GDP per capita has been argued in the literature to be a useful proxy of state capacity, which is arguably an important determinant of the likelihood of protests and the state's ability to control such protests (Berazneva & Lee, 2013; Ruijgrok, 2017; Vaccaro, 2023). State capacity is commonly understood as a "state's ability to project coercive force where needed in order to ensure the security of its citizens, while at the same time generating sufficient collective attachments so as to render internal coercion largely unnecessary" (Warren, 2015, p. 299). Plainly put, it is the ability of a state to enforce rules and provide goods to citizens in a systematic way. States with lower levels of capacity are said to be less capable of enforcing rules and providing social welfare evenly across their territory (Krönke et al., 2022). The more capacious a state, the better its ability to limit the emergence of protests and keep them in check. This is because a state that is more capable of providing its citizens with basic services and at the same time enforce rules should see less protests. African states have often been characterized as weak, and a recent study on state capacity found that a majority of states in Africa lack state capacity. With most either lacking the required infrastructure or capable bureaucracies (Krönke et al., 2022). It is particularly states in the SSA that tend to be less capable of taking care of their citizens and which are more ineffective at providing public goods while being more effective at providing public bads (L. Mueller, 2018; Sánchez & Namhata, 2019). Annual values of GDP per capita in current US$ by country are provided by the WB (2023b). While this data offers a useful proxy for state capacity, it falls short in capturing intra-country variations, as highlighted by Krönke et al. (2022). This form of operationalization is chosen however because it is easily accessible, academically relevant, and because it has also been used in previous studies (Ruijgrok, 2017; Vaccaro, 2023). Before being included into the analysis, the variable is log-transformed, which is a sensical choice given its distribution and is commonly done in the respective political science literature.

Taking into consideration the period under study here, there is a key factor that has yet to be considered by the analysis, which is the restrictions implemented as a response to the COVID-19 pandemic. It was in early 2020 when the COVID-19 pandemic took the world's governments by surprise, the unprecedented public health emergency left governments scrambling to protect their populations by implementing a range of measures from school

[60] GDP, as provided by the WB (2023a), is "the sum of national gross value added by all resident producers in the economy plus any product taxes minus any subsidies not included in the value of the product".

closings to contact tracing, many of which were unprecedented in their scale, speed, and intensity (Hale et al., 2021, 2023; University of Oxford, 2020). The SSA region was not spared by the development and governments, in response to or shortly before the first cases were recorded, started implementing policies to limit the spread of the disease as well as provide economic- and health assistance (V. Mueller et al., 2021). Evidence from studies in the European context suggests that protesters responded strategically to the newly implemented policies, most notably the stringency of such policies (E. Neumayer et al., 2021). Interestingly and counter-intuitively, data on the protest levels (see Figure 1c in the introduction) shows that protests seemingly increased in frequency throughout the pandemic. To account for government responses to COVID-19 and inter-country variations, the use of the stringency index provided by the Oxford Covid Government Response Tracker project (OxCGRT) is proposed. This cross-national and cross-temporal index tracks the use of containment and closure policies by governments including things like restrictions on the size of gatherings, restrictions on internal movements, and the cancellation of public events. It is composed of nine distinct indicators assessing the daily stringency of government closure and containment policies as well as the presence of public information campaigns run by governments (Hale et al., 2021).[61] Although since the start of the pandemic, over 40 different trackers of public health and social measures have emerged to provide data on the types of policies that were implemented worldwide to deal with the pandemic, the OxCGRT is selected because it has emerged as the largest, most current, and most readily usable of all (Hale et al., 2023). The index reflects the nationwide levels of response to the pandemic and operationalizes them on a 0 to 100, continuous scale with the latter value representing the implementation of the strictest possible policies.[62]

Lastly, this study includes a weekend indicator as a control variable. This binary indicator was inspired by Hassanpour (2014, 2017) and can be coded naturally, meaning it does not require any additional data. A one indicates that the day under consideration is either a Friday, Saturday, or Sunday, which are considered to be part of the weekend. All other days of the week are subsequently assigned a zero. On weekends, because people have more spare time on their hands, they are expected to be more likely to protest.

[61] The indicators include school closures, workplace closures, cancellations of public events, restrictions on public gatherings, closures of public transport, stay-at-home requirements, public information campaigns, restrictions on internal movement, and international travel controls (Hale et al., 2021).

[62] A caveat is that this data only records the number and degree of government policies and does not have a way to assess how well policies are being implemented, enforced, or complied with.

4.2.6 Data Set Structure and Summary

Given that the selected level of analysis is the country-day level, the data is structured accordingly with the rows recording the protest events per country day, for the 25 included SSA countries from January 1, 2016, to December 31, 2022. The columns on the other hand hold the information for the individual variables that are included in the analysis. As such there is, for example, a column recording the number of protests and a column recording, binarily, whether a shutdown is occurring on a given day. Overall, the data set used to test the hypotheses contains a total of 63,925 observations. The summary statistics table below provides a consolidated view of the data contained in the data set as well as some key statistical measures. A look at Table 1 already points to some interesting trends when it comes to the dependent variable. For one, as the measures of central tendency show, when compared to the overall range of the protest count variable, the daily protest levels are rather low. On at least half of the days per country, there are no protests, making it a rather infrequent event. The wide range shows however that there are also days with up to 98 protests, or 58 when using the ICEWS data. Similarly, the mean for the binary shutdown variable indicates that around 3% of all observations are accompanied by a shutdown. The column on the right-hand side of the table shows that, except for 0.01% for the service-type variable and 8% for both the GDP growth and GDP per capita variables, there is no missing data in the data set. The former missing data can be attributed to missing

**Table 1. Summary Statistics**

| | N | Mean | Median | SD | Min | Max | NAs (%) |
|---|---|---|---|---|---|---|---|
| Protest count (ACLED) | 63925 | 0.31 | 0.00 | 1.27 | 0.00 | 98.00 | 0.00 |
| Protest count (ICEWS) | 63925 | 0.15 | 0.00 | 1.14 | 0.00 | 58.00 | 0.00 |
| Shutdown temporal | 63925 | 0.05 | 0.00 | 0.30 | 0.00 | 2.00 | 0.00 |
| Shutdown duration (days) | 63925 | 3.36 | 0.00 | 29.32 | 0.00 | 473.00 | 0.00 |
| Shutdown binary (lagged) | 63925 | 0.03 | 0.00 | 0.16 | 0.00 | 1.00 | 0.00 |
| Throttle (lagged) | 63925 | 0.03 | 0.00 | 0.18 | 0.00 | 2.00 | 0.00 |
| Service-based (lagged) | 63920 | 0.04 | 0.00 | 0.26 | 0.00 | 2.00 | 0.01 |
| Internet access (%) | 63925 | 24.71 | 21.58 | 16.79 | 1.18 | 71.75 | 0.00 |
| Organizational capacity (ACLED) | 63925 | 105.73 | 31.00 | 204.19 | 0.00 | 1816.00 | 0.00 |
| Organizational capacity (ICEWS) | 63925 | 56.86 | 13.00 | 158.51 | 0.00 | 1705.00 | 0.00 |
| Urban population (%) | 63925 | 43.04 | 42.92 | 17.81 | 12.39 | 90.74 | 0.00 |
| GDP growth (annual) | 58811 | 2.62 | 3.48 | 3.90 | -10.78 | 10.82 | 8.00 |
| GDP per capita (logged) | 58811 | 7.11 | 6.98 | 0.82 | 5.38 | 9.08 | 8.00 |
| C19 restrictions (lagged) | 63925 | 16.30 | 0.00 | 24.65 | 0.00 | 97.22 | 0.00 |
| Regime type | 63925 | 0.36 | 0.32 | 0.18 | 0.07 | 0.74 | 0.00 |
| Youth bulge (%) | 63925 | 19.59 | 19.57 | 1.23 | 16.04 | 22.12 | 0.00 |
| Commodity price changes | 63925 | 7.61 | 0.48 | 17.45 | -9.71 | 56.27 | 0.00 |
| Weekend | 63925 | 0.43 | 0.00 | 0.49 | 0.00 | 1.00 | 0.00 |

information on the scope of a shutdown in Togo which happened between December 8, 2018, and December 12, 2018, where the type of shutdown could not be unequivocally determined.

## 4.3 Method of Analysis

The present study is interested in explaining the effects that internet shutdowns have on the daily number of protests in countries in SSA. The dependent variable, protest numbers, is a count variable, meaning that it can take only non-negative, whole integer values ($y = 0, 1, 2, ...$). Although count data is discrete data, it should not be confused with ordinal data, instead counts are an absolute ratio scale, meaning that the variables contain meaningful zeros and that, for example, four is meaningfully twice as much as two (Green, 2021). Since the number of protests cannot be negative, this operationalization of the data is logical. Given the operationalization of the dependent variable, special attention is required when it comes to deciding which types of models to use to analyze the data. This is because count data are often not normally distributed, heavily skewed, and can have a few extremely high values that look like outliers but might still be sound. Taking another look at the dependent variable and its summary statistics in the tables above supports this notion.

There are several appropriate means of analyzing count data, but some methods are less suitable than others. These include log-transforming the dependent variable and using a linear regression model (like ordinary least squares) or dichotomizing it to use a logistic regression model. While this has been done in academia to study count variables, such methods are, as King (1988) and Green (2021) expound on, inappropriate and can lead to flawed conclusions. As modeling count data is not an uncommon task in the social sciences, several approaches have been developed to do so. The most natural and appropriate way to model count data is to fit models that belong to the class of *count regression* models. Rather than assuming that the dependent variable fits a normal distribution, these models instead assume that it fits a different type of distribution, one that starts at zero and takes only whole, positive integer values (Zeileis et al., 2008). The most commonly used models, across a wide range of scientific disciplines, in this class are the Poisson regression model (PRM) and the negative binomial regression model (NBRM), which are tailored to count data and differ primarily in how they handle the variability in the counts (Green, 2021).[63] The PRM is the simplest model available to model count data and assumes that both the conditional mean and variance of the distribution are equal, also

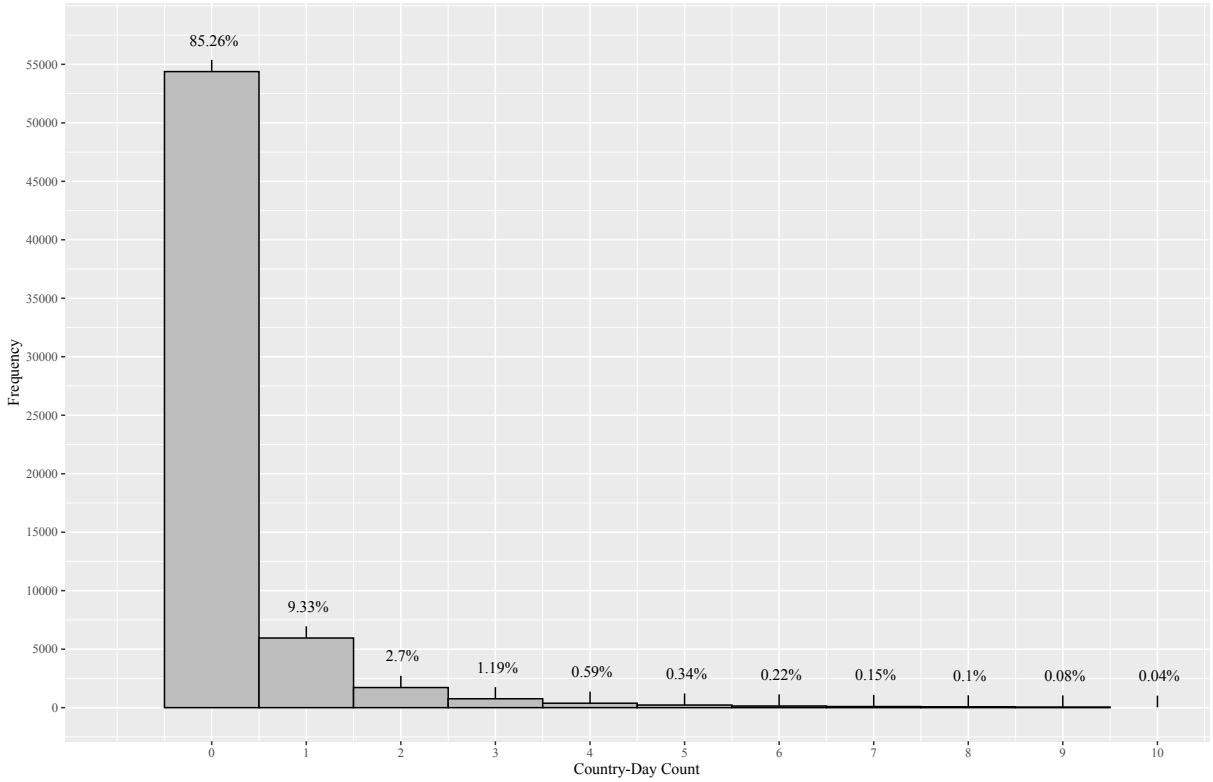
[63] Both of these models belong to the broad class of statistical models that is referred to as Generalized Linear Models for short (Venables & Ripley, 2002; Zeileis et al., 2008). They are extensions of the standard linear models and, inter alia, allow for more varied types of distributions of the dependent variable than the former (Agresti, 2015).

referred to as equidispersion, making it the most suitable for data where this assumption holds. More formally put, $var(y_i) = \mu_i = \lambda_i$, where the variance of the response variable $y_i$ is equal to its mean $\mu_i$ (or $\lambda_i$) (Agresti, 2015; Cameron, 2023). Statistically, a log-linear PRM is specified as $\ln(\mu_i) = \sum_{j=1}^{p} \beta_j x_{ij}\ or \ln(\boldsymbol{\mu}) = \mathbf{X}\boldsymbol{\beta}$, where the natural logarithm of the mean of the response variable is expressed as the sum of the products of coefficients and predictor variables for each observation $i$ and predictor $j$. On the right-hand side is a simplification of that expression in the form of a matrix notation, with X representing the matrix of predictor variables and $\beta$ the vector of coefficients (Agresti, 2015). When the assumption of equidispersion is violated, however, more efficient estimators than the PRM can be obtained.[64] This is "almost always" (Cameron & Trivedi, 2013, p. 74) the case for real-world count data used in the political sciences and beyond, which rarely conform to the assumption of equidispersion. Instead, such data typically "exhibit over-dispersion and/or an excess number of zeros" (Zeileis et al., 2008, p. 1). By introducing an additional parameter into the estimation equation, the *dispersion parameter* $\alpha$, the NBRM is better able to naturally deal with overdispersion in the data, namely where the conditional variance exceeds the conditional mean, offering a more flexible approach for analyzing real-world count data (Cameron, 2023; Cameron & Trivedi, 2013). While maintaining the earlier specification that $\ln(\boldsymbol{\mu}) = \mathbf{X}\boldsymbol{\beta}$, the variance is modeled differently by a NBRM. Instead of $var(y_i) = \mu_i$, it is now modeled as $var(y_i) = \mu_i + \alpha\mu_i^2$, and is no longer equal to the mean but depends on the value of the dispersion parameter $\alpha$ (Agresti, 2015; Cameron & Trivedi, 2013). The NBRM, through the introduction of the dispersion parameter, generalizes the PRM. As $\alpha$ nears zero, the NBRM reduces to the PRM (Cameron & Trivedi, 2013).

The dependent variable's distribution is displayed in the histogram below. As already hinted at during the closer inspection of the summary statistics tables, protests are a rather infrequent event across the countries and during the time frame under observation. Figure 6 shows that the count of zero is by far the most common observation with around 85% of the 63,925 observations being zero, the next highest being one with 9.33% or 5,954 observations. The dependent variable is highly right skewed and not normally distributed. Taking into consideration the large number of zeros in the dependent variable, one has to consider using additional extensions of the PRM and NBRM, which can formally account for the large number

[64] Although the PRM is resilient to distributional misspecifications, meaning that a Poisson distribution is not required for the dependent variable, non-equidispersion may impact the accuracy of standard error estimation. Given that standard errors are utilized in evaluating statistical significance, unaccounted for overdispersion can lead to considerably overinflated t-statistics, which in turn promote erroneous or overly optimistic conclusions of statistical significance (Cameron, 2023; Cameron & Trivedi, 2013).

**Figure 6. ACLED SSA Protest Count Histogram (2016-2022)**




The highest protest count observed for a single country-day is 98. For visualization purposes, this and other counts were excluded as they were very small in frequency and don't change the overall trend. Data provided by Raleigh et al. (2010).

of zeros in the data. Common models for this task are the hurdle- and the zero-inflated PRM or NBRM. In the present analysis, a conscious decision against the use of such two-step models is made. This is because, as Green (2021) points out, the PRM and NBRM, conditional on the mean of the dependent variable being relatively small, are capable of handling a large number of zeros. In this case, as we can see from the distributions and the information portrayed in the summary statistics tables above, the mean is relatively low. Despite the large amount of zeros, the PRM and NBRM fit and model the data well, as the later presented assessments of the model fit show. Also, using the two-step models would require further theoretical justification as they assume the zeros, which are modeled in the first step, to be generated by a separate process.[65] This additional complexity is deemed redundant for the analysis, which is why a decision against the use of such models was made.

[65] Zero-inflated and hurdle models differ primarily in how they conceptualize and handle zero counts in data. The former models assume zeros come from a mix of two groups: one that inherently produces zeros (structural zeros) and another that might have zeros due to not experiencing or reporting the outcome (sampling zeros). In contrast, hurdle models view all zeros as coming from a single, structural source, dividing the analysis into two parts: a binary model to predict zero versus positive counts, and a truncated model (like truncated PRM or NBRM) for modeling positive counts. This distinction impacts their approach to analyzing phenomena where the absence of an event (zero count) can have different implications. See Feng (2021) for more information on this.

Further analysis of the dependent variable's structure reveals that, like most real-world data, it is overdispersed rather than equidispersed. The sample variance is, as the mean-variance ratio in Table 2 shows, more than five times larger than the sample mean. While some of this over-dispersion can be dealt with through the inclusion of regressors in a statistical model, Cameron and Trivedi (2013) suggest, as a rule of thumb, that if the ratio exceeds two, the overdispersion is likely to persist even after the inclusion of regressors and has to be formally accounted for in the analysis. Instead of relying on this rule of thumb, it is decided to follow the specific-to-general strategy outlined by the same authors, in which one first computes a PRM (specific) which is, in a second step, followed by and compared in its fit with an NBRM (general). This is the strategy that is pursued in the subsequent analysis section.

Before delving into the analysis and presenting the results of this study, it is important to discuss the challenges and limitations of the selected method of analysis and underlying data. First, as the purposefully devised term shutdown-dissent nexus and the theoretical discussion suggest, the relationship between protests and shutdowns is not unidirectional, but intrinsically bidirectional. This simultaneity in the relationship can lead to issues with endogeneity, which make it harder to establish a causal relationship and therefore need to be addressed. This was already pointed out by Rydzak (2018) as a central issue, which he rightly suggests could, ideally, be mitigated by identifying an instrumental variable that is related to the independent variable but not to the dependent variable. Power outages, for example, could be used for this purpose. However, an extensive search for such data or reports by country did not yield any useful data. To address the issue of simultaneity, and given the structure of the underlying data, it is decided here to instead lag the relevant independent variables, which can mitigate the issue by helping to establish a temporal order of cause and effect. It is assumed that past values of the independent variable influence the current values of the dependent variable, reducing the likelihood of reverse causality. This approach is particularly useful in time series analyses, such as the present, where data points are collected over time. Another potential source for endogeneity is omitted variables, namely, the omitted variable bias. While this cannot be ruled out entirely, the careful selection of predictors that have been deemed relevant and are well-justified in the literature mitigates this issue as much as possible.

**Table 2. Mean-Variance Ratio**

| Statistics | Values |
|---|---|
| Mean | 0.31 |
| Variation | 1.62 |
| Ratio (Variation/Mean) | 5.32 |

The negative reporting bias, which has been emphasized by previous studies of protests, and other phenomena relying on event count data, also presents a challenge to the present analysis (e.g., Chenoweth et al., 2017; Earl et al., 2022; Gohdes, 2020). As the data for the main

dependent variable, as well as its robustness check, is gathered using publicly available information reported on in the news, it is subject to influences of variable media attention. Because national-level internet shutdowns disrupt the flow of information in the country where they are implemented, they can also affect the events that are covered by the media. Meaning that they "potentially silence reports of unrest rather than the unrest itself" (Rydzak, 2018, p. 164). Thus, during a shutdown, the actual number of protests could be artificially depressed simply because there is an unknown amount of unreported instances of protests. This has a negative influence on the study's validity by skewing the data and can lead to inaccurate conclusions. This is why the data set was selected so carefully and why the robustness check using a different data set is implemented. Another limitation is the use of data with different levels of temporal granularity, necessitated by the availability of data. While this was similarly done in other studies, it is nonetheless a limitation that needs to be pointed out here. This could potentially introduce biases or inaccuracies in the analysis, as combining data measured at different time scales may affect the consistency and reliability of the results.

## 5 Data Analysis

Having explained the cases, models, and data selection process as well as the underlying theoretical mechanism. The following section will be dedicated to presenting the results of the analysis, starting with an exploration of the first set of hypotheses which focuses on shutdowns and their longitudinal effects.[66]

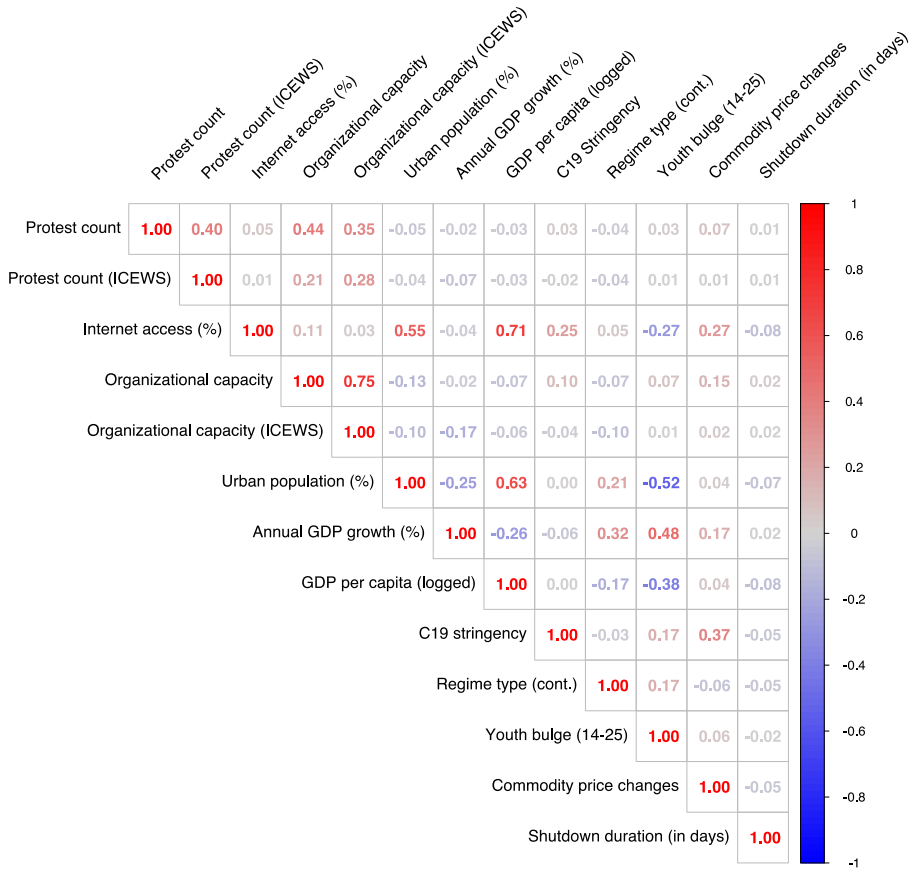
### 5.1 Shutdowns and their Longitudinal Ramifications

Before running and presenting any kind of analysis and its results, it is a sound practice to take a closer look at the interrelations between variables in the to-be-used data sets by computing and assessing their correlation. This can help one eschew potential problems of collinearity in the subsequent analyses. When independent variables are highly correlated, and a change in one variable is inadvertently related to a change in the other, it can become close to impossible to discern the effects that a single variable has on the outcome of interest. This is because one cannot plausibly discern between the individual impact of a variable. High levels of correlation can thus lead to issues with coefficient variance and also affect the t-statistic, in turn affecting any estimations of statistical significance. The correlation matrix in Figure 7 below displays the

[66] All of the analysis as well as other data presentations were created using RStudio Version 2023.12.0+369 (RStudio Team, 2023).

correlations between all relevant, continuous variables used in the analyses to assess the hypotheses. Two correlations stand out in particular, one is the positive correlation between organizational capacity and its ICEWS-based counterpart, and the other is a positive correlation between internet access and the logged GDP per capita.[67] The former correlation is of no concern, however, since the variables in question do not appear in the same models. The latter correlation, while lower than the previous, still warrants some attention. It is not unreasonable for there to be a correlation between internet access and the GDP per capita, as higher levels of access to the internet have been linked in the literature to better economic performance, which can translate to higher GDP per capita values (e.g., West, 2016). Given this correlation, a closer examination of the computed regression models was conducted which resulted in the logged GDP per capita being excluded from the final models, as its inclusion both affected the significance values as well as the direction of the model coefficients of other variables, while not improving the model fit.[68]

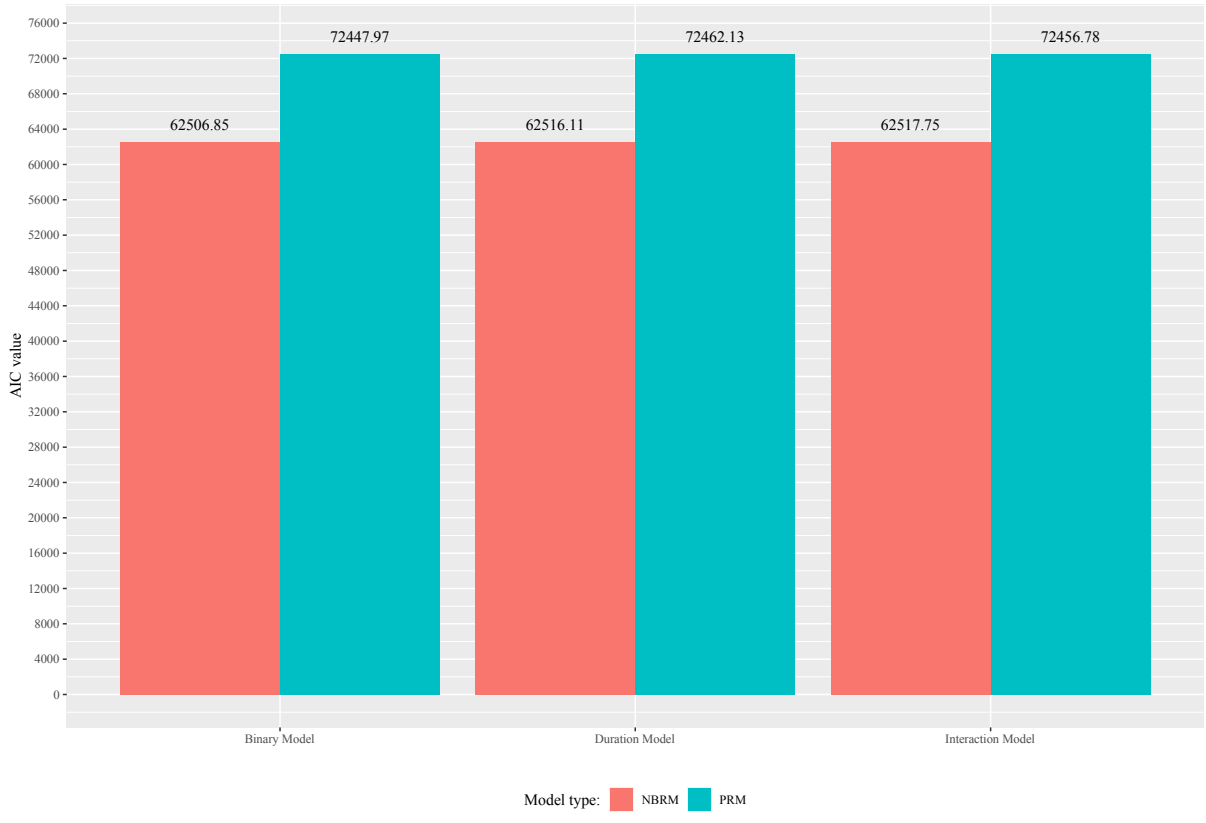
**Figure 7. Correlation Matrix**




[67] Following Rydzak's (2018) convention, correlations above 0.65 (+/-) require further consideration.
[68] Rydzak's (2018) correlation matrix pointed at even higher levels of correlation between his variable controlling for the levels of internet access and the logged GDP per capita variable, i.e., 0.89. The author did however not exclude any of them or made specific mention of this.

In line with the previously outlined strategy used to arrive at results regarding the first six hypotheses, a set of distinct PRMs and NBRMs is computed. The models all include the list of previously specified covariates, save the logged GDP per capita, and differ only in the estimation method used. Three distinctive models are computed per estimation method, which differ in how they incorporate shutdowns while mirroring each other in most other regards. The Binary Models only include a lagged, binary shutdown indicator, while the Duration- and Interaction Models replace this with the duration of a shutdown in days and, in the latter case, add two interaction effects. The Duration and Interaction Models further include a set of polynomial terms to control for potential, non-linearities in the effects of shutdowns over time. This was deemed important because of the peak-and-trough dynamic found by Rydzak (2018) and yielded improved or comparable results in model fit when compared to the same models without polynomial terms. To determine which models most accurately describe the data that they intend to explain – which models have the highest model fit – it is common practice to compare them using the Akaike information criterion (AIC) (Agresti, 2015). The AIC, by estimating the amount of information a model loses, balances its complexity with its goodness of fit, penalizing the addition of predictors (Green, 2021). Figure 8 compares the AIC values of the distinct PRMs and NBRMs that were computed, with lower AIC values on the y-axis indicating a better fit. A glance at the different bars makes it apparent that the NBRMs

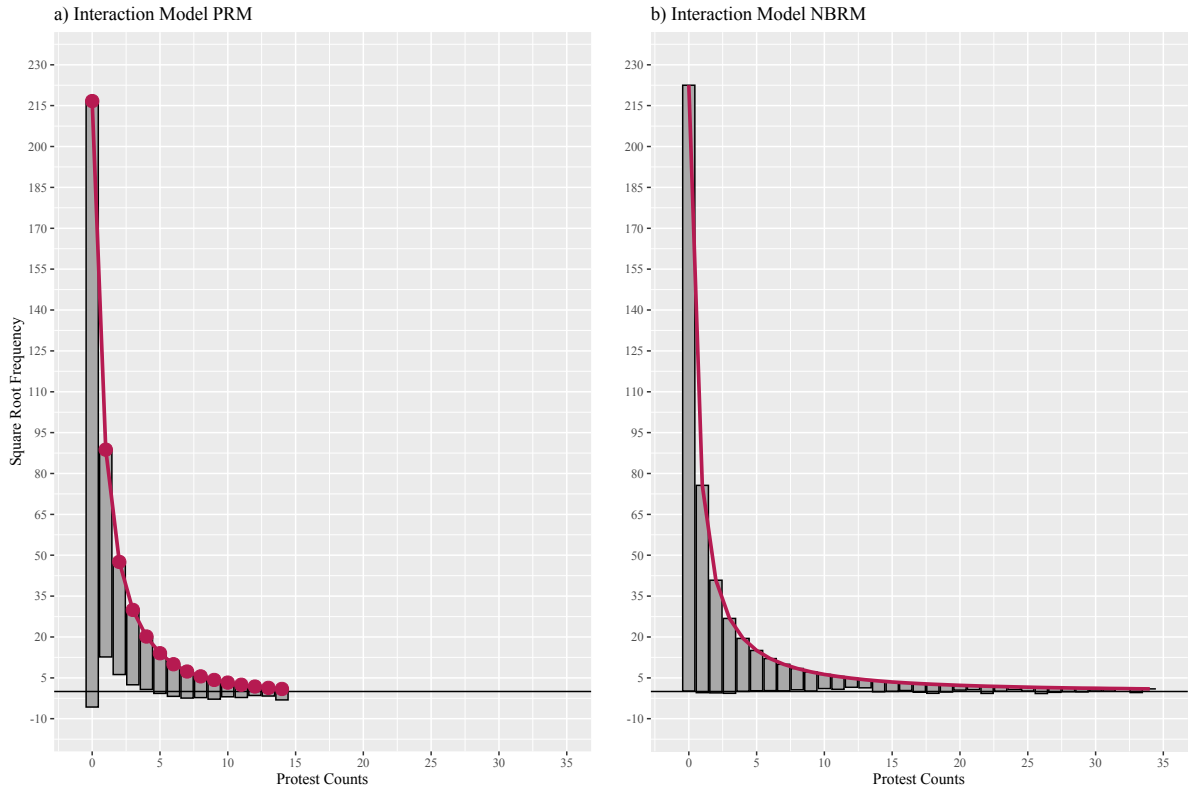
**Figure 8. Contrasting the AIC of the H1-H4 NBRMs and PRMs**



outperform the PRMs, no matter the model specifications. The NBRMs thus have a better model fit than the PRMs, making the conclusions drawn from them more accurate and reliable. Furthermore, following the example set by Cameron and Trivedi (2013), a series of likelihood-ratio (LR) tests is computed which compare the null hypothesis that $\alpha = 0$ (equidispersion) against the alternative that $\alpha > 0$ (overdispersion) to assess whether the assumption of equidispersion is met. The results suggest that overdispersion, despite the inclusion of relevant regressors, remains a problem and that the NBRMs are the more appropriate models for the data. All of the computed tests support a rejection of the null hypothesis. As expected previously, the PRMs are struggling to handle the overdispersion that is present in the data.[69]

Considering that the previously presented statistics are only able to identify more general issues related to the model fit of a specific model, several rootograms are generated as well. These visual representations of the model fit compare "observed and expected values graphically by plotting histogram-like rectangles or bars for the observed frequencies and a curve for the fitted frequencies, all on a square-root scale" (Kleiber & Zeileis, 2016, p. 3). In doing so, they allow for a close-up examination of a model's performance, complementing and refining formal approaches and fit metrics. Two representative, hanging rootograms for the

**Figure 9. Hanging Rootograms Comparing Interaction Effects PRM and NBRM**




[69] The extremely small p-values ($< 2.2e^{-16}$) of the conducted tests provide strong statistical evidence in support of rejecting the null hypothesis that a PRM is sufficient. For more on the results, consult the submitted R scripts.

computed PRMs and NBRMs are presented in Figure 9.[70] Kleiber and Zeileis (2016) suggest that when examining rootograms, it is essential to focus on the fit of the zero count and patterns of deviations. These 'runs' of deviations can identify specific aspects of the model fit that may warrant further attention. Bars that extend beyond the horizontal reference line at zero suggest that the respective value is being underfitted while bars that do not extend past it suggest overfitting of the values. The plot for the PRM clearly shows that zero counts are strongly underfitted, while counts one and two are overfitted. The overall wave-like pattern of over- and underfitting indicates that the PRM, just as the formal tests hinted at, suffers from a substantial amount of overdispersion, the lack of fit for zero values additionally indicates an issue with excess zeros. In stark contrast to this, the NBRM rootogram shows a much-improved fit of the underlying data. Not only is the zero count no longer being underfitted, but the other counts also much more closely trace the horizontal reference line with no signs of strong overfitting or underfitting.

Having identified the best-fitting set of models and most appropriate estimation technique, the following Table 3 presents the NBRMs' coefficients and estimation results.[71] All of the following models are run using country-fixed effects to account for any unobservable, time-invariant, country-specific effects that could influence the number of protests. This is suggested by, inter alia, the likes of De Mesquita and Smith (2010) who point to, for example, the effects that variation in underlying protest norms can have on protest activity in countries. Comparing the model fit and results of models without and with country-fixed effects suggests that their incorporation is sound, improving the performance of the models and consequently their results.[72]

[70] The hanging rootograms for the other computed regression models, i.e., the Binary- and the Duration Model can be found in Figure A4 in the Appendix. They closely resemble the hanging rootogram presented here, which is why it was chosen not to include them in the main corpus. The dots that are present on the red curve for the PRMs reflect the present issues with overdispersion with the different data counts and are displayed deliberately.

[71] The PRM counterpart to the model presented in Table 3 can be found in the Appendix in Table B1. Apart from the coefficient sign for commodity prices having a positive sign in the PRM table, the other coefficients are similar in size and sign. The main difference is the loss in significance across a number of coefficients when estimating the same models using an NBRM. This was expected however, as a violation of the equidispersion assumption can affect the estimations of statistical significance, making them overly sanguine.

[72] Table B2 in the Appendix shows both NBRMs with and without country-fixed effects, underlining the importance of including them. As the models presented here unequivocally show, including country-fixed effects not only improves the model fit but also leads to changes in the coefficient sign and significance. The shutdown duration variable's coefficient loses its statistical significance and changes its sign for example, as do the interaction effects coefficients.

**Table 3. NBRMs for H1 through H4**

| | *Dependent variable:* | | |
|---|---|---|---|
| | Daily Nonviolent Protest Count (ACLED) | | |
| | Binary Model | Duration Model | Interaction Model |
| | (1) | (2) | (3) |
| Shutdown binary (t-1) | 0.146** | | |
| | p = 0.006 | | |
| Shutdown duration (linear) | | 0.002 | 0.003 |
| | | p = 0.399 | p = 0.198 |
| Shutdown duration (quadratic) | | -0.00002 | -0.00002 |
| | | p = 0.257 | p = 0.186 |
| Shutdown duration (cubic) | | 0.00000003 | 0.00000003 |
| | | p = 0.249 | p = 0.268 |
| Organizational capacity | 0.001*** | 0.001*** | 0.001*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Internet access (%) | 0.053*** | 0.053*** | 0.053*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Regime type (continuous) | -0.393 | -0.452 | -0.457 |
| | p = 0.130 | p = 0.081 | p = 0.078 |
| C19 stringency (t-1) | -0.003*** | -0.003*** | -0.003*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Urbanization (%) | -0.036 | -0.037 | -0.039 |
| | p = 0.131 | p = 0.112 | p = 0.103 |
| Youth population (%) | -0.587*** | -0.573*** | -0.568*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Commodity price changes | -0.001 | -0.001 | -0.001 |
| | p = 0.238 | p = 0.228 | p = 0.267 |
| GDP growth | -0.017** | -0.017** | -0.017** |
| | p = 0.002 | p = 0.002 | p = 0.002 |
| Weekend (comp. no weekend) | -0.493*** | -0.493*** | -0.493*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Shutdown duration * Internet access | | | 0.0001 |
| | | | p = 0.486 |
| Shutdown duration * Organizational capacity | | | -0.00001 |
| | | | p = 0.331 |
| Constant | 9.110*** | 8.944*** | 8.903*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Country Fixed Effects | Yes | Yes | Yes |
| Observations | 58,811 | 58,811 | 58,811 |
| Log Likelihood | -31,220.420 | -31,223.050 | -31,221.880 |
| theta | 0.624*** (0.015) | 0.623*** (0.015) | 0.623*** (0.015) |
| Akaike Inf. Crit. | 62,506.850 | 62,516.110 | 62,517.750 |
| *Note:* | | | *p<0.05; **p<0.01; ***p<0.001 |

The Binary Model in the presented output features a dichotomous operationalization of an internet shutdown, lagged by one day, and a statistically significant coefficient.[73] When a shutdown is implemented by a country in the SSA, the log count of the number of protests is expected to increase by 0.146 on the day following that shutdown. In incidence rate ratios (IRRs), this translates to an expected increase, when holding the other variables constant, of 15.7% in the incidence rate of protest numbers per country day.[74] Overall, these results from the SSA context corroborate the findings from previous works on the shutdown-dissent nexus. The implementation of internet shutdowns does not seem to quash dissent, as the actors behind them hope, but instead promotes protest activity.[75] Although not directly related to the hypotheses, these results emphasize the importance of considering the impact of shutdowns on the number of protests in SSA countries.

Turning now to the duration of shutdowns and its expected effects on the number of protests in SSA countries. While previous results provided by Rydzak (2018) suggest a peak-and-trough dynamic, this thesis remained more open as to the expected effects of a shutdown in the short- and long-term but modeled the included variables in a manner that controls for the suggested presence of nonlinearities. Also, instead of operationalizing shutdowns and their duration in a categorical manner by artificially defining a threshold (such as a week), this thesis chose to operationalize them continuously, using a count of days instead. As it can be difficult to assess the exact effect of a variable by just looking at the coefficients, their size, and sign, marginal effects (ME) plots are created for both the duration coefficients and the interaction effects. Given that the models control for country-fixed effects, however, presenting a single ME plot would not yield any meaningful insight, as holding the country-fixed effects at their

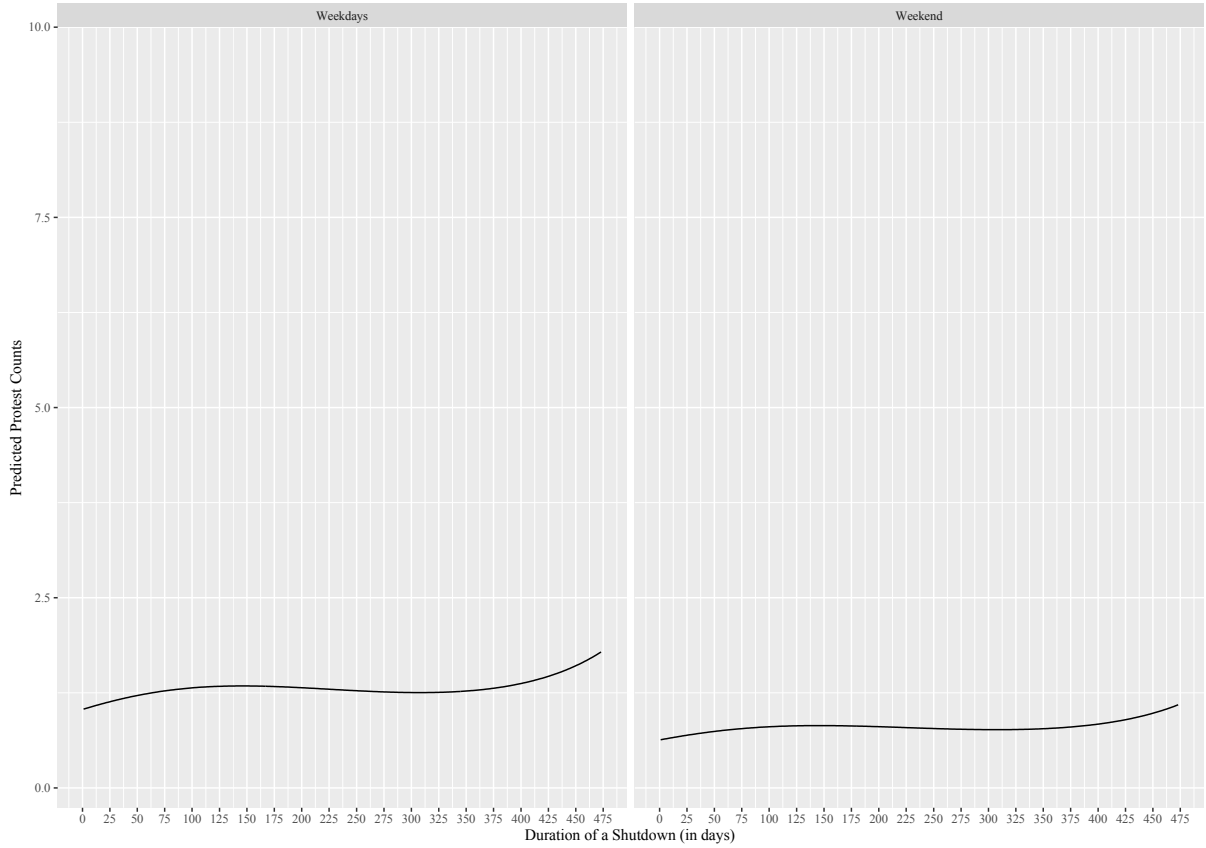
[73] A comparison of different time lags between one and five days supports the appropriateness of using a one-day time lag. Table B3 in the Appendix shows that the model with the one-day lag, although differences are small, fits the data the best. Also, no matter the time lag specification, the coefficient remains positive and similar in magnitude as well as significance. Moreover, the coefficients here suggest that the effects of shutdowns on protests persist over time, although the effect varies.

[74] For more on the interpretation of NBRMs and their results, consult the material provided by the University of California, Los Angeles: Statistical Consulting Group (n.d.). The IRRs are calculated by exponentiating the coefficients found in the model output. When interpreting the other coefficients and their impacts on the counts of protest events in SSA, *ceteris paribus* is always implied. To calculate the percentage change in IRRs, the coefficient values $\beta$ are plugged into this formula: $IRR\% = \left(e^{\beta} - 1\right) * 100$.

[75] The naïve models support these findings, also featuring positive and statistically significant coefficients for the binary operationalization of shutdowns. See the Appendix and Table B4 for the respective tables.

average value is not meaningful, since the concept of an 'average country' is not intuitive. Instead, it is decided to create plots for 23 out of the 25 countries included in the analysis and compare them (the full sets of ME plots can be found in the Appendix in Figures A5-7). Plots for South Sudan and Eritrea could not be generated because they were automatically excluded from the analysis due to missing data on GDP-related variables. As they are rather similar, the plot shown here for the DRC in Figure 10 is selected to represent these plots and the dynamics portrayed in them. The x-axis represents the number of days that a shutdown has been active, while the y-axis reflects the estimated number of protests for the DRC, holding all other variables at their respective means. To factor in the varying effects of the different days of the week, the plot is facetted by whether or not the day is considered to be a weekend (Friday, Saturday or Sunday) or whether it is a weekday. As the changing signs of the coefficients in the Duration- and Interaction Models already hinted at, the relationship is found to vary over time. While there is an initial, small increase in the predicted number of daily protests (which for the DRC lies around one protest event), there is an inflection point at around 125 days after which the predicted number of protests decreases slightly. A second inflection point is followed later at around the 350-day mark, where a slight uptick in the predicted number of protest events can be observed. The pattern, across all countries plotted, reflects a differently strongly pronounced, horizontal S-curve. The 95% confidence intervals shown as grey areas around the line, increase

**Figure 10. ME Plot Shutdown Duration and Predicted Protest Counts in the DRC**



over time, which was to be expected however as the number of observations in the data set decreases. There are only a handful of countries that have experienced shutdowns that were multiple hundred days long, with the DRC being one of them. Although the effects are not found to be statistically significant at conventional levels, which is also reflected by the strongly fluctuating confidence intervals, they do present an interesting story. As the binary coefficient suggested, shutdowns seem to have a positive effect on the number of protest events, no matter the country observed here. While this effect seemingly weakens over time, the ME plot(s) suggest that, with a considerable degree of uncertainty, the number of predicted protest events increases again over the long term. While this only provides suggestive evidence of the effects of the duration of shutdowns in the SSA, they seem to be leaning more towards support for the short-term flare-up hypothesis than the short-term suppression one. Moreover, given the dynamics presented here, there is probationary evidence that even in the longer term, shutdowns continue to spur protests, with a slight uptick in predicted events around the one-year mark. The provided evidence thus leans toward supporting the long-term surge hypothesis instead of its deterrence counterpart. Instead of the peak-and-trough dynamic found previously, the findings presented here suggest a peak-trough-peak dynamic, with the estimated amount of daily protests surging in the short term, slowing after the first inflection point, and increasing again after the second. On weekends, this effect is lowered, however, as the lower predicted counts across all plots suggest.

In addition to operationalizing the temporal effects in a continuous manner, it was also decided, to improve comparability with previous results and to check the robustness of the presented findings, to operationalize them categorically. This scheme of operationalization was inspired by Rydzak (2018) and uses a three-level categorical variable to test the temporal effects of shutdowns. With zero representing no shutdowns, one representing a shutdown in its first week (seven days or less) and two representing shutdowns in their second and consecutive weeks. While the estimated coefficients, presented in Table 4, are largely insignificant, their differing magnitudes suggest a peak-and-trough dynamic similar to what was found by Rydzak (2018). Shutdowns in their first week are found to have a higher effect on the log count of the number of protests than shutdowns in their second and consecutive weeks, when compared, respectively, to periods without a shutdown. This largely mirrors the effects found in the Duration- and Interaction Model, suggesting that the relationship holds across different specifications. Contrary to the continuous operationalization, the categorical operationalization hides the variation in longer-term effects of shutdowns, however, only predicting lower levels of protest activity. This model also provides suggestive support for the short- and long-term

surge hypotheses, as protest activity continues to be heightened through the implementation of a shutdown. The significant effect found in the Temporal Model for the first week coefficient disappears in the Temporal Interaction Model, suggesting that the direct effect and its significance are likely dependent on the levels of the interacting variables. Similar to the Interaction Model in the table above, the interaction effects in the categorical model are also not statistically significant but maintain the same direction.

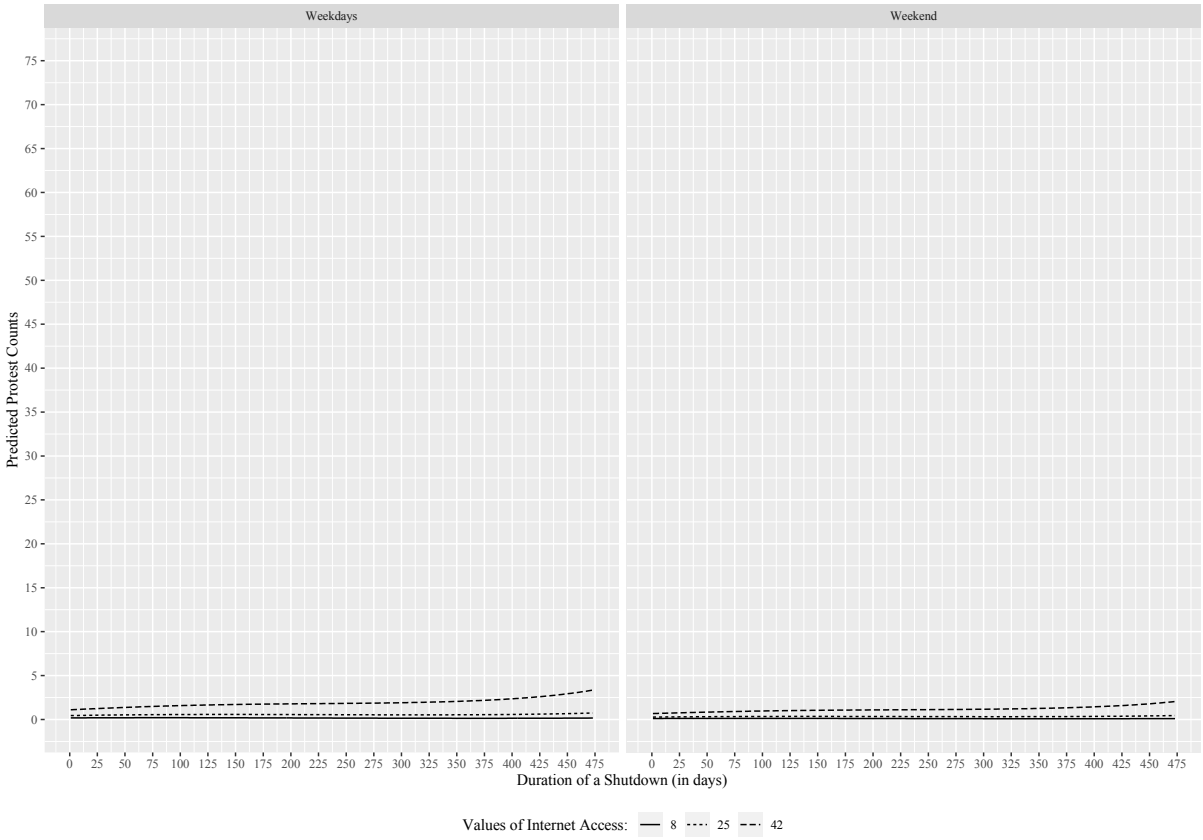
When considering the key conditioning variables, internet penetration, and organizational capacity, the included coefficients in Table 3 suggest that, across all three models, both have a positive and statistically significant effect. Thus, ceteris paribus, a one

**Table 4. NBRMs with Categorical Operationalization to Test Time-Varying Effects**

| | *Dependent variable:* | |
|---|---|---|
| | Daily Nonviolent Protest Count (ACLED) | |
| | Temporal Model | Temporal Interaction Model |
| | (1) | (2) |
| Shutdown week 1 | 0.617*** | 0.350 |
| | p < 0.001 | p = 0.195 |
| Shutdown week 2+ | 0.094 | 0.082 |
| | p = 0.101 | p = 0.417 |
| Organizational capacity | 0.001*** | 0.001*** |
| | p < 0.001 | p < 0.001 |
| Internet access (%) | 0.053*** | 0.053*** |
| | p < 0.001 | p < 0.001 |
| Shutdown week 1 * Internet access | | 0.011 |
| | | p = 0.276 |
| Shutdown week 2+ * Internet access | | 0.010 |
| | | p = 0.190 |
| Shutdown week 1 * Organizational capacity | | -0.00002 |
| | | p = 0.961 |
| Shutdown week 2+ * Organizational capacity | | -0.001 |
| | | p = 0.139 |
| Constant | 9.000*** | 9.055*** |
| | p < 0.001 | p < 0.001 |
| Country Fixed Effects | Yes | Yes |
| Observations | 58,811 | 58,811 |
| Log Likelihood | -31,210.160 | -31,208.140 |
| theta | 0.626*** (0.015) | 0.626*** (0.015) |
| Akaike Inf. Crit. | 62,488.320 | 62,492.280 |
| *Note:* | *p<0.05; **p<0.01; ***p<0.001 | |
| | Control variables are included but not shown. | |

percent increase in the annual levels of internet access in a country is expected to increase the log count of the number of protests by 0.053 and a one-unit increase in the organizational capacity is expected to increase it by 0.001. The former's sign and significance support the idea that is prevalent in the literature on ISM and protests that the ISM act as enablers of protest and can spur their mobilization. Thus, offering an interesting finding in that regard for the SSA. Furthermore, as has been suggested by much of the extant literature, organizational capacity also has a positive effect on the future mobilization of protests. To test the hypothesized conditioning effect of internet access and organizational capacity on the effect of an internet disruption, two interaction effects between the shutdown duration and the respective variables were included in the model. To better understand their effects, an ME plot for each country, similar to the plot for the duration itself is created.[76] Figure 11 presents the interaction effect for Nigeria, selected to represent the dynamics found in the other countries. The levels of internet penetration shown in the visualization represent the rounded mean and singular standard deviations from that mean. As one can tell from looking at the plot, with an increase in the levels of internet access, the predicted number of protests is estimated to climb. This

**Figure 11. ME Plot Internet Penetration and Shutdown Duration Effects on Protest Counts in Nigeria**

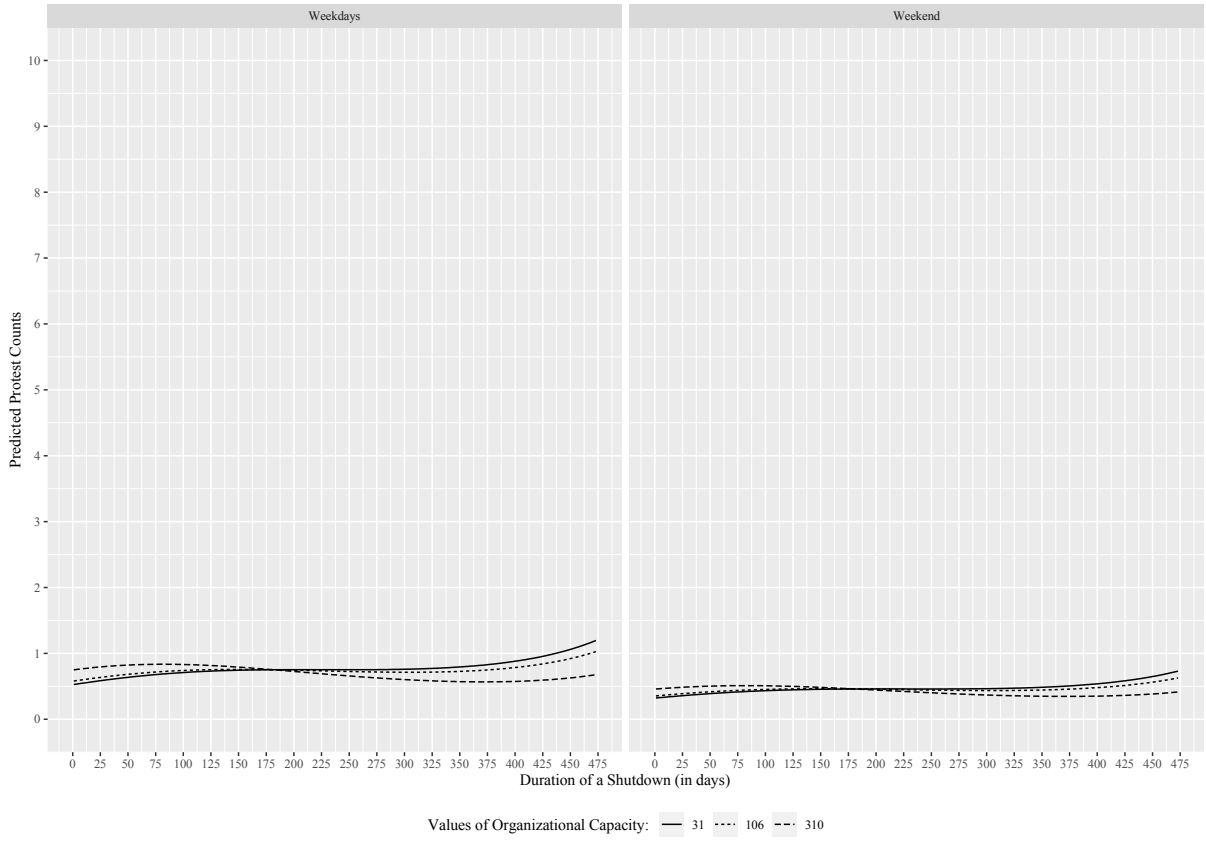



[76] This, again, excludes South Sudan and Eritrea.

effect, while growing more uncertain over time, is estimated to increase the longer a shutdown is active, with higher levels of internet penetration being linked to higher predicted counts of protests. Although the effect is not statistically significant at conventional levels, it does lend some support to the third hypothesis that the effects of shutdowns are augmented by increasing levels of internet penetration. The more people actively use the internet in a country, the higher the immediate frustration when a shutdown is implemented, which leads them to take to the streets more frequently. Also, in the longer term, as shutdowns are more and more circumvented and citizens get used to them, higher levels of internet access are expected to increase the protest activity with the ISM reclaiming their role as enablers of protests.

A similar plot (Figure 12) is presented to scrutinize the interaction between the duration of a shutdown and the organizational capacity of protests. The plot portrayed shows the predicted count of protest events for Sudan, which was again selected to represent the findings for the other countries. Holding all other variables at their respective mean, the different levels of organizational capacity, which is operationalized as a rolling tally of protests that occurred in the 365 days before the date under observation, suggest a variable effect over time. Similar to the plots presented for the duration variable, the plots for this interaction effect are characterized by a horizontal S-shape. Up until around 175 days, higher levels of organizational

**Figure 12. ME Plot Organizational Capacity and Shutdown Duration Effects on Protest Counts in Sudan**



capacity seemingly boost the occurrence of protests during shutdowns. After this point, the relationship seems to reverse, with higher levels of organizational capacity dampening the predicted amount of protests. Although the predictions get less precise the longer the duration, this reversal presents an interesting and unexpected finding that was not apparent from the coefficient alone. The dynamics suggest that organizational capacity becomes a hindrance to protest activity the longer a shutdown is going on. This could speak to the spontaneity of mobilization during shutdowns but also to their uniqueness.[77] The findings presented here do seem to lend some, although tentative support to the fourth hypothesis.

Out of the remaining control variables presented in Table 3, only the weekend indicator, the Covid-19 stringency index, the youth bulge variables, and the GDP growth are statistically significant. The former suggests that, in contrast to what one would theoretically expect, the log count of the number of protests is expected to decrease by 0.493 when compared to weekdays. The Covid-19 stringency index coefficient, which reflects the stringency of the measures implemented by governments to combat the pandemic, suggests that an increase in the stringency of the measures to contain the spread of Covid-19 is expected to decrease the number of protests on the following day. This is in line with what one would have theoretically expected and supports the notion that increasingly harsh restrictions on the freedom of assembly and related policies discourage people from taking to the streets. Contrary to findings from the current literature, the proportion of youth in a country, as controlled for using the proportion of 15 to 24-year-olds, is found to be negative. The negative and significant effect of the annual GDP growth variable supports current findings and grievance-oriented explanations of protests, suggesting that when countries are better off economically, they should experience lower levels of protest. Control variables like the regime type, commodity price changes, and the urbanization rate also go in a direction opposite to what one would expect theoretically, they are statistically insignificant, however.

### 5.2 Shutdown Variations and their Effects on Protests

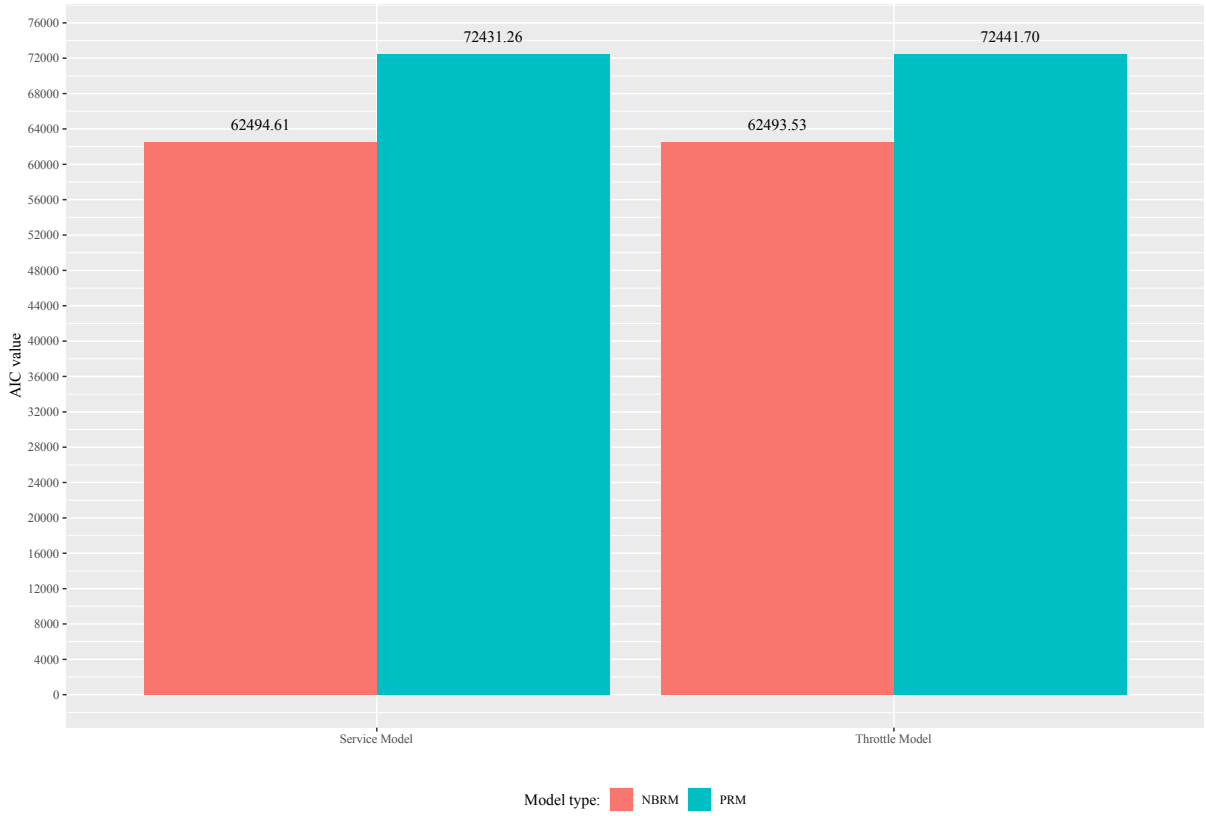
Full shutdowns are, as the previous results corroborate, significant predictors of protest activity in SSA countries – at least during the period presently under observation. In this subsection, given that shutdowns are not homogenous events and that, globally, governments are seemingly shifting away from the implementation of full shutdowns, an analysis of the effect of shutdown

[77] It is important to highlight however that the diverging effects are marginal and that they might not be able to be told apart, as the overlapping confidence intervals suggest. One can only draw very vague conclusions from this. Similarly, to the ME plot in Figure 11, the values of organizational capacity plotted were chosen because they represent relevant values in the underlying data.

variations on country-day protest counts in SSA is presented. The study of such variations, namely the speed and depth of shutdowns, is a first and as such, the evidence presented here actively pushes the boundaries of what is currently known in the literature on the shutdown-dissent nexus.

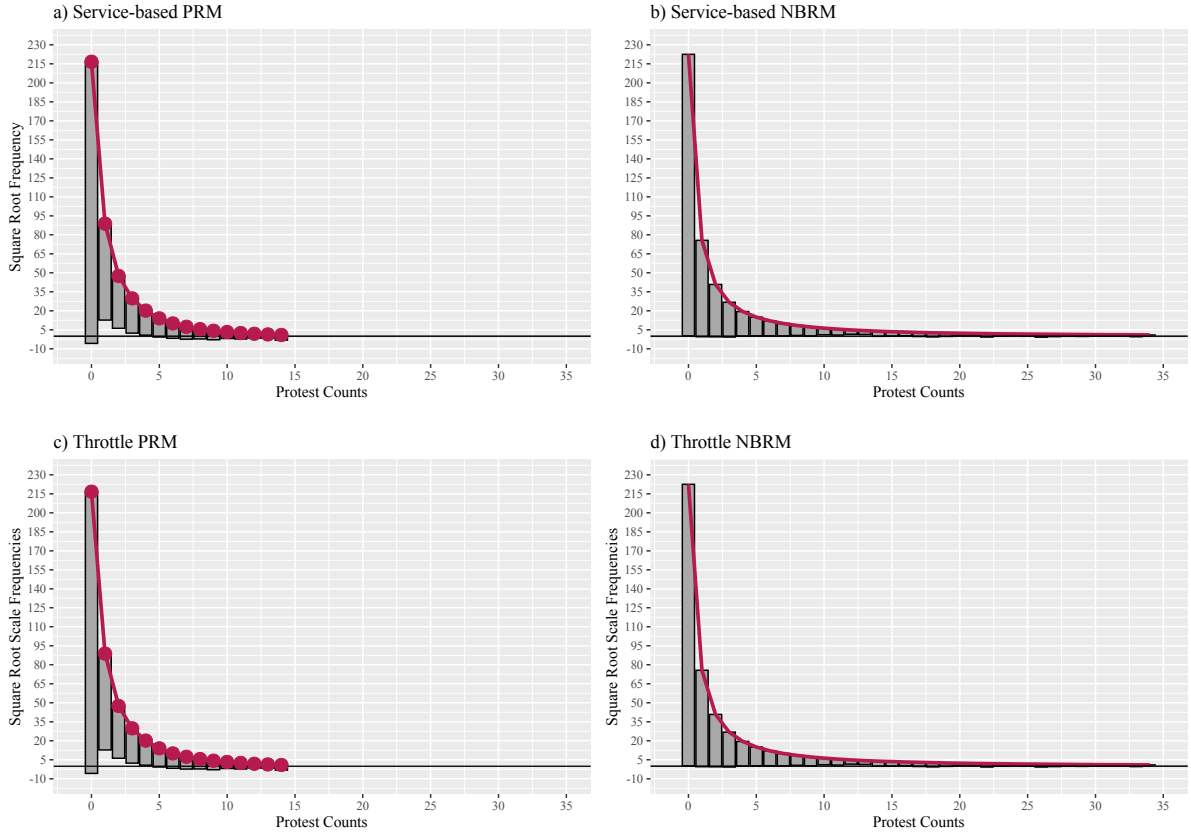
To perform the analysis, the previously outlined data and analysis strategy are used, with shutdown variations being coded as three-level, categorical variables, respectively. Where a zero represents no shutdown on a country-day, a one represents a full shutdown and a two represents the variation in question. A model is computed for each type of shutdown in question, mostly mirroring the models used earlier but replacing the binary shutdown indicator with the

**Figure 13. AIC Comparison of H5 & H6 NBRMs and PRMs**




three-level indicator for a shutdown. This way of operationalizing shutdown variations allows one to not only test their effects on the protest activity in SSA, but to also factor in the effects of full shutdowns while doing so. Which is, given the findings above, important. Figure 13 shows that in both cases, the NBRM versions of the models outperform their PRM counterparts. Given the similarity of the models in this section with the models in the previous section and the fact that the underlying data remains the same, this resembles a foreseeable conclusion. Similarly, the generated rootograms in Figure 14 for the new Service- and Throttle Models support that, overall, the presented NBRMs provide the best fit for the data. Not only do they avoid underfitting zero values, but they also do not encounter overdispersion issues, which

**Figure 14. Hanging Rootograms Comparing H5 & H6 NBRMs and PRMs**




PRMs are not equipped to handle. Instead, the expected and observed frequencies closely match one another, and there are no patterns of over- or underfitting in either of the NBRMs.

It is thus the NRBMs with all control variables included as well as country-fixed effects that fit the data the best and which are used here to estimate the effects of shutdown variations on protest activity in SSA countries. As Table 5 shows, while both coefficients for the service-based shutdowns and throttles are positive and similar in magnitude, only the latter's coefficient is statistically significant at levels considered meaningful for scientific research.[78] Compared to days without shutdowns, a throttle at time t-1 is found to be associated with an increase of 0.119 in the log count of the number of protests (or 12.64% in the incidence rate) on the subsequent day. Similarly, service-based shutdowns are found to, when implemented, increase the log count of the number of protests on the following day by 0.147 or 15.84%. As this coefficient is not significant, however, one should be cautious when using it to make inferences. A notable trend visible in the table becomes apparent when comparing the coefficients for the shutdown variation variables with their full shutdown counterparts. It appears that, particularly when considering the Throttle Model, the effects of a full shutdown on protests are substantially

[78] A naïve version of the models presented in Table 5 can be found in Table B5 in the Appendix.

**Table 5. NBRMs to Test H5 & H6**

| | *Dependent variable:* | |
|---|---|---|
| | Daily Nonviolent Protest Count (ACLED) | |
| | Service-based Model | Throttle Model |
| | (1) | (2) |
| Service-based shutdown (t-1; comp. no shutdown) | 0.147 | |
| | p = 0.054 | |
| Throttle (t-1; comp. no shutdown) | | 0.119* |
| | | p = 0.026 |
| Shutdown (t-1; comp. no shutdown) | 0.136 | 1.492*** |
| | p = 0.068 | p < 0.001 |
| Organizational capacity | 0.001*** | 0.001*** |
| | p < 0.001 | p < 0.001 |
| Internet access (%) | 0.053*** | 0.054*** |
| | p < 0.001 | p < 0.001 |
| Regime type (continuous) | -0.392 | -0.399 |
| | p = 0.132 | p = 0.124 |
| C19 stringency (t-1) | -0.003*** | -0.003*** |
| | p < 0.001 | p < 0.001 |
| Urbanization (%) | -0.036 | -0.036 |
| | p = 0.128 | p = 0.122 |
| Youth population (%) | -0.587*** | -0.593*** |
| | p < 0.001 | p < 0.001 |
| Commodity price index | -0.001 | -0.001 |
| | p = 0.242 | p = 0.218 |
| GDP growth | -0.017** | -0.017** |
| | p = 0.002 | p = 0.002 |
| Weekend (comp. no shutdown) | -0.494*** | -0.493*** |
| | p < 0.001 | p < 0.001 |
| Constant | 9.125*** | 9.252*** |
| | p < 0.001 | p < 0.001 |
| Country Fixed Effects | Yes | Yes |
| Observations | 58,806 | 58,811 |
| Log Likelihood | -31,213.300 | -31,212.770 |
| theta | 0.624*** (0.015) | 0.623*** (0.015) |
| Akaike Inf. Crit. | 62,494.610 | 62,493.530 |
| *Note:* | | *p<0.05; **p<0.01; ***p<0.001 |

larger than the effects of a throttle. According to this model, when compared to days without shutdowns, days with shutdowns are expected to increase the log count of the number of protests on the subsequent day by 1.149, which equals an increase in the incidence rate of 215.5%. For service-based shutdowns on the other hand, although both coefficients are

insignificant, the marginally larger size of the coefficient for the variation hints at a reversal of these effects. The coefficients in Table 5 for the shutdown variations thus lend support to hypothesis six but no conclusive support for hypothesis five. Throttles are found to increase the incidence of protests, although to a much lesser degree than full shutdowns. This makes inherent sense, however, as throttles represent a less drastic disruption of the flow of information and everyday life. Therefore, they can be expected and are likely to cause fewer grievances and in turn, do not spur the mobilization of protests as much. Service-based shutdowns on the other hand seem to spark more protests than their full counterparts. This could be explained by the nature of service-based shutdowns, which are easier to circumvent while still creating and increasing the buildup of grievances among the population. The creation of grievances paired with an easier circumvention, as other online channels remain available, provides more fertile ground for the emergence of protests than the environment of a full shutdown. Considering the lack of statistical significance and small differences in magnitudes, it is advisable to approach this conclusion with a degree of caution, however.

The control variables included are similar in size, direction, and significance to the ones in the models used to test hypotheses one through four, underlining their reliability across different model specifications. In addition, similar to the checks performed for the Binary Model, the appropriateness of the lags was assessed for the present models as well. Table 6 presents the coefficients for both models with lags varying from the incorporated one-day lag over a three-day lag to a five-day lag. A look at the first set of coefficients for the service-based shutdowns suggests that the chosen lag is appropriate. Although there are changes in size across the different model specifications, the signs and significance do not suddenly change. Also, the AIC of all three models is similar. Interestingly, when including a five-day lag in Model 3, the

**Table 6. Comparing Different Lag Specifications for the H5 & H6 NBRMs**

| | *Dependent variable:* | | | | | |
|---|---|---|---|---|---|---|
| | Daily Nonviolent Protest Count (ACLED) | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Service-based (t-1) | 0.147<br>p = 0.054 | | | | | |
| Service-based (t-3) | | 0.096<br>p = 0.214 | | | | |
| Service-based (t-5) | | | 0.126<br>p = 0.099 | | | |
| Throttle (t-1) | | | | 0.119*<br>p = 0.026 | | |
| Throttle (t-3) | | | | | 0.085<br>p = 0.113 | |
| Throttle (t-5) | | | | | | 0.119*<br>p = 0.027 |
| Shutdown (t-1) | 0.136<br>p = 0.068 | | | 1.492***<br>p < 0.001 | | |
| Shutdown (t-3) | | 0.142<br>p = 0.057 | | | 1.644***<br>p < 0.001 | |
| Shutdown (t-5) | | | 0.156*<br>p = 0.036 | | | 1.375***<br>p < 0.001 |
| Constant | 9.125***<br>p < 0.001 | 9.155***<br>p < 0.001 | 9.120***<br>p < 0.001 | 9.252***<br>p < 0.001 | 9.208***<br>p < 0.001 | 9.215***<br>p < 0.001 |
| Country Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 58,806 | 58,806 | 58,806 | 58,811 | 58,811 | 58,811 |
| Log Likelihood | -31,213.300 | -31,210.970 | -31,217.130 | -31,212.770 | -31,208.730 | -31,214.160 |
| theta | 0.624***<br>(0.015) | 0.624***<br>(0.015) | 0.624***<br>(0.015) | 0.623***<br>(0.015) | 0.624***<br>(0.015) | 0.624***<br>(0.015) |
| Akaike Inf. Crit. | 62,494.6 | 62,489.940 | 62,502.270 | 62,493.530 | 62,485.460 | 62,496.320 |

*Note:* *p<0.05; **p<0.01; ***p<0.001

Control variables are included but not shown.

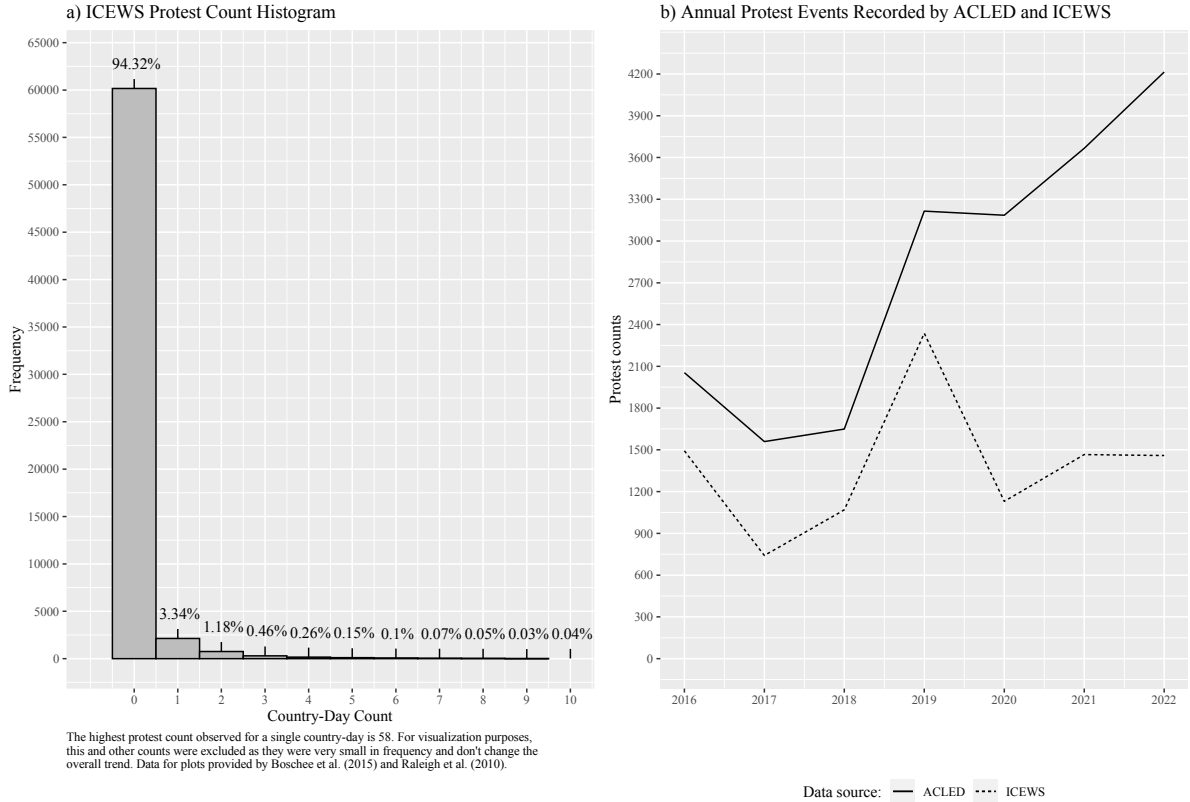
coefficient for a full shutdown becomes statistically significant at the 95% level, suggesting that the effects of shutdowns can seemingly linger on. This requires further testing however and represents a rather cautious conclusion. When considering the variations of the Throttle Model, the continued significance and similar size of the shutdown variable underlines the reliability of the previous conclusion that shutdowns have a lingering effect and that they have an effect that is larger in magnitude than that of a throttle. The coefficients for the throttle variable itself remain positive and similar in size. When using a three-day lag, the coefficient loses

significance, however, and decreases in size. While this casts some doubt as to the reliability of the previous conclusions, the similar AICs and signs of the coefficients still suggest that throttles have a positive effect on protests. The varying levels of significance, point to something that has not been considered here or in other studies before, which is, that the timing of a shutdown in relation to protests can play an important role in its impact on such. This is not considered more closely here but deserves further attention in the future.

## 5.3 Robustness Checks

To assess the robustness of the previously presented findings and considering the breadth of data available, it is decided to use a different operationalization of the dependent variable. Instead of the previously used data on nonviolent protest numbers in SSA countries provided by ACLED, this section presents regression results using ICEWS, machine-coded data. As depicted in Figure 15b, using different data sets is crucial as they can vary significantly in the events and subsequently trends that they capture. While both ACLED and ICEWS data indicate comparable trends until 2019, they exhibit substantial divergence in the number of protests recorded for SSA countries in the subsequent years. Therefore, assessing the reliability of the previous estimates by using another reputable source for event-level protest data can further reinforce our conclusions. This has been done by previous works in the field as well and

**Figure 15. ICEWS SSA Protest Count Histogram and Trend Comparison (2016-2022)**




The highest protest count observed for a single country-day is 58. For visualization purposes, this and other counts were excluded as they were very small in frequency and don't change the overall trend. Data for plots provided by Boschee et al. (2015) and Raleigh et al. (2010).

provides a good test of the reliability of the findings presented above. The histogram in Figure 15a displays the distribution of events in the ICEWS data set. As already suggested by the line plot next to it and the summary statistics table above, the ICEWS data counts fewer events, increasing the zero count to 94.32% instead of 85.26% in the ACLED data. But the distribution is, overall, similarly skewed rightward and not normal, making the use of count regression models and the previously employed strategy appropriate. Further analysis of the data suggests notable overdispersion, as evidenced by a mean-variance ratio of 8.6, computed using the sample mean of 0.15 and a sample variance of 1.30. This ratio significantly diverges from the mean-variance characteristics observed in the ACLED data set, in that it is larger. Suggesting again that models, such as the NBRM, which can more naturally account for such overdispersion are better suited to analyze the data. The hanging rootograms in Figure A8 and formal LR tests confirm that the NBRM is the more appropriate model and fits the data better than an equally specified PRM. The rootograms, while suggesting a poorer model fit than with the ACLED data, furthermore, do not suggest any issues with zero inflation.

Table 7 presents the results of a set of NBRMs mirroring the NBRMs in Table 3 used to test hypotheses one through four but using ICEWS data instead. Overall, the model coefficients presented here bear out results that closely mirror the ones presented in Table 3 previously. There are however some differences that require further attention and point to the need to further explore the relationship at hand. Notably, while the signs of the coefficients remain similar (except for the interaction effects and the commodity price variable), the coefficients show a higher level of statistical significance when running the analysis using the ICEWS data. The coefficients for the shutdown duration variable, be they linear or polynomial, keep their signs but are now statistically significant at levels considered relevant for scientific research. Plotting them in the form of ME plots reveals a similar, horizontal S-curve describing the relationship between the duration of a shutdown and the predicted protest levels (see Figure A9 in the Appendix for all ME country plots). In contrast to the estimations using the ACLED data, the inflection points have shifted forward and the curves tend to show more pronounced changes. But the overall dynamic seems to bear out the relationship described before, providing more support for the short- and long-term surge hypotheses. The binary shutdown variable remains positive and statistically significant, supporting the previous finding that shutdowns, at t-1, increase the number of protests on the subsequent day. Regarding the interaction effects

**Table 7. NBRMs Robustness Checks for H1 through H4 Models**

| | *Dependent variable:* | | |
|---|---|---|---|
| | Daily Nonviolent Protest Count (ICEWS) | | |
| | Binary Model | Duration Model | Interaction Model |
| | (1) | (2) | (3) |
| Shutdown binary (t-1) | 1.146*** | | |
| | p < 0.001 | | |
| Shutdown duration (linear) | | 0.023*** | 0.025*** |
| | | p < 0.001 | p < 0.001 |
| Shutdown duration (quadratic) | | -0.0002*** | -0.0002*** |
| | | p < 0.001 | p < 0.001 |
| Shutdown duration (cubic) | | 0.0000003*** | 0.0000003*** |
| | | p < 0.001 | p < 0.001 |
| Organizational capacity | 0.001*** | 0.001*** | 0.001*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Internet access (%) | 0.032*** | 0.032*** | 0.032*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Regime type (continuous) | -3.810*** | -3.767*** | -3.781*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| C19 stringency (t-1) | -0.007*** | -0.008*** | -0.008*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Urbanization (%) | -0.192*** | -0.196*** | -0.190*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Youth population (%) | -0.184* | -0.132 | -0.135 |
| | p = 0.033 | p = 0.125 | p = 0.117 |
| Commodity price changes | 0.001 | 0.001 | 0.001 |
| | p = 0.460 | p = 0.500 | p = 0.483 |
| GDP growth | -0.025** | -0.029*** | -0.028*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Weekend (comp. no weekend) | -0.492*** | -0.473*** | -0.474*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Shutdown duration * Internet access | | | -0.0002** |
| | | | p = 0.003 |
| Shutdown duration * Organizational capacity | | | 0.00002 |
| | | | p = 0.077 |
| Constant | 10.547*** | 9.738*** | 9.527*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Country Fixed Effects | Yes | Yes | Yes |
| Observations | 58,811 | 58,811 | 58,811 |
| Log Likelihood | -17,205.100 | -17,265.240 | -17,260.990 |
| theta | 0.125*** (0.004) | 0.123*** (0.004) | 0.123*** (0.004) |
| Akaike Inf. Crit. | 34,476.190 | 34,600.470 | 34,595.980 |
| *Note:* | | | *p<0.05; **p<0.01; ***p<0.001 |

coefficients, the results in Table 7 are more contradictory to the previously presented ones. Both change their signs from, respectively, positive to negative in the case of the interaction between the internet penetration rate and the shutdown duration, and from negative to positive for the other. Moreover, the former interaction effect's coefficient is now statistically significant at the 99% level. Plotting the interaction effect between the internet penetration level and the duration of a shutdown for the different countries reveals a strongly, S-shaped curve compared to the more linear relationship found previously using the ACLED data.[79] Interestingly, and in a similar fashion to the organizational capacity interaction effect described in Figure 12, the effect of internet penetration seems to vary over time. While it is found to first augment the effects that a shutdown has on protests by increasing the levels of protests, after roughly 200 days of a shutdown, this relationship is turned upside down. It is now lower levels of internet penetration that are found to be related to heightened protest activity during a shutdown. This points to an effect where the internet heightens the protest activity at first because its absence increases the short-term creation of grievances. In the longer term, however, higher levels of internet penetration seemingly become a burden to mobilization, as the long absence of the internet and the previously increased reliance increase the damage dealt to a country and its population. While it does lend support to hypothesis three in that the internet augments the effects of a shutdown, it describes a different relationship than found previously. In the short-term, higher levels of internet penetration increase the levels of protest while they affect it negatively in the long run. The change in significance and sign when using the ICEWS data instead of ACLED does support the need for further analysis and underlines the remaining uncertainties. This need for further analysis is also underscored by the change in the sign of the interaction effect between organizational capacity and duration. ME plots created using the Interaction Model from Table 7 display a dynamic that is different from the one previously presented.[80] While higher levels of organizational capacity still bolster protest activity during shutdowns, they are now predicted to do so throughout the entire duration of the shutdown. This is in contrast to the previously shown reversal of the relationship.

The remaining control variables are mostly similar in sign and significance. The coefficients for internet penetration, organizational capacity, weekend, annual GDP growth, and Covid-19 stringency maintain their signs and significance. The regime type and urbanization variables maintain their negative signs but are now statistically significant. While changing its sign, the commodity price coefficient remains insignificant. Lastly, the coefficient

[79] See Figure A10 for the internet penetration and shutdown duration interaction effect ME country plots. The weekend variable, as in the previous model and plots is also found to decrease the level of protest activity.
[80] See Figure A11 for the respective ME country plots.

controlling for the effect of youth bulges maintains its sign but loses its statistical significance.

Turning now to the models run using the ICEWS protest counts as a dependent variable and the model specifications used to test the shutdown variation hypotheses. Again, both formal tests and rootograms suggest that, to no surprise, the NBRMs fit the data better than their PRM

**Table 8. NBRM Robustness Checks of H5 and H6 Models**

| | *Dependent variable:* | |
|---|---|---|
| | Daily Nonviolent Protest Count (ICEWS) | |
| | Service-based Model | Throttle Model |
| | (1) | (2) |
| Service-based shutdown (t-1; comp. no shutdown) | 1.640*** | |
| | p < 0.001 | |
| Throttle (t-1; comp. no shutdown) | | 0.755*** |
| | | p < 0.001 |
| Shutdown (t-1; comp. no shutdown) | 0.624*** | 3.726*** |
| | p < 0.001 | p < 0.001 |
| Organizational capacity | 0.001*** | 0.001*** |
| | p < 0.001 | p < 0.001 |
| Internet access (%) | 0.035*** | 0.040*** |
| | p < 0.001 | p < 0.001 |
| Regime type (continuous) | -3.703*** | -3.748*** |
| | p < 0.001 | p < 0.001 |
| C19 stringency (t-1) | -0.007*** | -0.008*** |
| | p < 0.001 | p < 0.001 |
| Urbanization (%) | -0.188*** | -0.190*** |
| | p < 0.001 | p < 0.001 |
| Youth population (%) | -0.193* | -0.268** |
| | p = 0.026 | p = 0.003 |
| Commodity price index | -0.0002 | -0.0002 |
| | p = 0.921 | p = 0.918 |
| GDP growth | -0.021** | -0.023** |
| | p = 0.010 | p = 0.005 |
| Weekend (comp. no weekend) | -0.492*** | -0.481*** |
| | p < 0.001 | p < 0.001 |
| Constant | 10.381*** | 11.855*** |
| | p < 0.001 | p < 0.001 |
| Country Fixed Effects | Yes | Yes |
| Observations | 58,806 | 58,811 |
| Log Likelihood | -17,181.810 | -17,149.610 |
| theta | 0.125*** (0.004) | 0.129*** (0.004) |
| Akaike Inf. Crit. | 34,431.610 | 34,367.220 |
| *Note:* | | *p<0.05; **p<0.01; ***p<0.001 |

counterparts (see Figure A12 in the Appendix for the rootograms). Table 8 presents the results of the NBRMs using the same specifications as used previously in Table 5. Similar to the changes that are observed above, when using the ICEWS data, the overall levels of statistical significance across the included coefficients grow. Generally, however, the contents of the table are very similar in both their sign and statistical significance to the models in Table 5, suggesting their robustness to different data specifications. The shutdown variation variables both maintain their positive sign, but in contrast to the findings in Table 5, the coefficients for the service-based shutdown type and its full counterpart are now statistically significant. Their maintained size and the continued more pronounced effect of service-based shutdowns, when contrasted to their full counterparts, support the previous findings and hypothesis five. Given the change in statistical significance, a future revision of the models presented here is however suggested. The coefficients for the full shutdown and throttle in the Throttle Model also maintain their sign and increase in statistical significance, supporting the previous findings and increasing the confidence in their right specification. Both service-based and throttle-type shutdowns are found to increase the log count of protest events on the day following their implementation by 1.640 and 0.755 respectively.

Similar to what was found before, the remaining control variables mostly maintain their signs and statistical significance. The proportion of youth between 14 and 25 loses some significance, however, and the regime type and urban population variables become statistically significant. All in all, the robustness test performed by using a different data source for the dependent variable largely supports the previous findings but also underscores the need for further analysis in the future.

## 6 Conclusion and Outlook

Throughout the previous sections, the present study has aimed to provide an answer to the question of how the implementation of national-level internet shutdowns affects the levels of protests in SSA countries. More specifically, it has looked at what it calls the shutdown-dissent nexus, or the interaction between daily counts of nonviolent protests and the implementation, duration, and type of government-ordered, nationwide internet disruptions. Considering the hitherto poor understanding of internet disruptions and their societal consequences, particularly in SSA, this study thus set out to build and improve upon previous work, using new, easily accessible data on shutdowns provided by Access Now, and by directly and formally addressing issues like the ecological fallacy or simultaneity that plagued previous analyses. To accomplish this, the study relied on careful selection of the most recent and reliable data available for 25 SSA countries between 2016 and 2022 and employed both PRMs and NBRMs to run the

analyses and test the formulated hypotheses. The endeavor was motivated not only by the tentative nature or apparent lack of generalizability of extant findings but also by the repeated and seemingly counter-intuitive findings that shutdowns do not quell but rather spur mobilization once implemented.

The findings presented in the previous sections suggest that, controlling for issues with reverse causality by lagging the independent variable, the implementation of a nationwide shutdown increases the expected count of protests on the following day in SSA countries. This was found to be robust to a change in the dependent variable as well as a change in the lag specification, thus corroborating earlier findings of a protest-promoting effect of shutdowns. Moreover, to inquire into the longitudinal ramifications of shutdowns on protests, this study relied on a continuous operationalization of the duration as a count of days instead of previously used, categorical operationalizations. From this, it aimed to obtain more precise accounts of how a shutdown affects protests over time. The results of the computed models suggest that the relationship between a shutdown's duration and protests is more complex than previously believed. Instead of the previously found peak-and-trough dynamic, this study found evidence suggesting a peak-trough-peak dynamic. While shutdowns are found to increase the predicted numbers of protests overall, they were found to do so increasingly in their early phases (until the first inflection point) and in their late phases, respectively (after the second inflection point). The evidence provided, while tentative, considering the lack of statistical significance in the ACLED NBRMs, thus provides some support for the short-term flare-up hypothesis (1b) as well as the long-term surge hypothesis (2b) in the SSA context. It is corroborated by the categorical operationalization which, while blurring the fine-grained longitudinal dynamics of shutdowns, suggests that shutdowns continue to increase the frequency of protests, no matter whether they are in their first or any consecutive weeks. Moving beyond the considerations of duration, in what is a first in the literature, this study also more closely scrutinized the effects that different variations of shutdowns have on protests, namely service-based and throttle-type shutdowns. The presented evidence, although less conclusive for the former type, supports the notions presented in hypotheses five and six. Both types of shutdowns increase the number of protests following their implementation when compared to days without shutdowns. By disrupting citizens' access to the ISM and the conduct of their everyday lives, these types of shutdowns create grievances that were found to fuel collective mobilization. Furthermore, the presented analyses provided evidence allowing one to contrast the effects of full shutdowns with the effects of their, arguably less disruptive, variations. Whereas throttles were found to be less protest-promoting than their full counterparts, service-based shutdowns seemingly have

a stronger effect on their emergence than their full counterparts. This can be explained through the less disruptive nature of throttles which are expected to create fewer grievances as the access to the ISM is not restricted completely but *merely* slowed. Service-based shutdowns on the other hand are most disruptive to the central avenues for the expression of grievances, promoting their accumulation while still allowing access to other means of communication via the internet. Thus, they should be more protest-promoting than their full counterparts, which is what the probationary evidence for SSA suggests. When considering the interaction effects, their lack of statistical significance as well as the change in coefficient signs when comparing the ACLED and ICEWS models, any conclusions drawn from them are neither definitive nor particularly informative. There is thus neither conclusive support for hypothesis three nor hypothesis four.

All in all, the presented findings yield thought-provoking results regarding the effects of shutdowns while also pointing to the need for further exploration of this dynamic using more extensive data and diverse methods, including a qualitative exploration of the consequences of shutdowns. By studying what happens in the sudden absence of the affordances of the ISM, the study offers evidence on their utility in the SSA, which as of yet is scarce in the literature. Similar to the findings offered by Manacorda and Tesei (2020), the present results suggest that the ISM are but enablers of protests. Seen as how protest is spurred in an environment characterized by their sudden absence, the technology seems to be neither necessary nor sufficient for the emergence of collective action in SSA. The positive and significant coefficients for the internet penetration variable in all model specifications underline this. Furthermore, the protest-promoting effects of shutdowns in the SSA presented here call into question the rationale behind governments persistently employing them although they have proven time and time again to be both economically and politically counterproductive.

Future scientific endeavors in this area should, building on the insights provided here, further disaggregate the study geographically by using regional and local level data on both shutdowns and protests. While such data is presently readily available for protests, current data on shutdowns provided by Access Now cannot yet be used without limitations. Also, studies should look to improve upon the ways used here to address potential issues with simultaneity. The most appropriate way of doing so is by using an instrumental variable, such as power outages, which is related to the independent but not the dependent variable. As there are currently no data sets available, the burden will fall on the researcher to collect such data. Furthermore, getting better and more disaggregated data on shutdown variations would do much to improve upon the current findings, as they were hampered in their utility by the

inability to distinguish between, for example, harsher or less harsh throttles or the shutdown of specific social media services compared to others. Another interesting avenue for future research would be to look beyond the sheer number of protests and instead consider their size, which can vary drastically between events. Also, it is not only the number of protests but also their size that can determine their effects (Biggs, 2018). Currently, the study is limited by the absence of comprehensive data collection efforts and good data on protest size, however.

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# Appendix

## Appendix A: Figures

**Figure A1. Maps of Annual Internet Shutdowns in SSA**

a) 2016

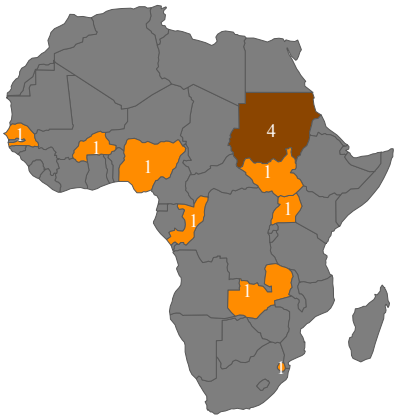

b) 2017


c) 2018

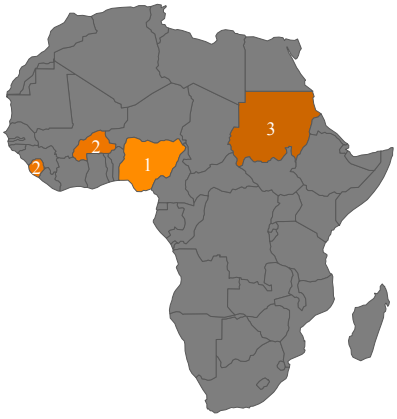

d) 2019


e) 2020


f) 2021

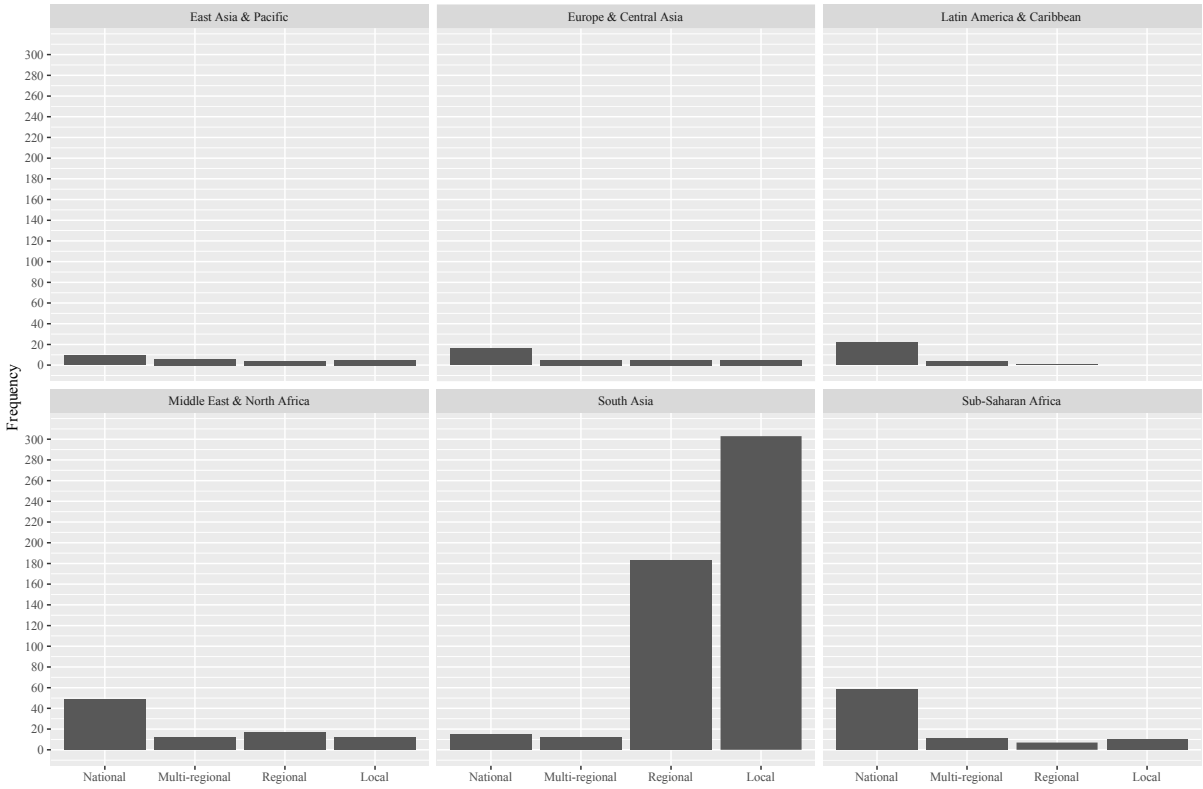



g) 2022



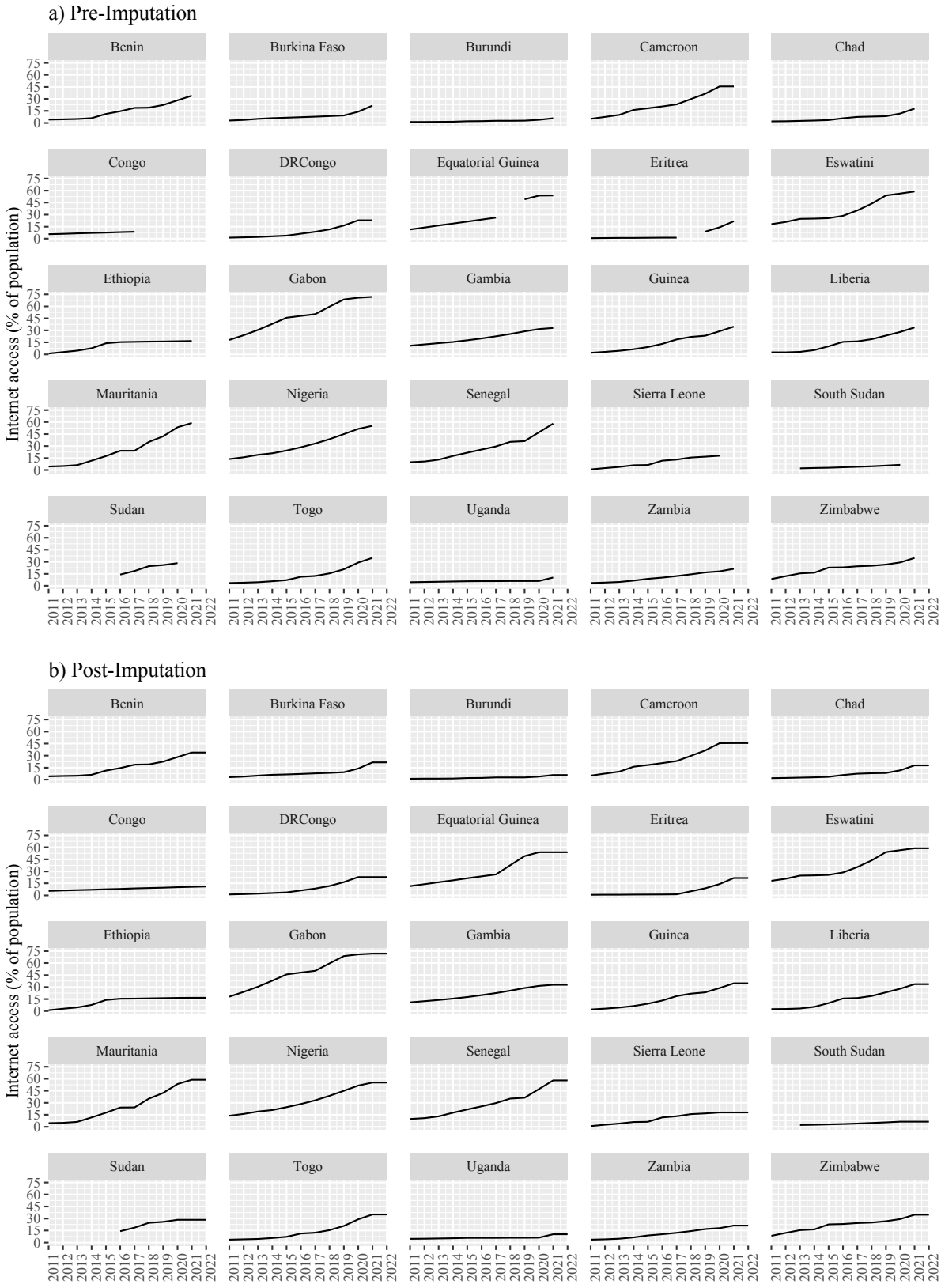

Data provided by Access Now (2023a).

## Figure A2. Geographical Scopes of Internet Shutdowns by World Region (2016-2022)




Data from Access Now (2023a). World regions as defined by the World Bank's World Development Indicators.

## Figure A3. Internet Penetration Rate SSA Countries Pre- and Post-Imputation




Data provided by World Bank (2023c).

## Figure A4. Hanging Rootograms of the Binary- and Duration Model PRMs and NBRMs

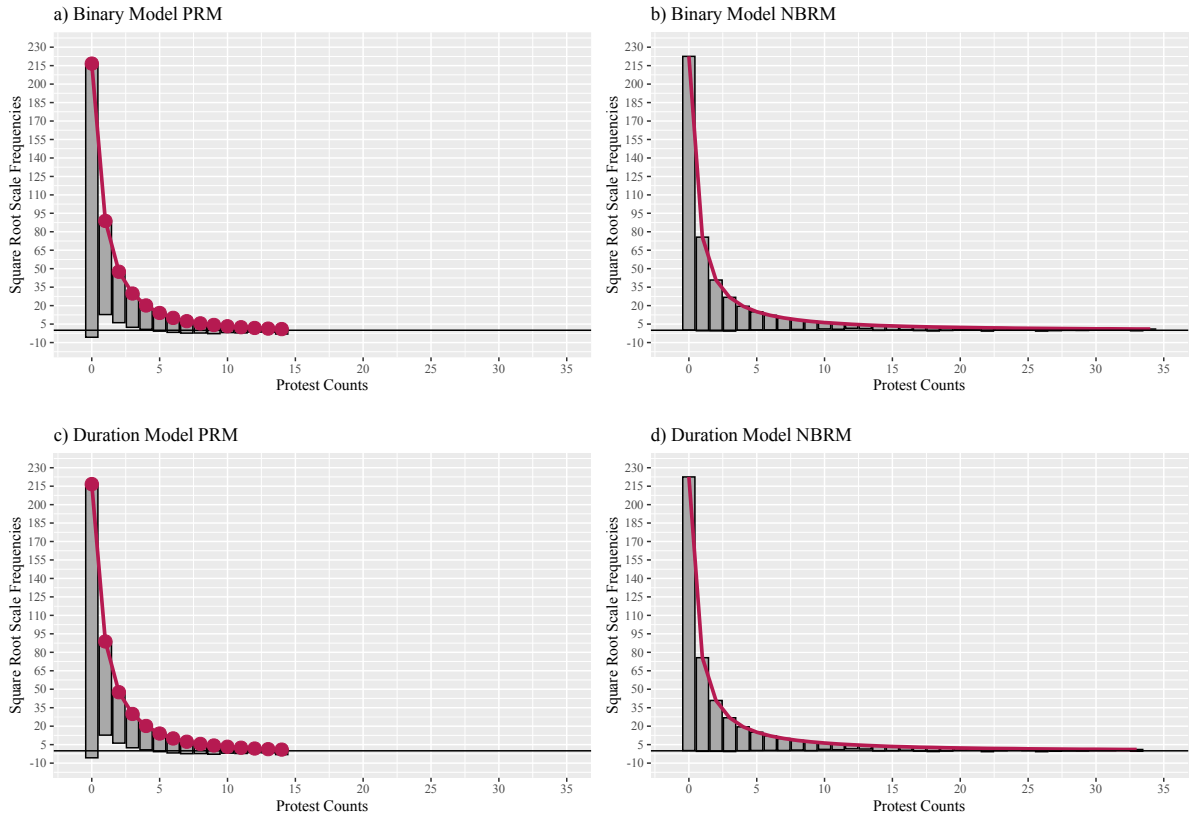
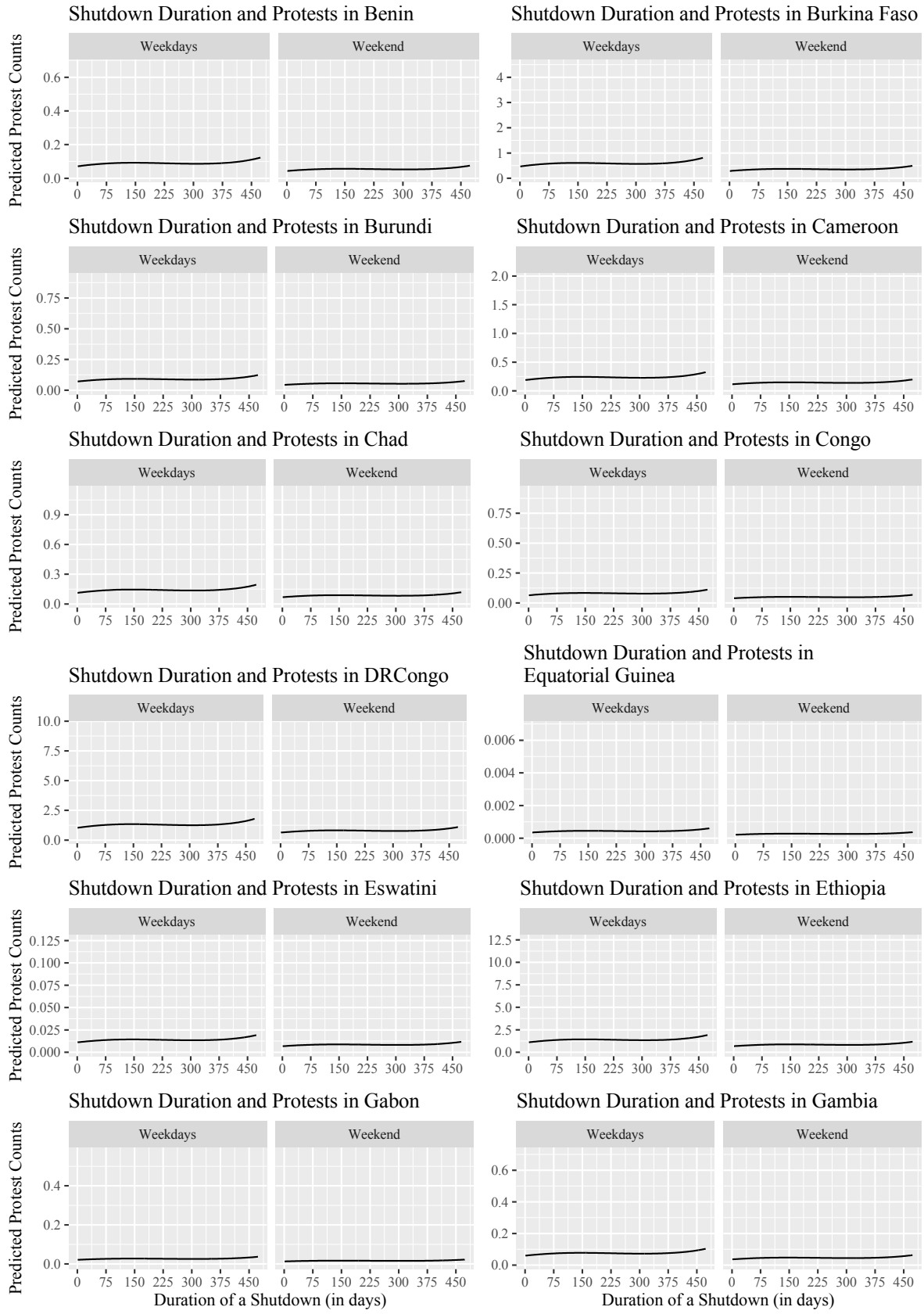


**Figure A5. Shutdown Duration Country ME Plots**



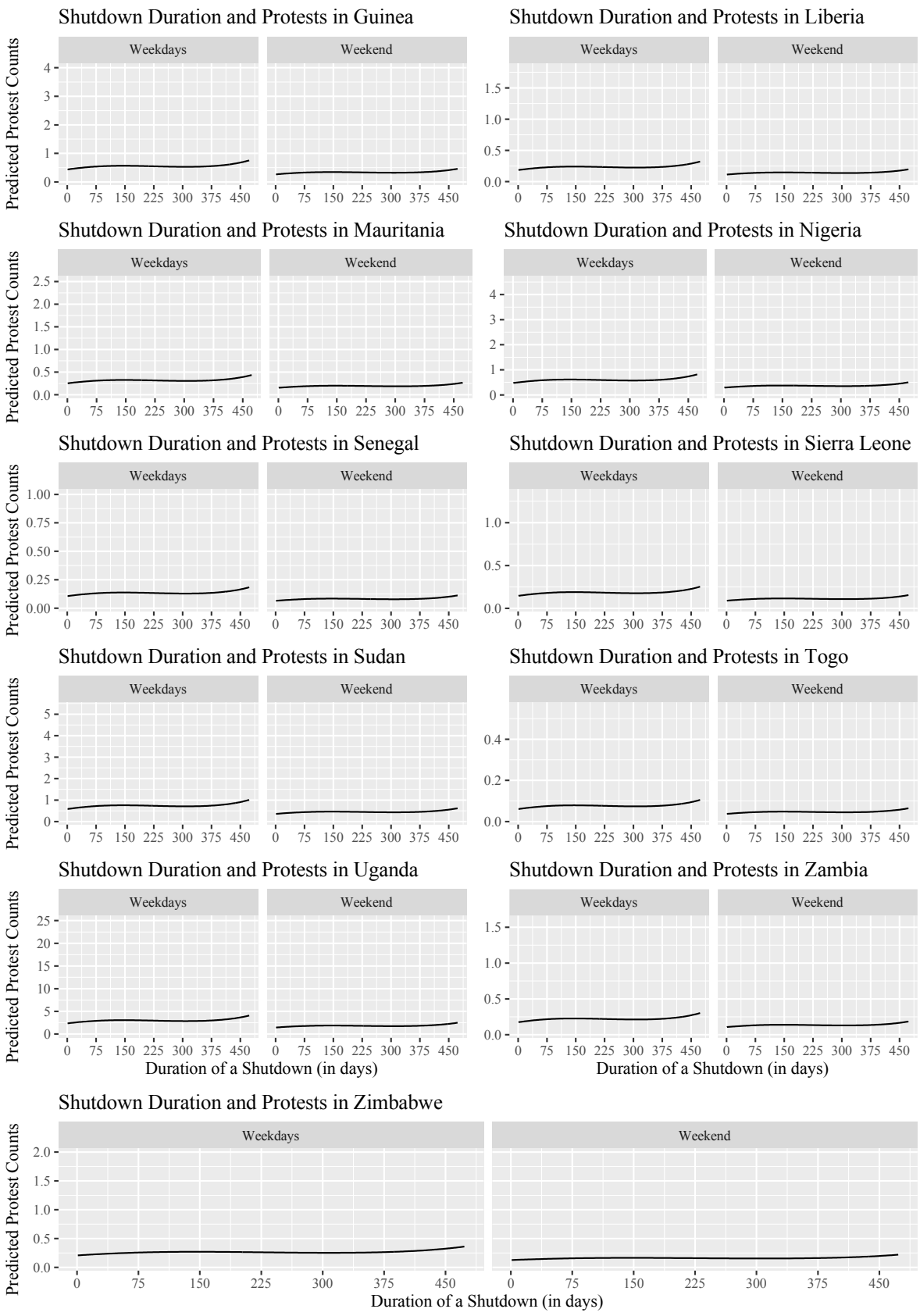
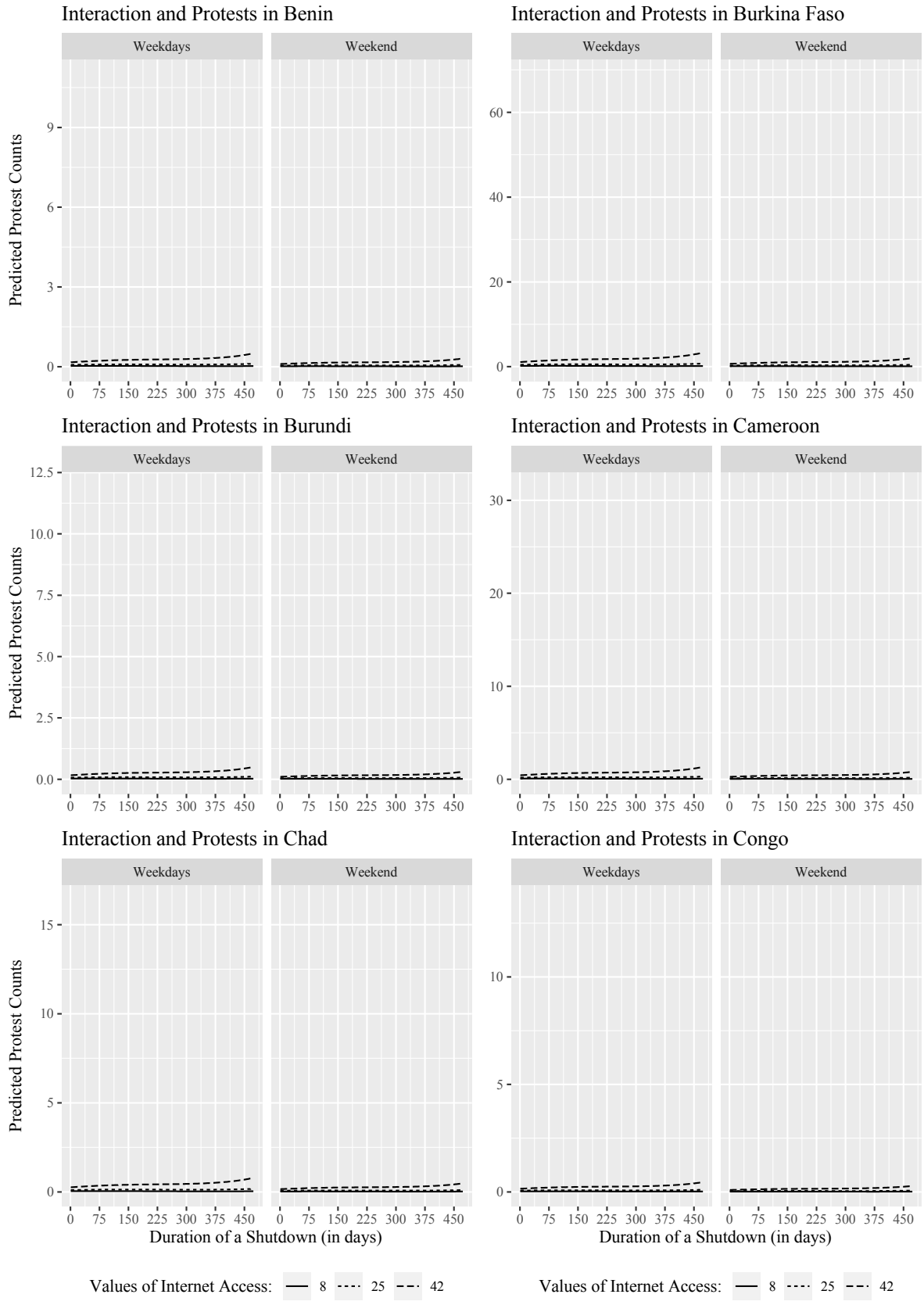
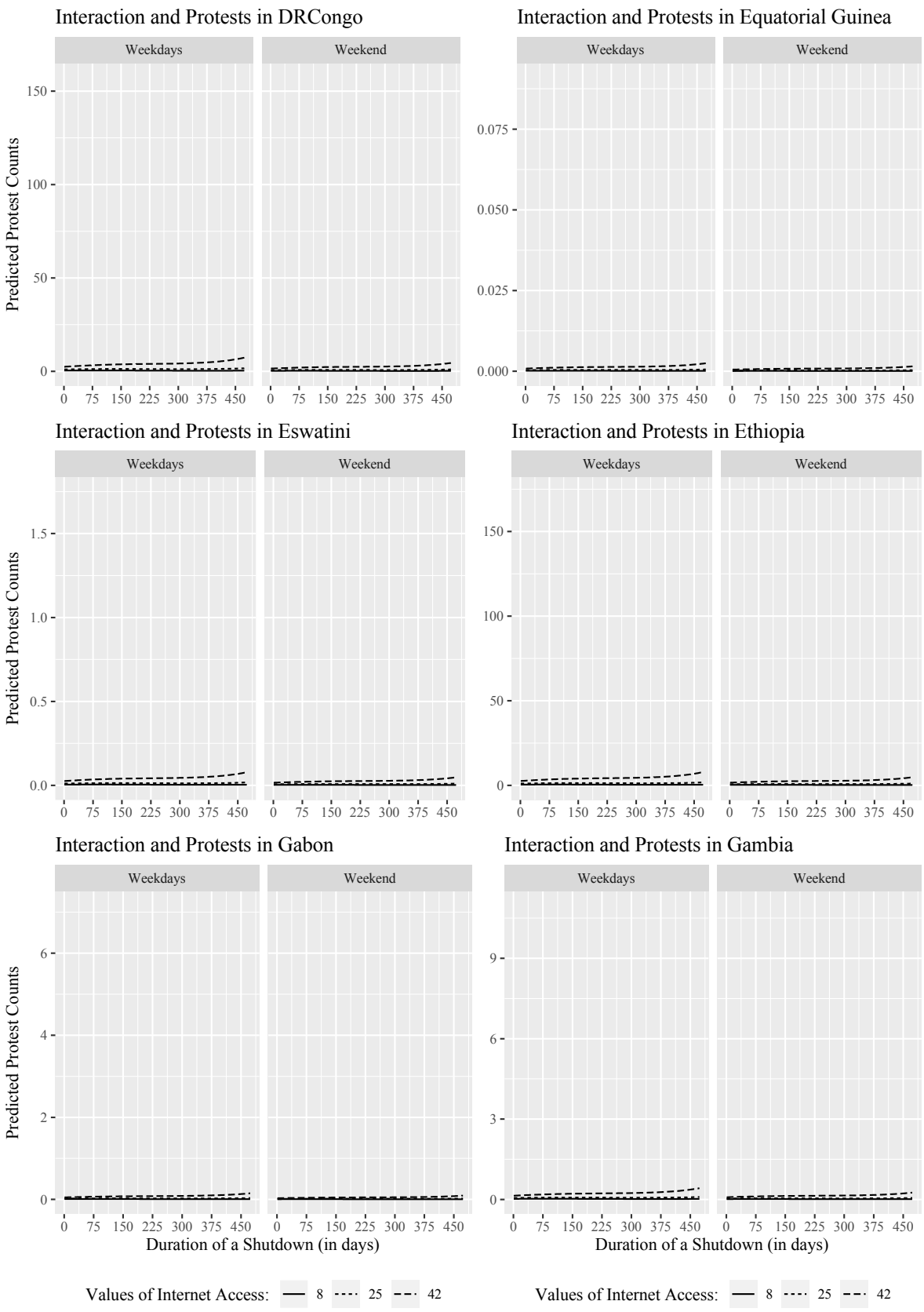
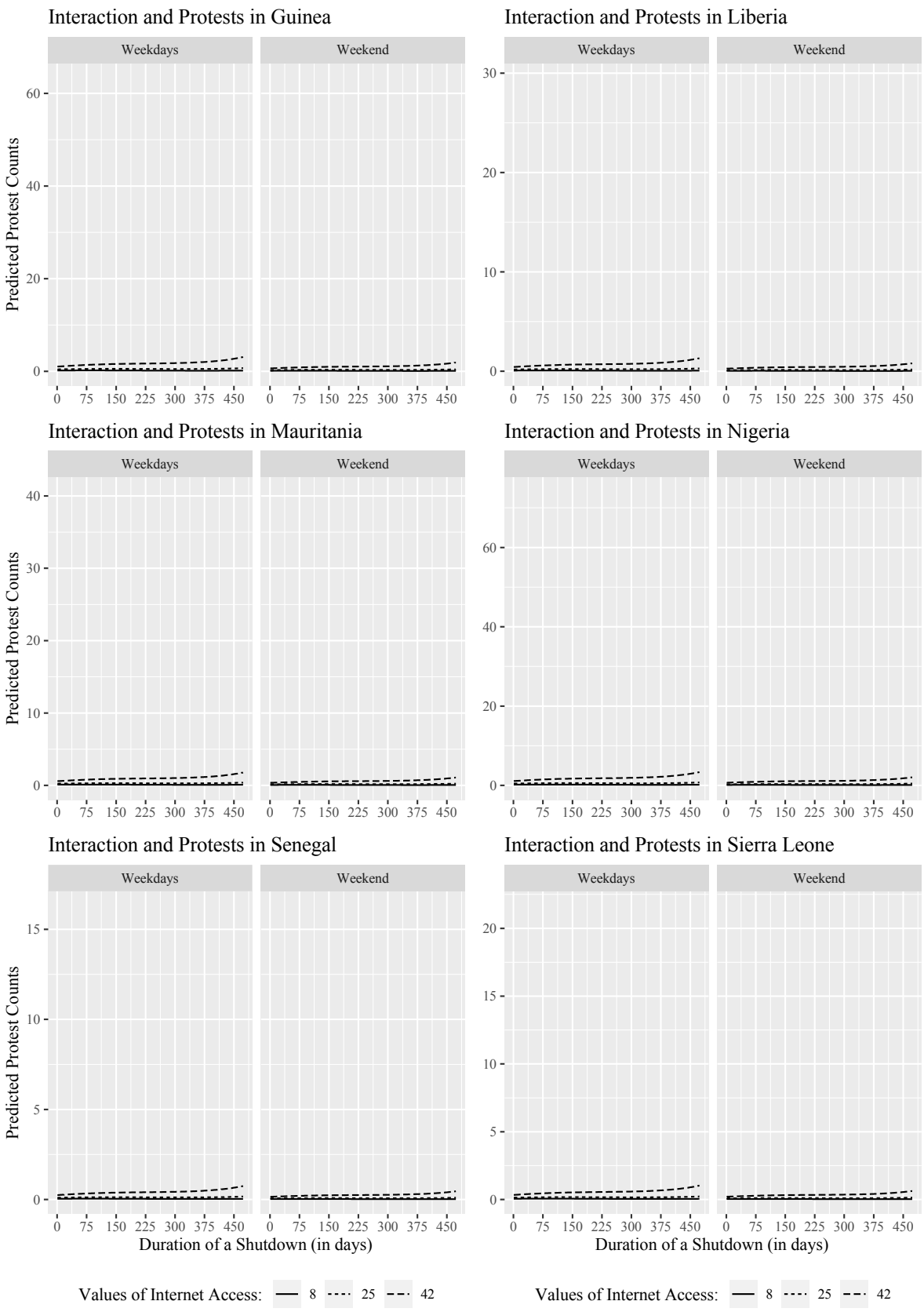

Shutdown Duration and Protests in Guinea
Shutdown Duration and Protests in Liberia
Shutdown Duration and Protests in Mauritania
Shutdown Duration and Protests in Nigeria
Shutdown Duration and Protests in Senegal
Shutdown Duration and Protests in Sierra Leone
Shutdown Duration and Protests in Sudan
Shutdown Duration and Protests in Togo
Shutdown Duration and Protests in Uganda
Shutdown Duration and Protests in Zambia
Shutdown Duration and Protests in Zimbabwe
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)

**Figure A6. Shutdown Duration and Internet Access Interaction Country ME Plots**




Interaction and Protests in DRCongo
Interaction and Protests in Equatorial Guinea
Interaction and Protests in Eswatini
Interaction and Protests in Ethiopia
Interaction and Protests in Gabon
Interaction and Protests in Gambia
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)
Values of Internet Access: 8 25 42


Interaction and Protests in Guinea
Interaction and Protests in Liberia
Interaction and Protests in Mauritania
Interaction and Protests in Nigeria
Interaction and Protests in Senegal
Interaction and Protests in Sierra Leone
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)
Values of Internet Access: 8 25 42

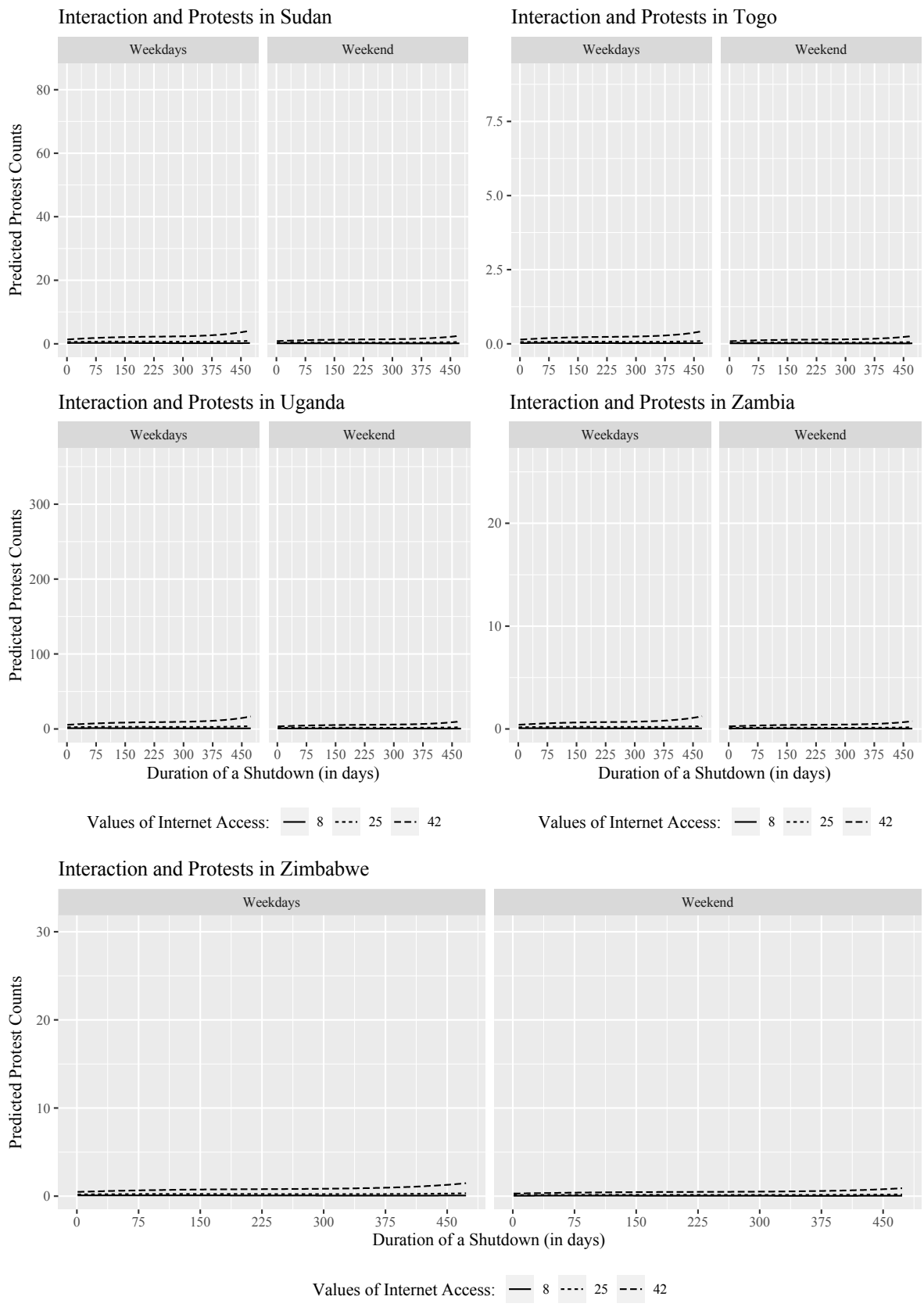
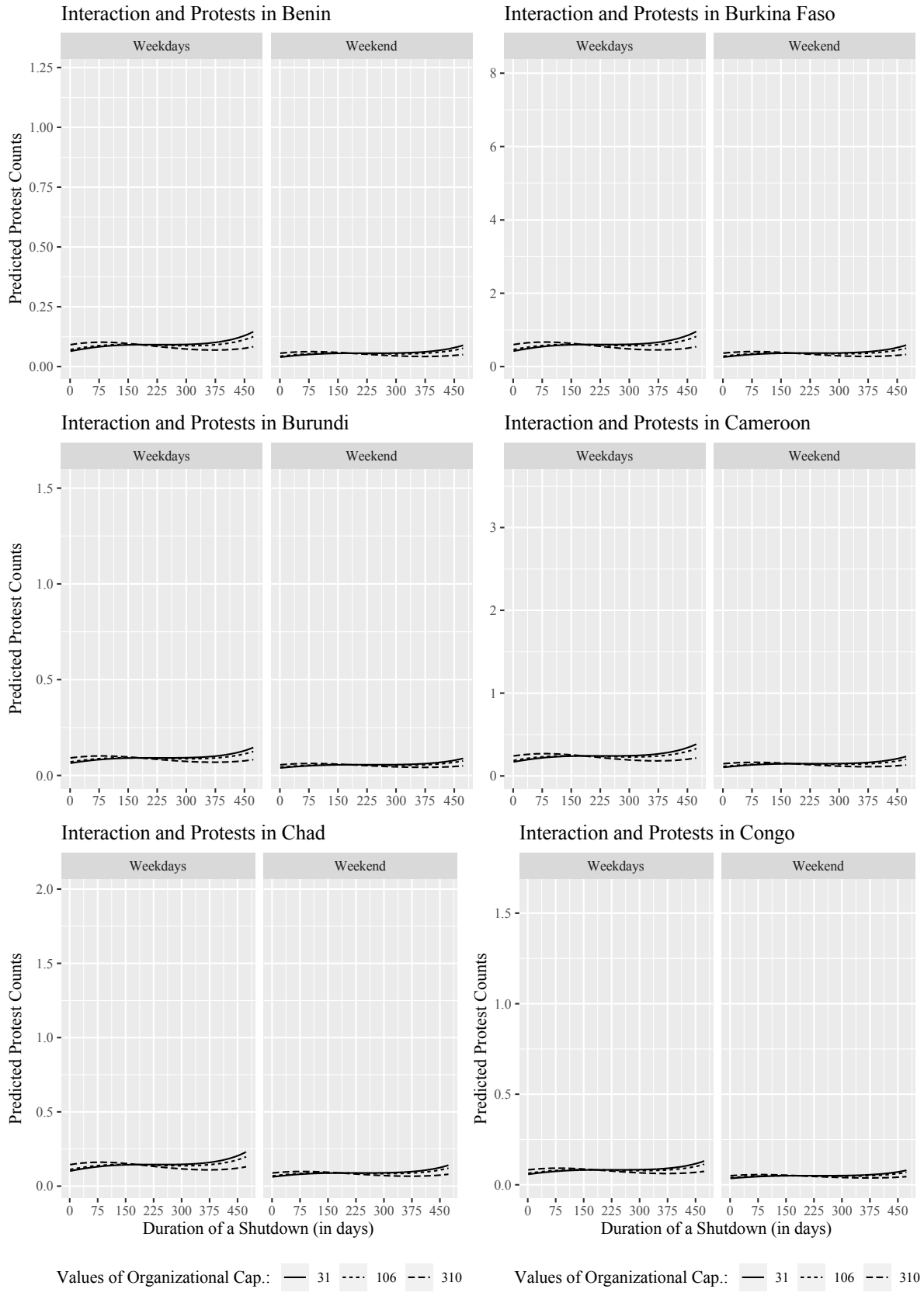
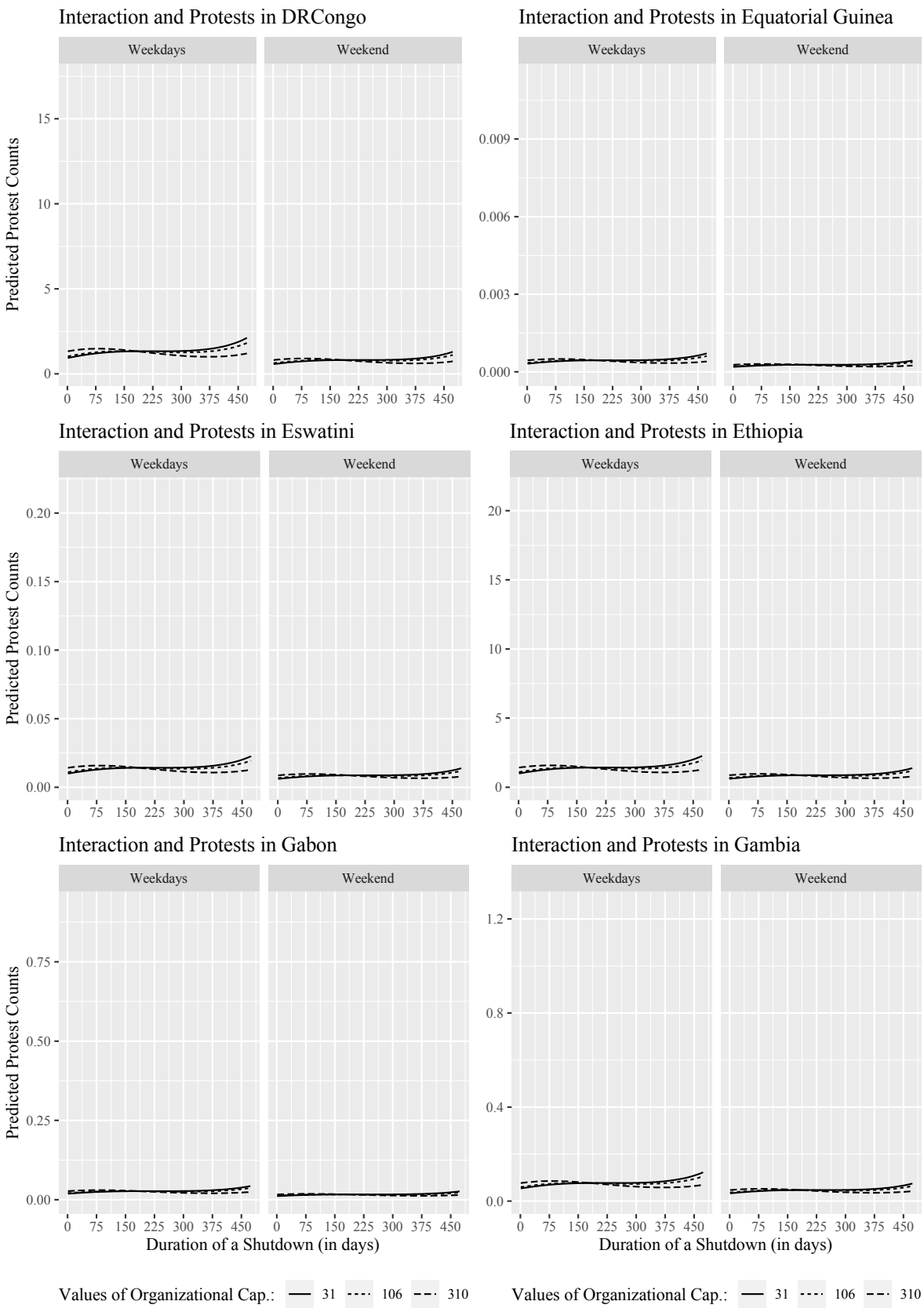
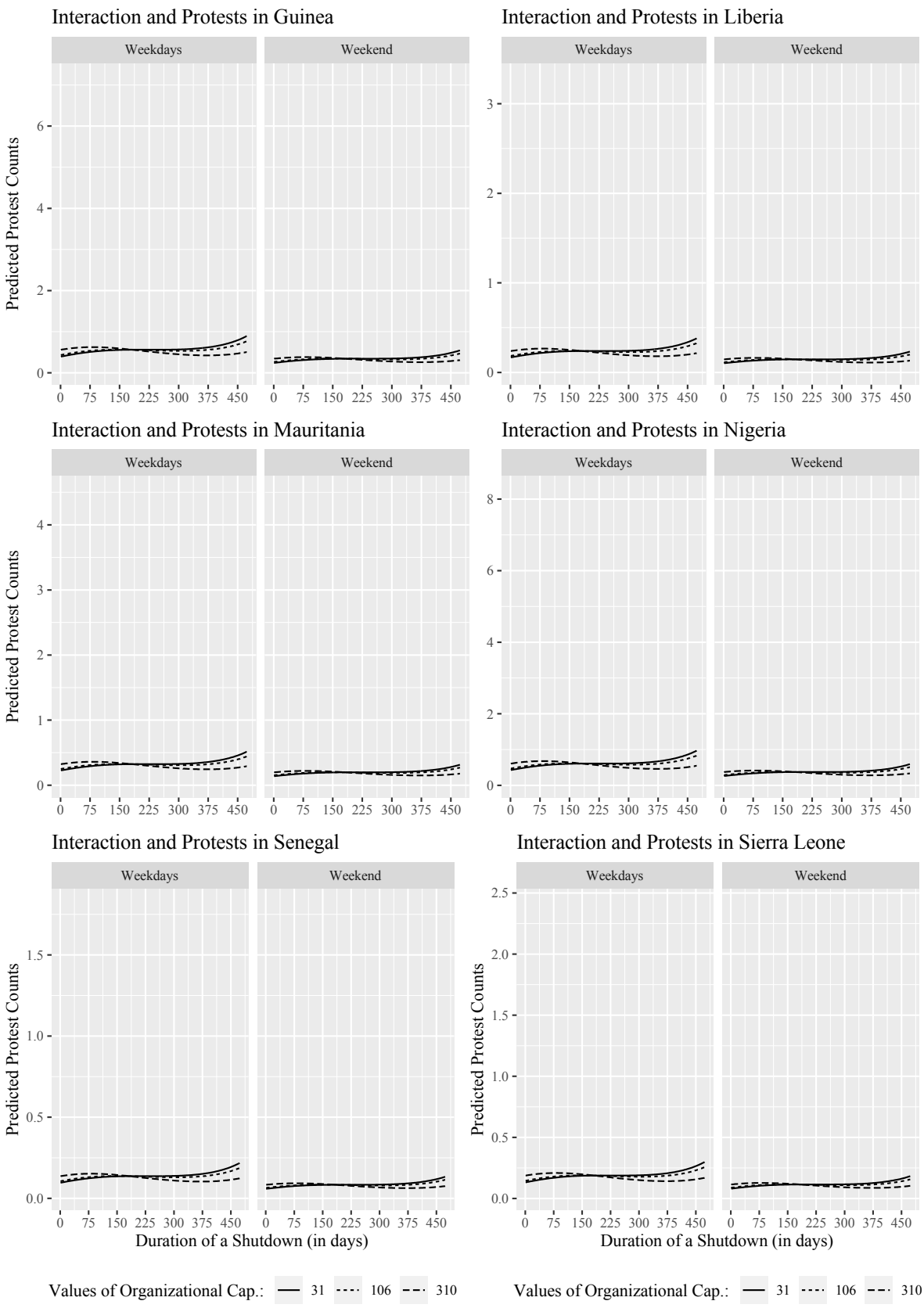

Interaction and Protests in Sudan
Interaction and Protests in Togo
Interaction and Protests in Uganda
Interaction and Protests in Zambia
Interaction and Protests in Zimbabwe
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)
Values of Internet Access: 8 25 42

**Figure A7. Interaction Shutdown Duration and Organizational Cap. Country ME Plots**




Interaction and Protests in DRCongo
Interaction and Protests in Equatorial Guinea
Interaction and Protests in Eswatini
Interaction and Protests in Ethiopia
Interaction and Protests in Gabon
Interaction and Protests in Gambia
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)
Values of Organizational Cap.: 31 106 310


Interaction and Protests in Guinea
Interaction and Protests in Liberia
Interaction and Protests in Mauritania
Interaction and Protests in Nigeria
Interaction and Protests in Senegal
Interaction and Protests in Sierra Leone
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)
Values of Organizational Cap.: 31 106 310

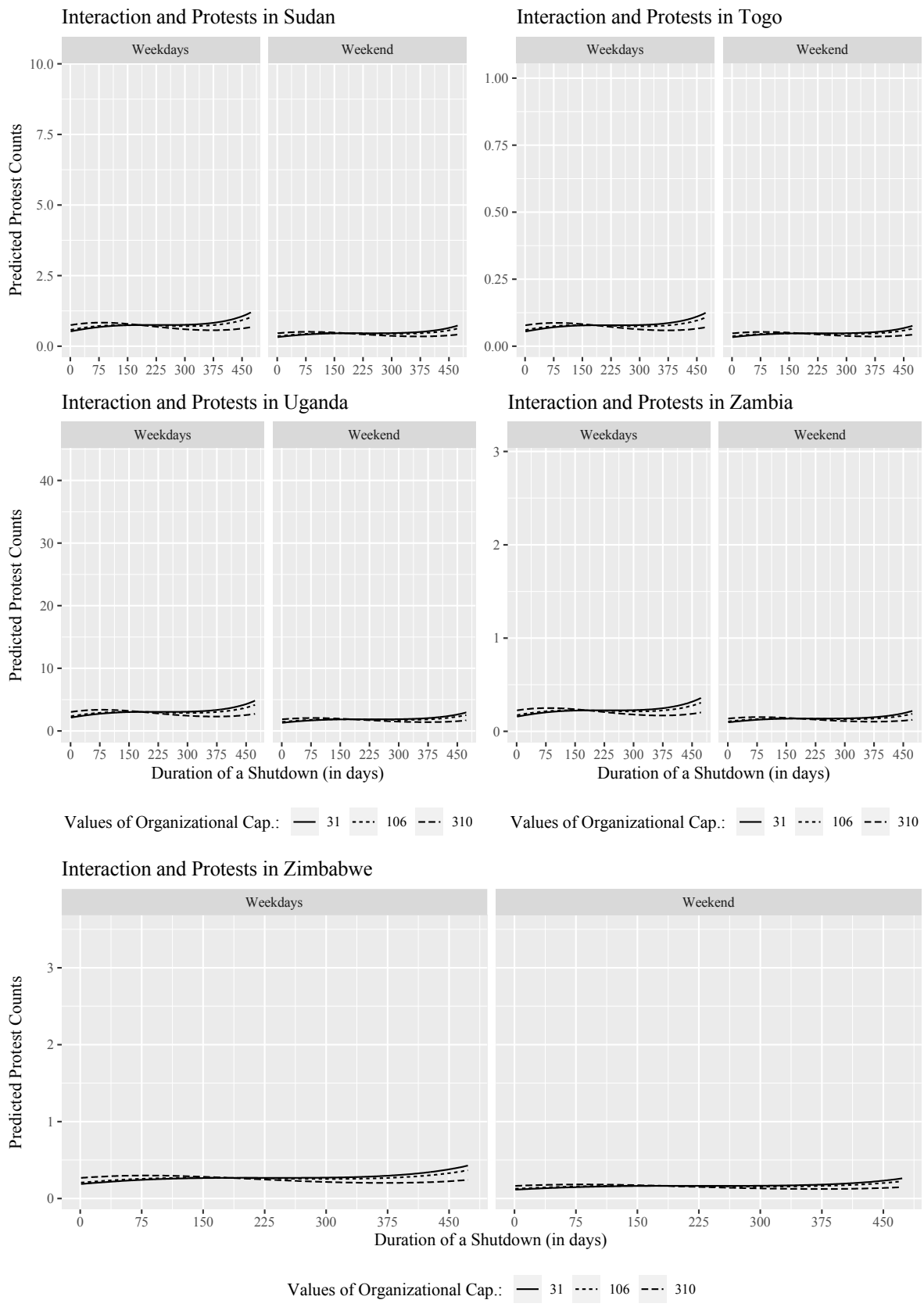

Interaction and Protests in Sudan
Interaction and Protests in Togo
Interaction and Protests in Uganda
Interaction and Protests in Zambia
Interaction and Protests in Zimbabwe
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)
Values of Organizational Cap.: 31 106 310

**Figure A8. Hanging Rootograms for the H1-H4 Robustness Check Models**

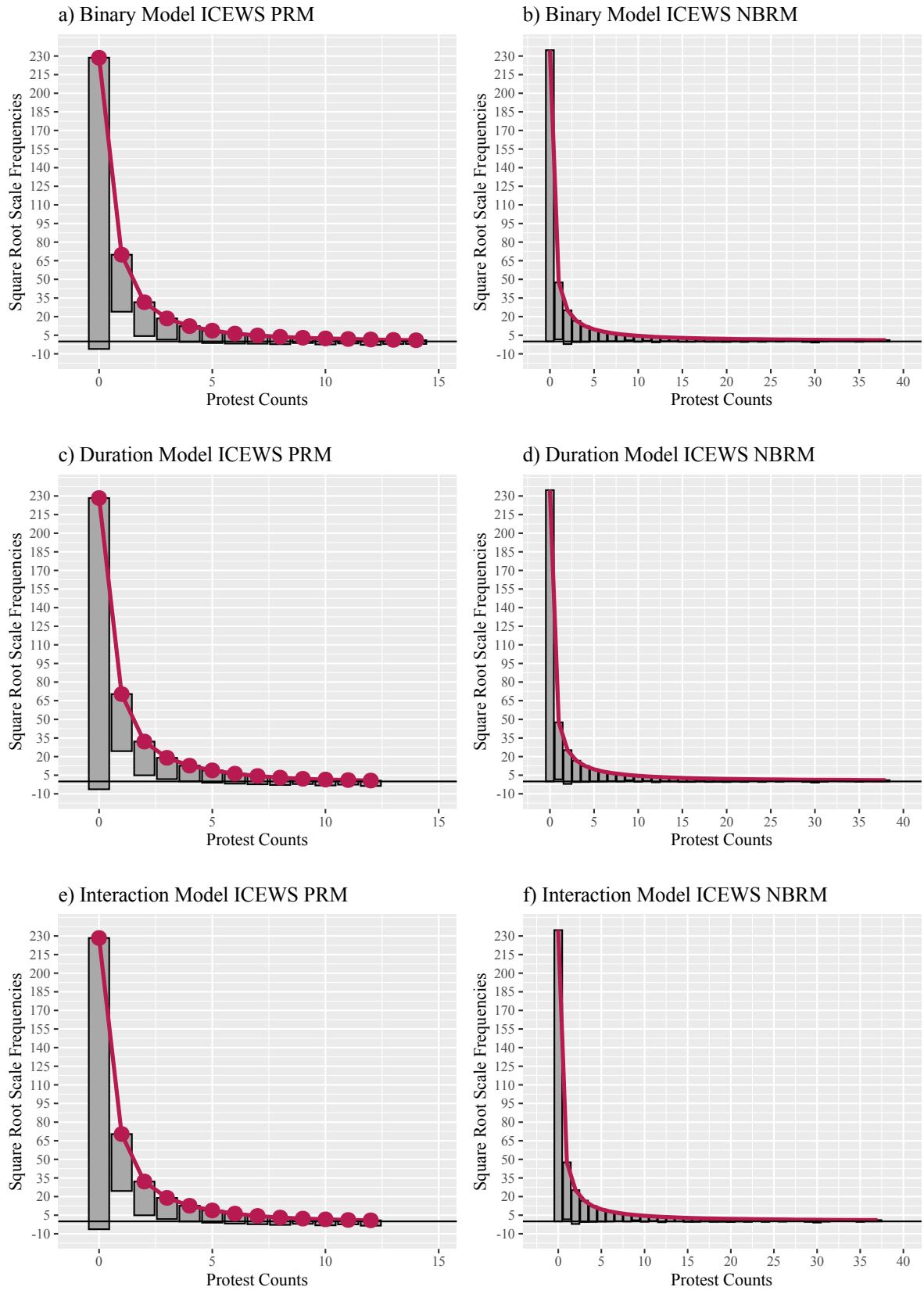
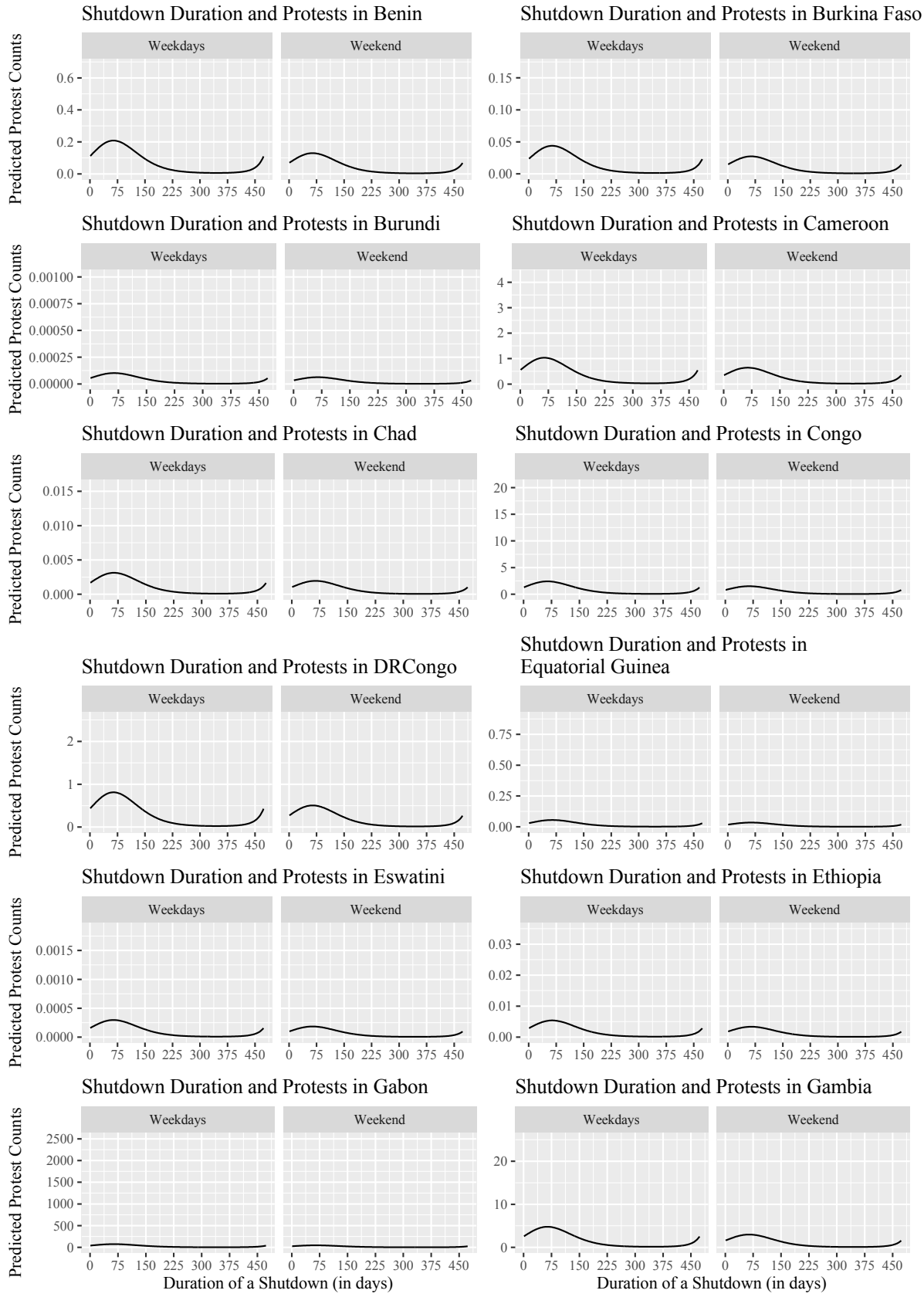


**Figure A9. Robustness Check Shutdown Duration Country ME Plots**



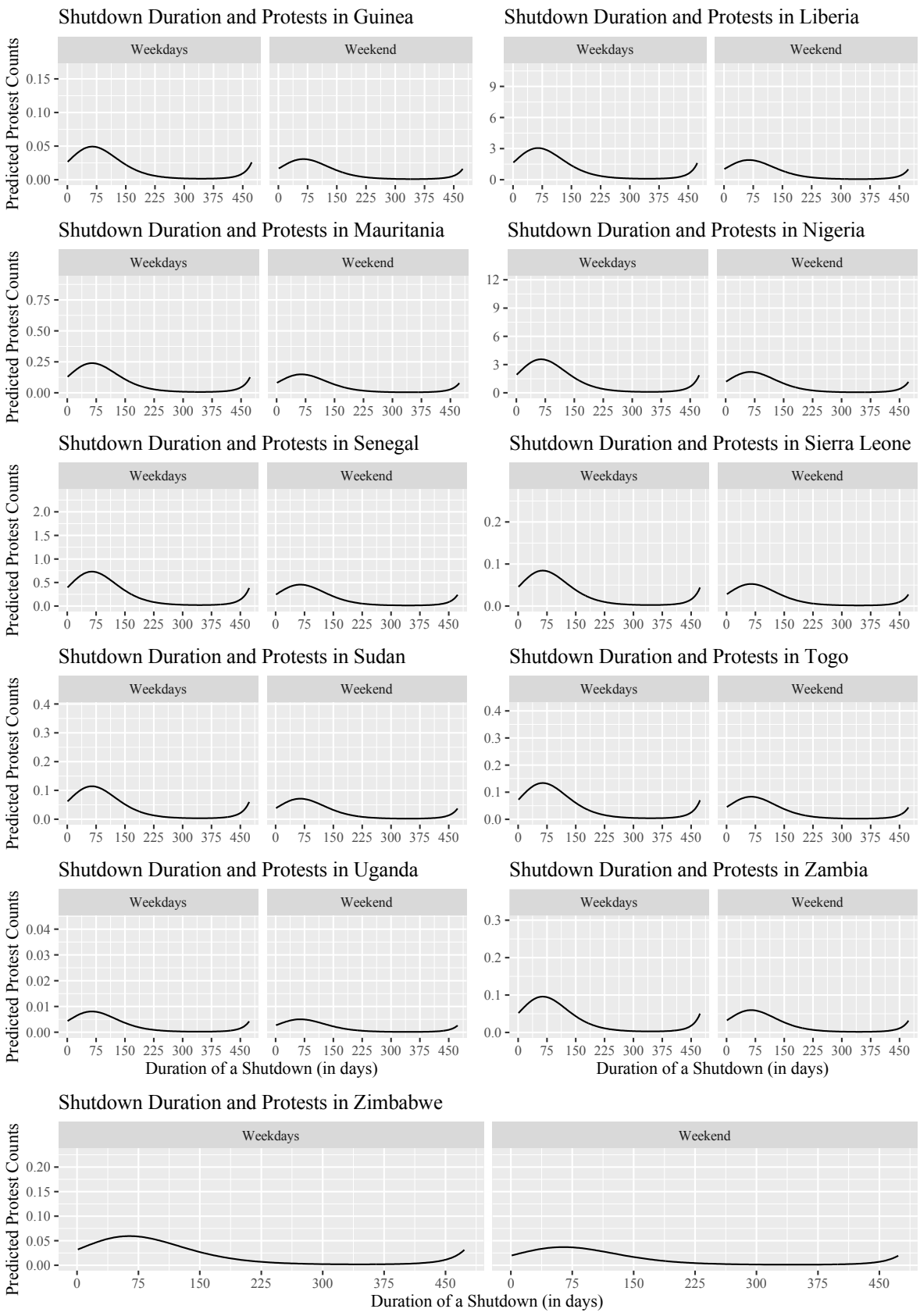
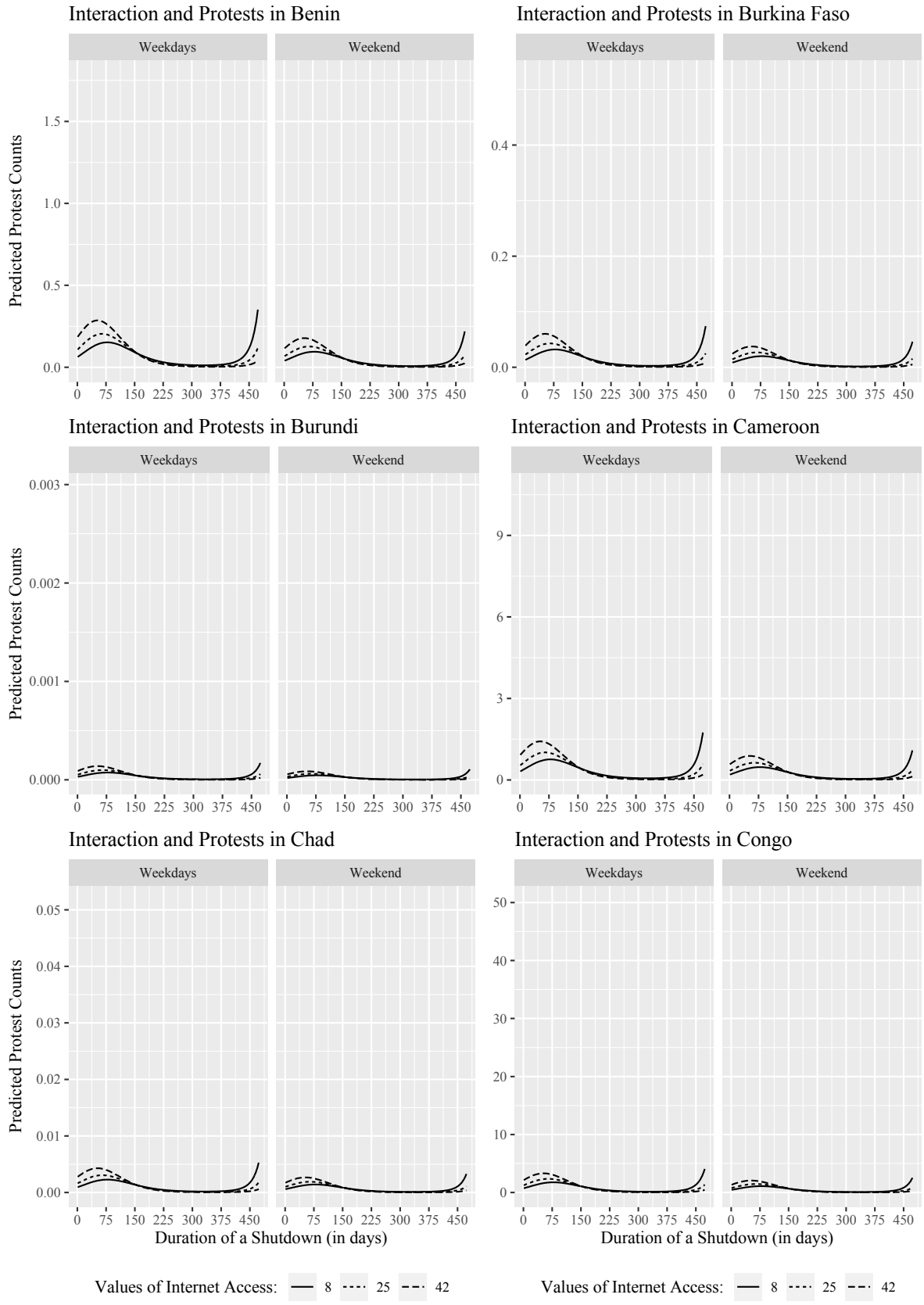
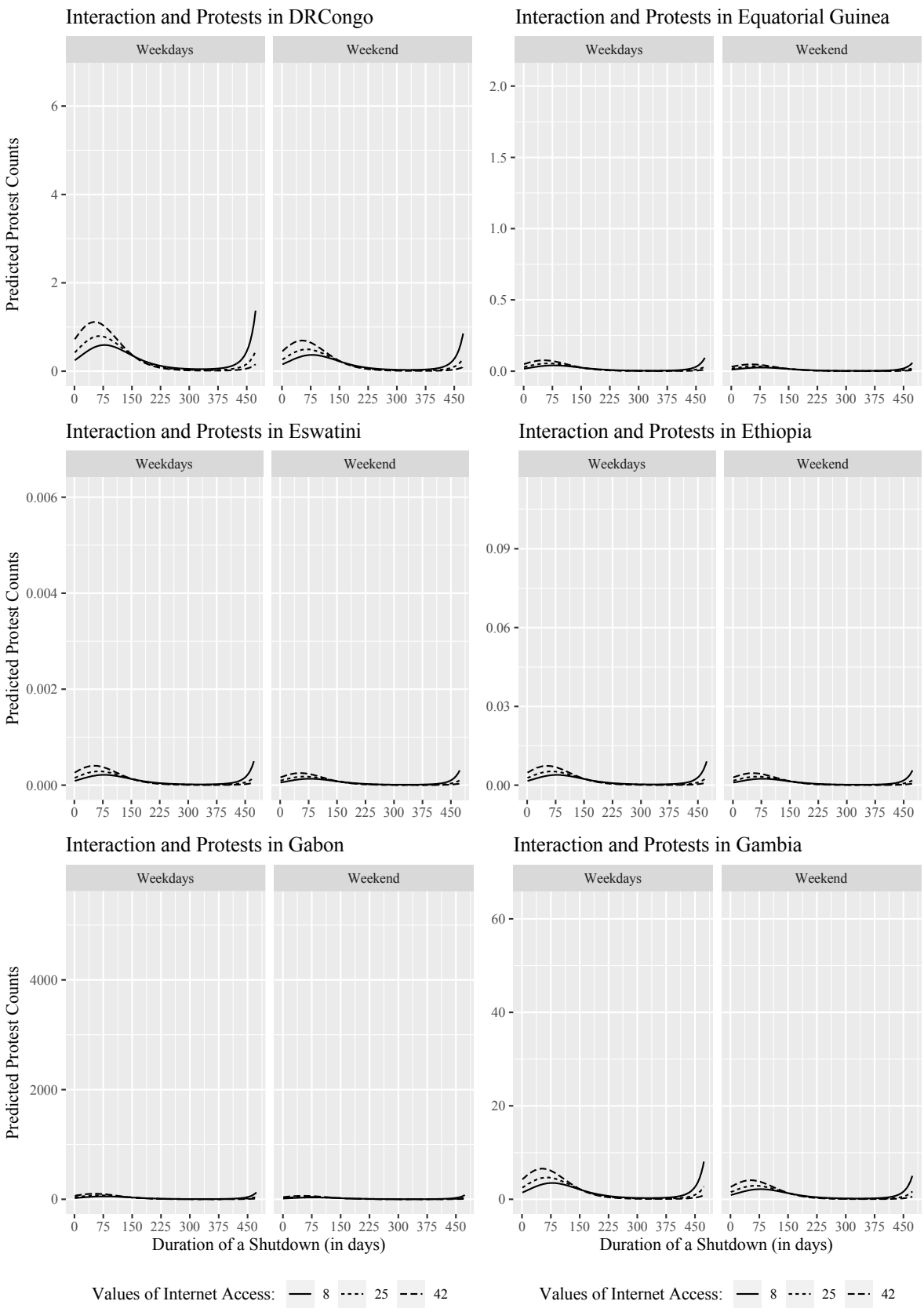
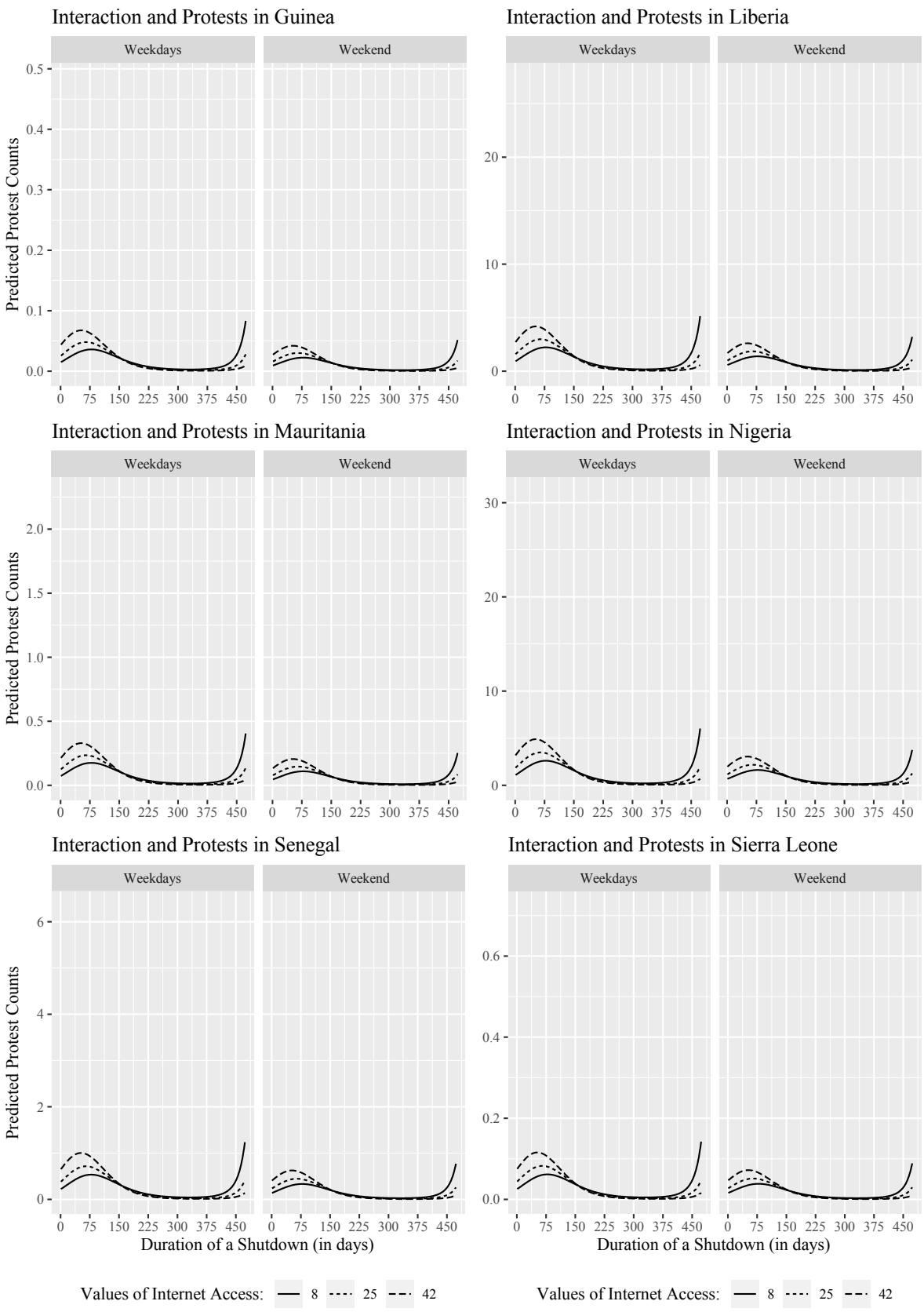

Shutdown Duration and Protests in Guinea
Shutdown Duration and Protests in Liberia
Shutdown Duration and Protests in Mauritania
Shutdown Duration and Protests in Nigeria
Shutdown Duration and Protests in Senegal
Shutdown Duration and Protests in Sierra Leone
Shutdown Duration and Protests in Sudan
Shutdown Duration and Protests in Togo
Shutdown Duration and Protests in Uganda
Shutdown Duration and Protests in Zambia
Shutdown Duration and Protests in Zimbabwe
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)

**Figure A10. Robustness Check Interaction Shutdown Duration and Internet Country ME Plots**




Interaction and Protests in DRCongo
Interaction and Protests in Equatorial Guinea
Interaction and Protests in Eswatini
Interaction and Protests in Ethiopia
Interaction and Protests in Gabon
Interaction and Protests in Gambia
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)
Values of Internet Access: 8 25 42


Interaction and Protests in Guinea
Interaction and Protests in Liberia
Interaction and Protests in Mauritania
Interaction and Protests in Nigeria
Interaction and Protests in Senegal
Interaction and Protests in Sierra Leone
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)
Values of Internet Access: 8 25 42

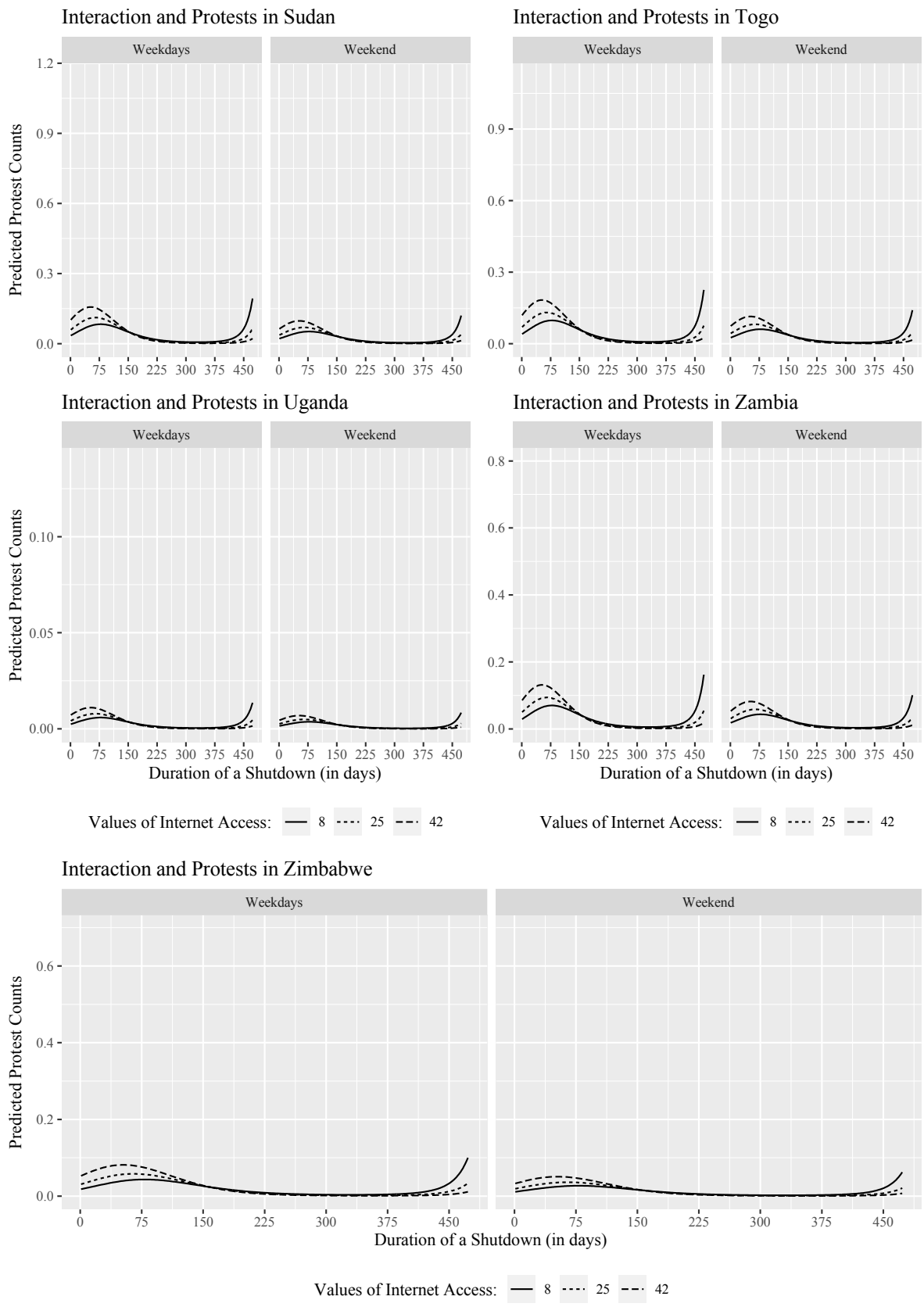
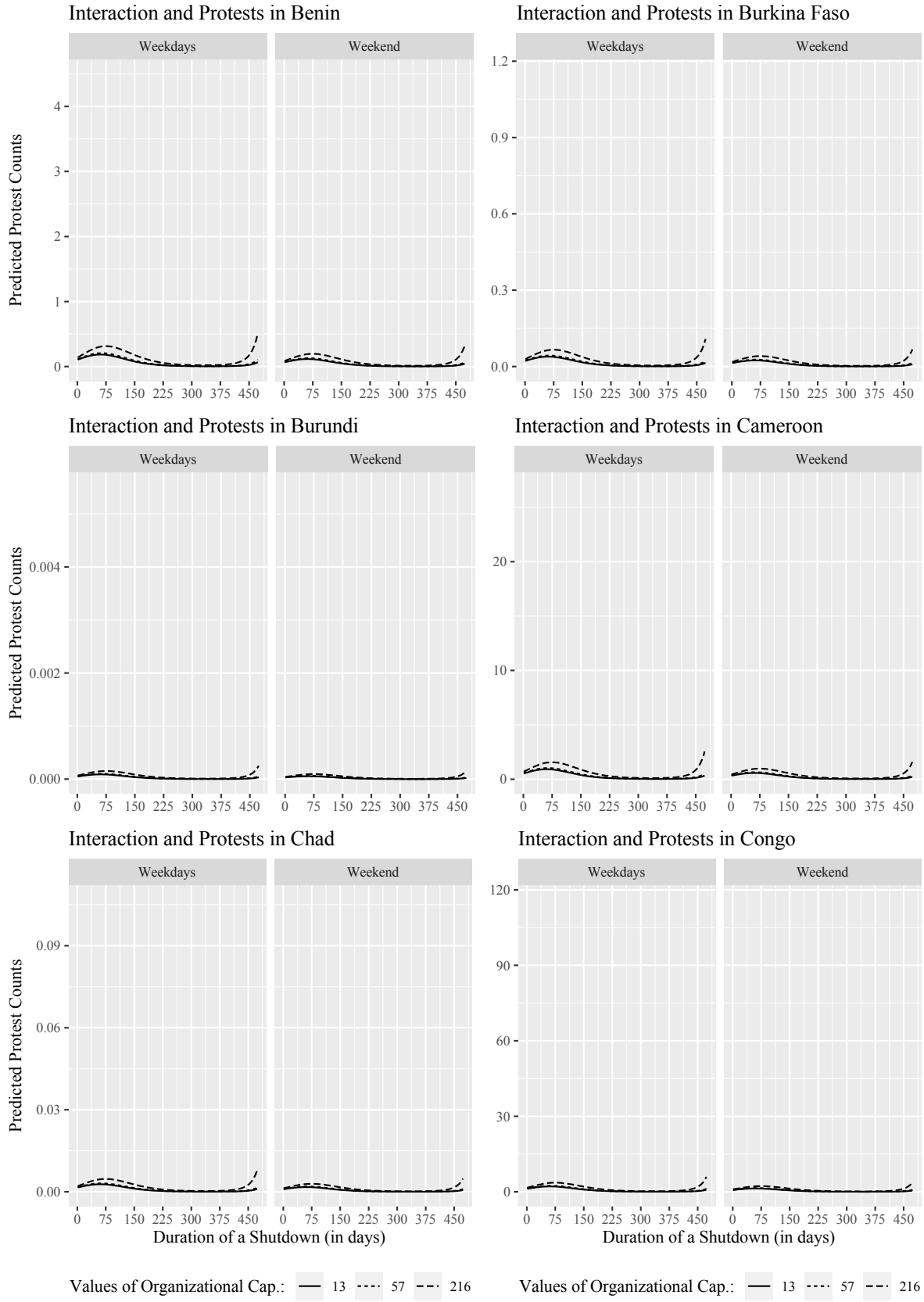
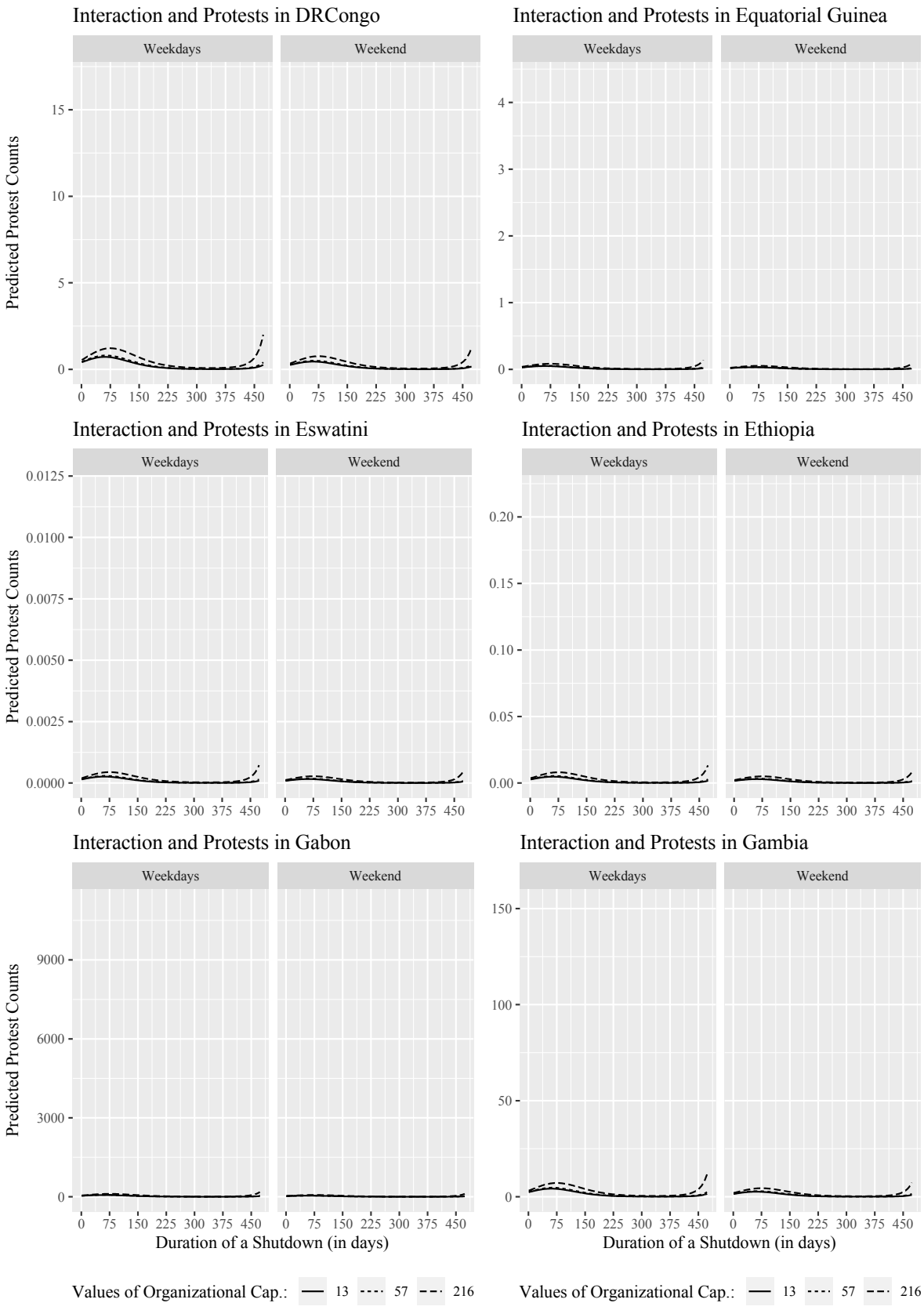
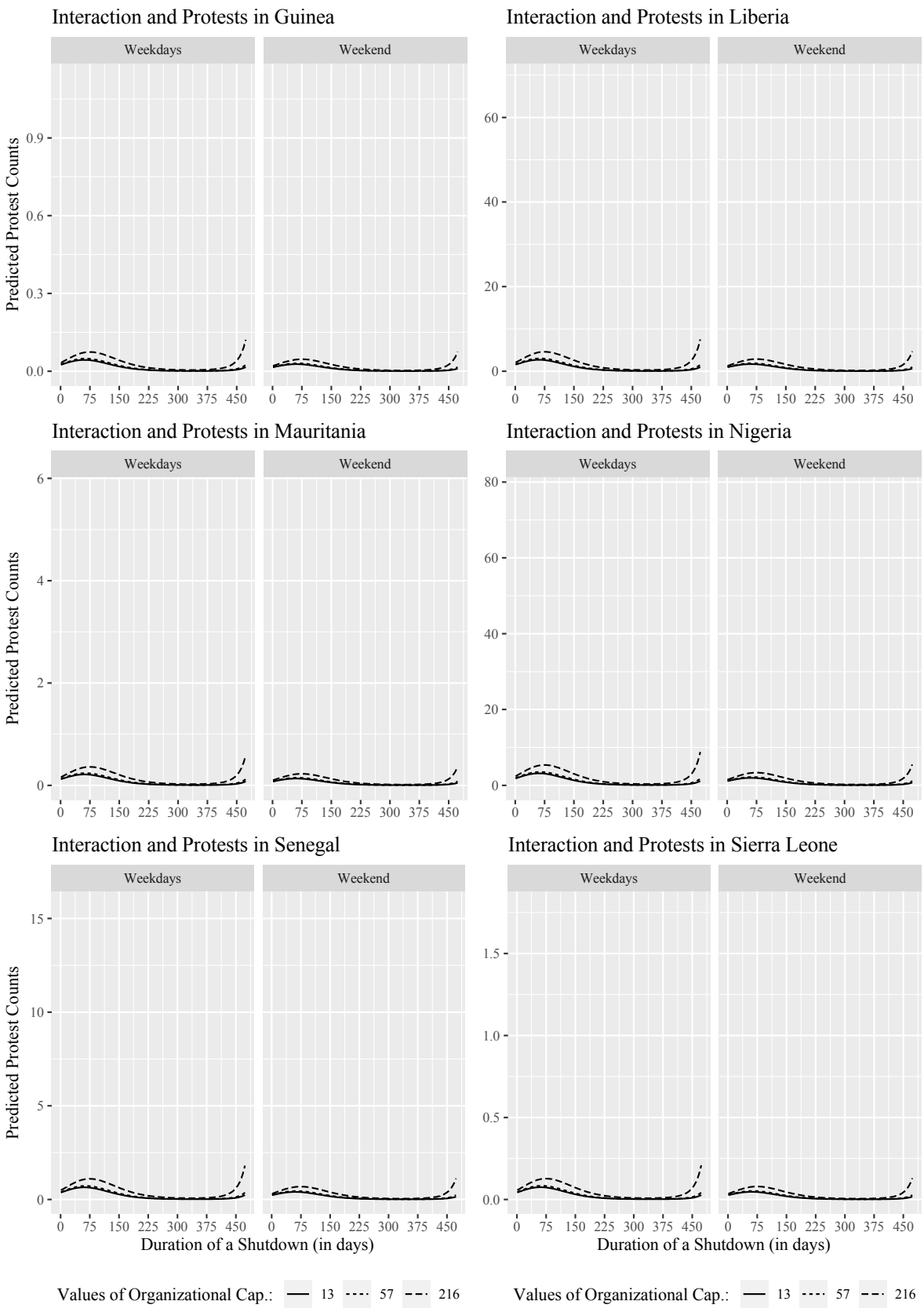
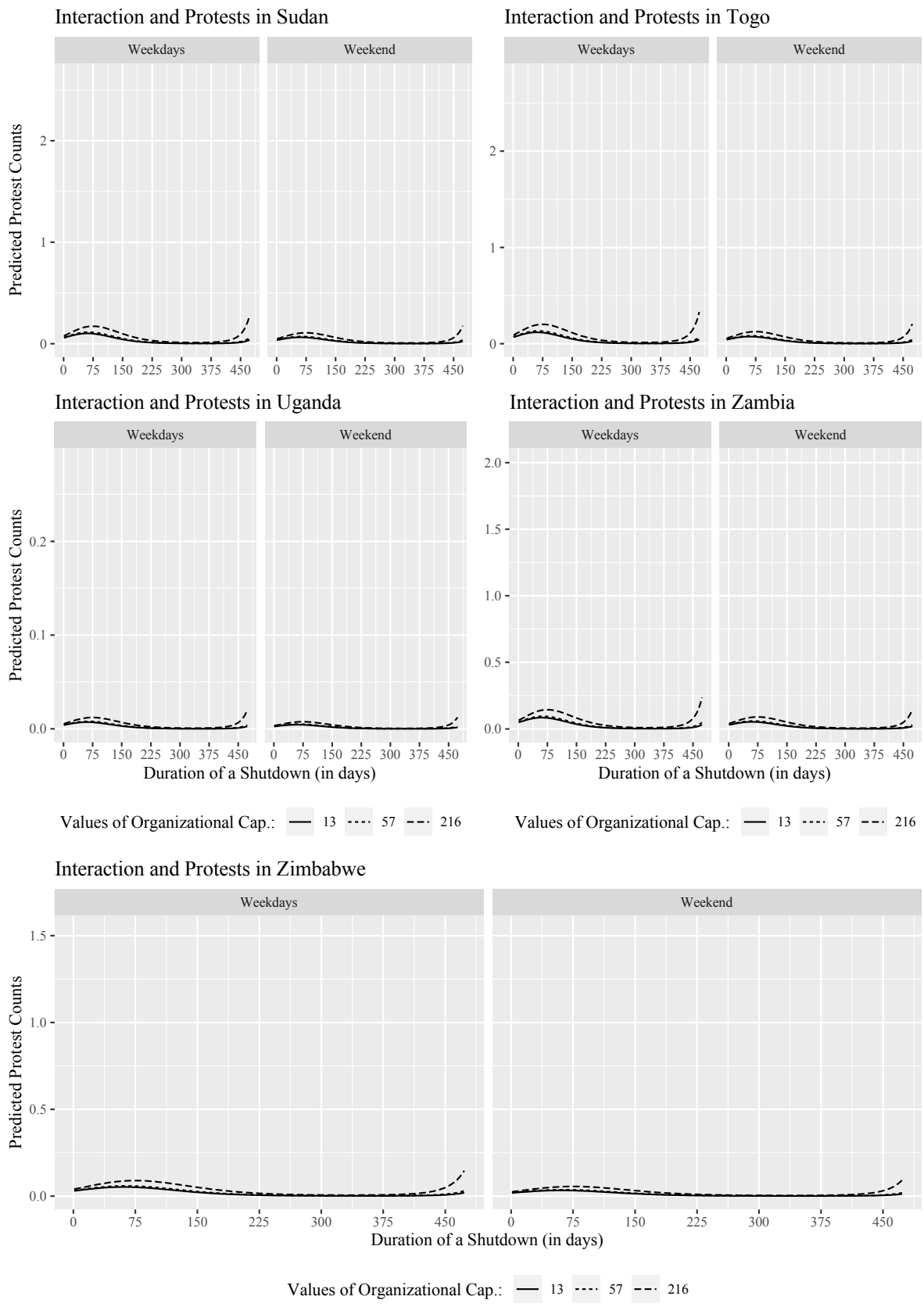

Interaction and Protests in Sudan
Weekdays
Weekend
Predicted Protest Counts
Interaction and Protests in Togo
Interaction and Protests in Uganda
Interaction and Protests in Zambia
Duration of a Shutdown (in days)
Values of Internet Access: 8 25 42
Interaction and Protests in Zimbabwe

**Figure A11. Robustness Check Interaction Shutdown Duration and Organizational Cap. Country ME Plots**

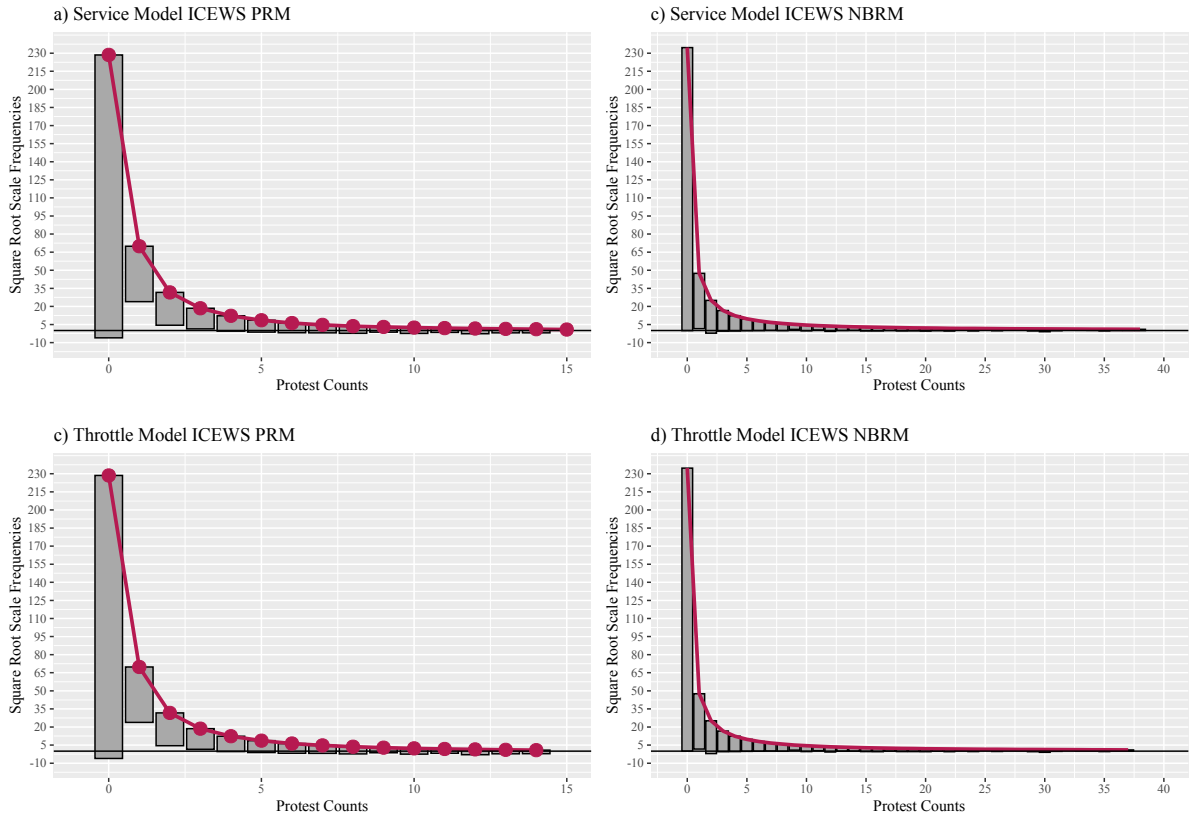



Interaction and Protests in DRCongo
Interaction and Protests in Equatorial Guinea
Interaction and Protests in Eswatini
Interaction and Protests in Ethiopia
Interaction and Protests in Gabon
Interaction and Protests in Gambia
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)
Values of Organizational Cap.: 13 57 216


Interaction and Protests in Guinea
Interaction and Protests in Liberia
Interaction and Protests in Mauritania
Interaction and Protests in Nigeria
Interaction and Protests in Senegal
Interaction and Protests in Sierra Leone
Weekdays
Weekend
Predicted Protest Counts
Duration of a Shutdown (in days)
Values of Organizational Cap.: 13 57 216


Interaction and Protests in Sudan
Weekdays
Weekend
Predicted Protest Counts
0
1
2
0 75 150 225 300 375 450
Interaction and Protests in Togo
Weekdays
Weekend
0
1
2
0 75 150 225 300 375 450
Interaction and Protests in Uganda
Weekdays
Weekend
Predicted Protest Counts
0.0
0.1
0.2
0 75 150 225 300 375 450
Duration of a Shutdown (in days)
Values of Organizational Cap.: 13 57 216
Interaction and Protests in Zambia
Weekdays
Weekend
0.0
0.5
1.0
1.5
2.0
0 75 150 225 300 375 450
Duration of a Shutdown (in days)
Values of Organizational Cap.: 13 57 216
Interaction and Protests in Zimbabwe
Weekdays
Weekend
Predicted Protest Counts
0.0
0.5
1.0
1.5
0 75 150 225 300 375 450
Duration of a Shutdown (in days)
Values of Organizational Cap.: 13 57 216

## Figure A12. Hanging Rootograms for the H5 and H6 Robustness Check Models



Appendix B: Tables

**Table B1. PRMs for H1 through H4**

| | *Dependent variable:* | | |
|---|---|---|---|
| | Daily Nonviolent Protest Count (ACLED) | | |
| | Binary Model | Duration Model | Interaction Model |
| | (1) | (2) | (3) |
| Shutdown binary (t-1) | 0.155*** | | |
| | p < 0.001 | | |
| Shutdown duration (linear) | | 0.004*** | 0.006*** |
| | | p < 0.001 | p < 0.001 |
| Shutdown duration (quadratic) | | -0.00004*** | -0.00005*** |
| | | p < 0.001 | p < 0.001 |
| Shutdown duration (cubic) | | 0.00000009*** | 0.00000006*** |
| | | p < 0.001 | p < 0.001 |
| Organizational capacity | 0.001*** | 0.001*** | 0.001*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Internet access (%) | 0.063*** | 0.063*** | 0.063*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Regime type (continuous) | -0.706*** | -0.812*** | -0.811*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| C19 stringency (t-1) | -0.005*** | -0.005*** | -0.004*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Urbanization (%) | -0.093*** | -0.101*** | -0.104*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Youth population (%) | -0.718*** | -0.688*** | -0.684*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Commodity price changes | 0.001 | 0.001 | 0.001 |
| | p = 0.308 | p = 0.172 | p = 0.125 |
| GDP growth | -0.025*** | -0.024*** | -0.024*** |
| | p = 0.000 | p < 0.001 | p < 0.001 |
| Weekend (comp. no weekend) | -0.538*** | -0.538*** | -0.538*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Shutdown duration * Internet access | | | 0.0001* |
| | | | p = 0.033 |
| Shutdown duration * Organizational capacity | | | -0.00001* |
| | | | p = 0.012 |
| Constant | 14.395*** | 14.214*** | 14.262*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Country Fixed Effects | Yes | Yes | Yes |
| Observations | 58,811 | 58,811 | 58,811 |
| Log Likelihood | -36,190.990 | -36,196.060 | -36,191.390 |

| | | | |
|---|---|---|---|
| Akaike Inf. Crit. | 72,447.980 | 72,462.130 | 72,456.780 |

*Note:* $^{*}$p<0.05; $^{**}$p<0.01; $^{***}$p<0.001

**Table B2. NBRM With and Without Country-Fixed Effects**

| | *Dependent variable:* | | | | | |
|---|---|---|---|---|---|---|
| | Daily Nonviolent Protest Count (ACLED) | | | | | |
| | Binary Model (1) | Binary Model (2) | Duration Model (3) | Duration Model (4) | Interaction Model (5) | (6) |
| Shutdown binary (t-1) | 0.486$^{***}$ | 0.146$^{**}$ | | | | |
| | p < 0.001 | p = 0.006 | | | | |
| Shutdown duration (linear) | | | 0.008$^{***}$ | 0.002 | 0.016$^{***}$ | 0.003 |
| | | | p < 0.001 | p = 0.399 | p < 0.001 | p = 0.198 |
| Shutdown duration (squared) | | | -0.00004$^{*}$ | -0.00002 | -0.0001$^{***}$ | -0.00002 |
| | | | p = 0.013 | p = 0.257 | p < 0.001 | p = 0.186 |
| Shutdown duration (cubic) | | | 0.00000005 | 0.00000003 | 0.00000008$^{**}$ | 0.00000003 |
| | | | p = 0.073 | p = 0.249 | p = 0.006 | p = 0.268 |
| Organizational capacity | 0.004$^{***}$ | 0.001$^{***}$ | 0.004$^{***}$ | 0.001$^{***}$ | 0.004$^{***}$ | 0.001$^{***}$ |
| | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 |
| Internet access (%) | 0.010$^{***}$ | 0.053$^{***}$ | 0.010$^{***}$ | 0.053$^{***}$ | 0.011$^{***}$ | 0.053$^{***}$ |
| | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 |
| Regime type (cont.) | 0.094 | -0.393 | 0.064 | -0.452 | 0.102 | -0.457 |
| | p = 0.264 | p = 0.130 | p = 0.445 | p = 0.081 | p = 0.230 | p = 0.078 |
| C19 stringency (t-1) | -0.0003 | -0.003$^{***}$ | -0.0005 | -0.003$^{***}$ | -0.0004 | -0.003$^{***}$ |
| | p = 0.541 | p < 0.001 | p = 0.390 | p < 0.001 | p = 0.480 | p < 0.001 |
| Urbanization (%) | -0.019$^{***}$ | -0.036 | -0.019$^{***}$ | -0.037 | -0.019$^{***}$ | -0.039 |
| | p < 0.001 | p = 0.131 | p < 0.001 | p = 0.112 | p < 0.001 | p = 0.103 |
| Youth population (%) | 0.091$^{***}$ | -0.587$^{***}$ | 0.090$^{***}$ | -0.573$^{***}$ | 0.091$^{***}$ | -0.568$^{***}$ |
| | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 |
| Commodity price index | -0.003$^{***}$ | -0.001 | -0.003$^{***}$ | -0.001 | -0.003$^{***}$ | -0.001 |
| | p < 0.001 | p = 0.238 | p < 0.001 | p = 0.228 | p < 0.001 | p = 0.267 |
| GDP growth | 0.017$^{***}$ | -0.017$^{**}$ | 0.016$^{***}$ | -0.017$^{**}$ | 0.016$^{***}$ | -0.017$^{**}$ |
| | p < 0.001 | p = 0.002 | p < 0.001 | p = 0.002 | p < 0.001 | p = 0.002 |
| Weekend (comp. no weekend) | -0.482$^{***}$ | -0.493$^{***}$ | -0.481$^{***}$ | -0.493$^{***}$ | -0.481$^{***}$ | -0.493$^{***}$ |
| | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 |
| Shutdown duration * Internet penetration | | | | | -0.0004$^{***}$ | 0.0001 |
| | | | | | p < 0.001 | p = 0.486 |
| Shutdown duration * Organizational capacity | | | | | 0.00001$^{*}$ | -0.00001 |
| | | | | | p = 0.048 | p = 0.331 |
| Constant | -3.335$^{***}$ | 9.110$^{***}$ | -3.273$^{***}$ | 8.944$^{***}$ | -3.324$^{***}$ | 8.903$^{***}$ |
| | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Country Fixed Effects | No | Yes | No | Yes | No | Yes |
| Observations | 58,811 | 58,811 | 58,811 | 58,811 | 58,811 | 58,811 |
| Log Likelihood | -32,998.620 | -31,220.420 | -33,023.110 | -31,223.050 | -33,002.820 | -31,221.880 |
| theta | 0.410*** (0.008) | 0.624*** (0.015) | 0.408*** (0.008) | 0.623*** (0.015) | 0.409*** (0.008) | 0.623*** (0.015) |
| Akaike Inf. Crit. | 66,019.240 | 62,506.850 | 66,072.220 | 62,516.110 | 66,035.650 | 62,517.750 |

*Note:* *p<0.05; **p<0.01; ***p<0.001

**Table B3. Comparing Different Lag Specifications for the H1-H4 NBRMs**

| | *Dependent variable:* | | |
|---|---|---|---|
| | Daily Nonviolent Protest Count (ACLED) | | |
| | (1) | (2) | (3) |
| Shutdown binary (t-1) | 0.146** | | |
| | p = 0.006 | | |
| Shutdown binary (t-3) | | 0.127* | |
| | | p = 0.017 | |
| Shutdown binary (t-5) | | | 0.144** |
| | | | p = 0.007 |
| Constant | 9.110*** | 9.095*** | 9.091*** |
| | p < 0.001 | p < 0.001 | p < 0.001 |
| Country Fixed Effects | Yes | Yes | Yes |
| Observations | 58,811 | 58,811 | 58,811 |
| Log Likelihood | -31,220.420 | -31,221.390 | -31,220.520 |
| theta | 0.624*** (0.015) | 0.623*** (0.015) | 0.624*** (0.015) |
| Akaike Inf. Crit. | 62,506.850 | 62,508.780 | 62,507.040 |

*Note:* *p<0.05; **p<0.01; ***p<0.001
Control variables are included but not shown.

**Table B4. Naïve NBRMs for Models H1 through H4**

| | *Dependent variable:* | | | | | |
|---|---|---|---|---|---|---|
| | Daily Nonviolent Protest Count (ACLED) | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Shutdown binary (t-1) | 0.506*** | 0.171** | | | | |
| | p < 0.001 | p = 0.002 | | | | |
| Shutdown duration (linear) | | | 0.009*** | 0.004* | 0.016*** | 0.004 |
| | | | p < 0.001 | p = 0.042 | p < 0.001 | p = 0.123 |
| Shutdown duration (squared) | | | -0.0001** | -0.00004* | -0.0001*** | -0.00003 |
| | | | p = 0.004 | p = 0.015 | p < 0.001 | p = 0.125 |
| Shutdown duration (cubic) | | | 0.00000007* | 0.00000007* | 0.00000009** | 0.00000004 |
| | | | p = 0.017 | p = 0.019 | p = 0.004 | p = 0.206 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Organizational capacity | 0.005*** | 0.002*** | 0.005*** | 0.002*** | 0.005*** | 0.001*** |
| | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 |
| Internet access (%) | | | | | -0.001 | 0.034*** |
| | | | | | p = 0.089 | p < 0.001 |
| Weekend (comp. no weekend) | -0.478*** | -0.499*** | -0.476*** | -0.499*** | -0.478*** | -0.497*** |
| | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 |
| Shutdown duration * Internet penetration | | | | | -0.0002 | 0.0001 |
| | | | | | p = 0.116 | p = 0.382 |
| Shutdown duration * Organizational capacity | | | | | 0.0000004 | -0.00001 |
| | | | | | p = 0.957 | p = 0.161 |
| Constant | -2.079*** | -3.040*** | -2.071*** | -3.039*** | -2.052*** | -3.886*** |
| | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 | p < 0.001 |
| Country Fixed Effects | No | Yes | No | Yes | No | Yes |
| Observations | 63,925 | 63,925 | 63,925 | 63,925 | 63,925 | 63,925 |
| Log Likelihood | -34,310.800 | -32,244.760 | -34,338.150 | -32,244.660 | -34,316.360 | -32,035.860 |
| theta | 0.389*** (0.008) | 0.582*** (0.013) | 0.387*** (0.008) | 0.582*** (0.014) | 0.388*** (0.008) | 0.604*** (0.014) |
| Akaike Inf. Crit. | 68,629.610 | 64,545.520 | 68,688.300 | 64,549.330 | 68,650.720 | 64,137.720 |

*Note:* *p<0.05; **p<0.01; ***p<0.001

**Table B5. Naïve NBRMs to Test H5 and H6**

| | *Dependent variable:* | |
|---|---|---|
| | Daily Nonviolent Protest Count (ACLED) | |
| | Service-based Model | Throttle Model |
| | (1) | (2) |
| Service-based shutdown (t-1; comp. no shutdown) | 0.067 | |
| | p = 0.375 | |
| Shutdown (t-1; comp. no shutdown) | 0.257*** | |
| | p < 0.001 | |
| Throttle (t-1; comp. no shutdown) | | 0.153** |
| | | p = 0.005 |
| Shutdown (t-1; comp. no shutdown) | | 0.868** |
| | | p = 0.003 |
| Organizational capacity | 0.002*** | 0.002*** |
| | p < 0.001 | p < 0.001 |
| Weekend (comp. no weekend) | -0.500*** | -0.499*** |
| | p < 0.001 | p < 0.001 |
| Constant | -3.039*** | -3.040*** |

| | p < 0.001 | p < 0.001 |
|---|---|---|
| Country Fixed Effects | Yes | Yes |
| Observations | 63,920 | 63,925 |
| Log Likelihood | -32,236.500 | -32,242.360 |
| theta | 0.582*** (0.014) | 0.582*** (0.013) |
| Akaike Inf. Crit. | 64,531.000 | 64,542.710 |
| *Note:* | | *p<0.05; **p<0.01; ***p<0.001 |