

# Fast Internet and Political Violence in Africa

Master Thesis International Economics

## Abstract

*To investigate how the arrival of fast internet in Africa has affected the local development of political violence, I employ the gradual arrival of submarine cables to the coast of Africa, maps of the terrestrial backbone network and information on the location of political violence events. Data on protests, riots, battles and violence against civilians for twelve coastal African countries are used. With a difference-in-difference model, I estimate that there is a relative decrease in events of political violence in areas connected to fast Internet as compared to areas not connected to fast internet after the arrival of the submarine cables. This effect does not depend on the relative quality of government in a country and cannot be explained by the change in income in these areas that followed the arrival of the submarine cables. The estimated treatment effect holds for a sample restricted to protests or riots, but diminishes in a sample restricted to battles or violence against civilians.*

**Student: Eline Wolfhagen | Student number: 413752**

**Supervisor: prof. dr. Maarten Bosker | Second assessor: prof. dr. Sacha Kapoor**

**Date final version: 10-08-2020**

## **Table of contents**

I. Introduction	3
II. Literature review	6
III. Background	11
IV. Data	14
V. Empirical strategy	22
VI. Results	25
VII. Discussion	41
VIII. Sources	44
IX. Appendix	51

## **I. Introduction**

Large anti-government demonstrations have spread throughout the world in 2019 – from Catalunya to Chile and from Honduras to Hong Kong. The people have not raised their voice in such numbers since the late 1980s. One factor that explains this wave of protests throughout the world is the use of social media – it facilitates protest and might even fuel the anger (“Economics, demography and,” 2019). The effect of social media is illustrated by the recent protest wave in Hong Kong. In 2019, the people of Hong Kong revolted against Chinese domination in a year of continuous protests. This historic uprising was supported by the smart use of apps. In encrypted message boards people could anonymously share information on protests (Vincent, 2019) and an app was created to track the location of the police. This gives an idea of how access to Internet and social media can shape protest (“Apple removes police,” 2019). Because of its decentralized nature and easy accessibility, the Internet facilitates independent communication and mobilizes people. In this spirit, Diamond (2012) has described the Internet and mobile phones as liberation technologies.

For the Internet to liberate, it needs to be accessible and affordable to the masses. Although dependable and cheap access to Internet has long been part of western life, this cannot be said for many other parts of the world. In Africa satellite Internet has, for a large part, been the main form of Internet available. Satellite Internet is known to be expensive and slow (OECD, 2014). In many cases satellite Internet did, thus, not comply to the promise of cheaply spreading information (Howard & Hussain, 2013). During the late 2000s and early 2010s, submarine Internet cables slowly found their way from Europe to the coast of Africa.<sup>1</sup> They greatly increased the speed and capacity of the terrestrial Internet network in Africa (Hjort & Poulsen, 2019). The submarine cables offered an alternative to satellite connections (OECD, 2014) and consequently provided faster and more affordable Internet. This new connection allowed, among other things, for a better functioning of social media by improving the usability of platforms as Facebook and Youtube (McCarthy, 2009). In other words, the submarine cables, and the fast Internet that followed, have improved communication technologies in Africa and provided the circumstances for the Internet to liberate.

---

<sup>1</sup> During the sample period one of the ten cables that arrived in Africa connected the continent with UAE, another connected both Europe and India with the continent.

I will use a unique dataset on the gradual arrival of submarine Internet cables to Africa to investigate if the Internet does indeed liberate. I will look at the effect of fast Internet on political violence to answer the question: *How does the arrival of fast Internet affect political violence in Africa?* The term political violence describes organized and violent forms of collective action (Pierskalla & Hollenbach, 2013). In this paper, four categories of political violence are included: violence against civilians, riots, battles, and protests. Information on these events is gathered using the Armed Conflict Location & Event Data Project (ACLED). ACLED provides detailed geographical information on all political violence events in Africa.

In the literature both the activating<sup>2</sup> and (indirect) pacifying role<sup>3</sup> of the Internet is described. The effect of the Internet can depend on the category of political violence and the quality of government. This paper will be the first difference-in-difference study to research how the arrival of submarine cables in Africa influenced political violence intensity. Earlier research has often been limited to a case study of one country;<sup>4</sup> has focused more on the spread of other ICTs such as mobile phones and has often studied only one category of political violence.<sup>5</sup> By using detailed geographical information on the events of political violence and the terrestrial backbone Internet network in Africa, I compare the trend of political violence in areas connected and unconnected to the Internet network before and after the arrival of the submarine cables in a sample of twelve African countries. The included data allows me to consider different categories of political violence, the quality of government in terms of level of democracy and press freedom and local economic development proxied by light density to gain more insight in the channels through which Internet and political violence are related. The sample period is country specific, but stretches from 2006 to 2015.<sup>6</sup>

My main results are as follows. There is a significant and quantitatively large difference between the development of political violence in areas connected to fast Internet and areas unconnected to fast Internet after the arrival of the submarine cables. Areas connected to fast Internet show a slower increase in political violence than areas not connected to the network. These results hold for a sample containing only events of protests or riots but fade for a sample containing only events of violence against civilians or battles. I find no prove for a

---

<sup>2</sup> See e.g. Pierskalla & Hollenbach (2013), Enikopolov et al. (2020)

<sup>3</sup> See e.g. Hassanpour (2014), Bond et al. (2012)

<sup>4</sup> See e.g. Yanagizaw-Drott (2014), Jones & Mattiacci (2019)

<sup>5</sup> See Chirstensen & Garfias (2018), Manacorda & Tesei (2018)

<sup>6</sup> The exact sample period and countries are reported in Appendix Table A1.

heterogeneous treatment effect based on differences in quality of government in countries. Earlier research has shown that the arrival of fast Internet positively affected local economic development. I have not discovered any evidence, however, that shows that political violence and fast Internet are related through this income change. The most noteworthy limitation to this paper is that the significance of the results is dependent on the inclusion of South Africa in the dataset. The estimated treatment effect remains similar in size and sign after excluding South Africa, but as many of the events of political violence reported in the dataset took place in South Africa, the estimate of interest loses its significance.

In a time where the stories about the activating power of the Internet are widespread, from the Arab Spring to Black Lives Matter, I find evidence for the opposite relationship between political violence and Internet in Africa: in areas connected to faster Internet there have been less events of political violence than in areas not connected to faster Internet.

In the next section, I give an extensive literature review of earlier research on ICTs and political violence. In section III., I provide more background on the practical implications of the arrival of the submarine cables to the coast of Africa. In section IV. and V., I further explain my usage of data and described the methodology of this paper. In the final two sections of the paper, I discuss the results and their implications.

## II. Literature review

In this section, I provide a literature review of studies related to both political violence and access to Internet and other ICTs. What causes political violence is a heavily researched topic (Collier & Hoeffler, 2007). Researchers have touched on economic factors (Berman & Couttenier, 2015; Cederman, et al., 2011), religious and ethnic diversity (Wucherpfenning et al., 2012), history of violence, geographical factors (Collier & Hoeffler 2004) and new and old media. Warren (2015) has looked at the difference between mass communication and ICTs. He finds that mass media pacifies, while social and decentralised new media activates. These results contradict Yanagizawa-Drott's (2014) findings. He describes how mass media was effectively used in Rwanda to promote violence. In this study, I will focus on the effect of access to fast Internet on political violence and thus limit the research to the effect of new media on political violence.<sup>7</sup> Several mechanisms could influence the relation between Internet and political violence. Factors such as lower coordination costs and audience effects have an activating effect, but the Internet also offers opportunity for government to suppress political violence. Both aspects are discussed in this section.

### *The stimulating role of the Internet*

Many studies have described how ICTs facilitate collective organisation of political violence by lowering coordination costs.<sup>8</sup> Before, I mentioned that political violence refers to violent and organised forms of collective action. Participating in a protest or in violent conflict imposes private costs on participants. Firstly, these are practical costs for gathering information about the event and for the time spend attending or participating (Enikopolov et al., 2020). The potential participants need to hear about the event. The organisers need to know that their call for action was heard, and participants need to know that the organisers know they heard their call for action. Communication technologies can play an important role in facilitating all of this (Christensen & Garfias, 2018). In this context, preference falsification is also often considered. Preference falsification refers to a situation where the private preferences of an individual differ from their publicly expressed preferences (Kuran, 1997). More participants increase the chance of success of a political action. Consequently, the individual returns on participating in these actions and expressing private preferences publicly grow with the number of participants. ICTs

---

<sup>7</sup> Although several studies have shown that cyber-attacks are part of modern-day violence, the exact effect still needs to be established (Gohdes, 2018). Cyber-attacks are not included in this paper, as it is difficult to assign a location to cyber-attacks and the empirical strategy is based on pinpointing the location of events precisely.

<sup>8</sup> See e.g. Pierskalla & Hollenbach (2013), Enikopolov et al., (2020), Christensen & Garfias (2018), Manacorda & Tessei (2018)

can help inform citizens about public support for their private preferences. Together with the more practical coordination costs they create a coordination problem where participants act as strategic complements. The Internet's potential in lowering coordination cost was captured in Diamond's controversial term: liberation technology (2012). Mobile phones and the Internet lower the costs for accessing and spreading information and decentralize the provision of information. In doing so, they facilitate liberation (Manacorda & Tesei, 2018). Little (2016) argues that ICTs reduce the practical coordination costs, but do not necessarily reduce costs for preference falsification.

Internet can also assist political violence through the domestic, or international audience effect. Social media and the new connectivity with the rest of the world can be used by protesters and rebels as a diplomatic tool. Jones and Mattiacci (2019) describe how this tool was used in the Libyan civil war by rebels to gain support of the United States. This could fit in the narrative of a coordination problem - when does a government decide to act against political violence? Choosing to act against insurgents imposes costs on the insurgents and is a show of strength from the government. It sets an example and can deter further actions of the opposition. However, there are also costs for the government when they decide to act. There could be repercussions from the international community if governments show force. Repression can, in this case, inflame the anger of people not involved. Previously docile citizens could become activated by government aggression. Moreover, the improved Internet connection leads to better accessibility of information on government performance within the country and consequently improved accountability of the government (Manacordi & Tesei, 2018). Research on which factor is most important in governments' decision to act is limited (Christensen & Garfias, 2018). Siegel (2011) does, however, provide us with a valuable insight. He finds that the chance of a backlash after repression is limited when ties between those suffering from government aggression and citizens outside the community under attack are weak. Enhanced connectivity can strengthen these ties. Moreover, because of the international audience effect better connectivity enlarges the chances of international repercussions (Jones & Mattiacci, 2019). Consequently, one would expect that increased use of ICTs and the enhanced connectivity that follows could discourage governments to act against political violence and thus reduces expected costs of participating in political violence.

In many of the studies mentioned above it is difficult to separate the effect of the different informational factors and determine which factor is key in nudging participants' decision to act (Cantoni et al., 2019).

### *The pacifying role of the Internet*

Above mentioned studies all describe the stimulating role of Internet on political violence. Other studies<sup>9</sup> have, however, described the appeasing role of the Internet. Social media discourage face-to-face interaction, leading to weaker ties in the community. Consequently, Internet would not encourage mobilization but stimulate pacification. Moreover, these “liberation technologies” are a tool for governments to gather information on political violence and spread propaganda (Qin et al., 2017). ICTs make it easier and safer for the population to share information with governments on political violence (Shapiro & Weidmann, 2015). Many people use social media to access news, but these media have also facilitated the spread of misinformation. Valenzuela et al. (2019) argue that political engagement is both a consequence of social media and a cause of the spread of misinformation. Access to the Internet helps the spread of information, but the quality of this information is not ensured. Next to spreading misinformation, the government can censor the available information or even block the Internet completely. In the twelve African countries studied in a period stretching from 2006 to 2015, one can see a tightening of regulation on ICTs and an increase in prosecutions for voicing opinions with ICTs.<sup>10</sup> Since 2016, there has been a definitive rise in network disruptions by African governments (CIPESA, 2019). These disruptions have since become a popular measure during elections in Sub Saharan Africa to repress the opposition (Ogala, 2019). Freyborg & Garbe (2018) illustrate that these measures are most popular in autocracies, while democratic rulers appear to refrain from such actions. The quality of government could thus affect the relation between political violence and fast Internet.

### *The indirect effect*

The channel through which fast Internet affects political violence could also be less direct. Hjort and Poulsen (2019) have studied the effect of the arrival of submarine cables on employment using the same sample countries and period. They found a significant positive relation between employment and economic development in the areas connected to fast Internet. Moreover, several studies have shown that there is a relationship between income and

---

<sup>9</sup> See e.g. Hassanpour (2014), Bond et al. (2012)

<sup>10</sup> The exact sample period differs per country. The country-specific sample period is reported in Appendix Table A1.

political violence (Berman & Couttenier, 2015). Indirectly, the arrival of fast Internet could reduce political violence through the income shock identified by Hjort and Poulsen.

### *The category of violence*

Different studies focus on different categories of political violence. Shapiro and Weidmann (2015) find that better connectivity leads to less violence from rebels as government-supporting citizens use the increased connectivity to inform the government about actions of the groups. Their study focusses on this one category of political violence, namely conflict. In conflicts, non-participating individuals are often not spared by either the rebels' violence or the governments' counter-attacks. In the case of protests, it is often only the protesters themselves who suffer the consequences of their actions. Consequently, there is less incentive for non-involved civilians to inform the government about actions of rebels. Although both protests and rebel attacks are considered as forms of political violence in this paper, the costs imposed on the non-participating individuals are different and could thus influence the use of ICTs by these civilians and the potential effect of improved connectivity (Shapiro & Siegel, 2015).

### *Contribution to the literature*

From the overview above it should be clear that there is not one straightforward answer to the question of how fast Internet and political violence are related. Improved connection to fast Internet can have an activating role by lowering coordination costs or through the international audience effect. On the other hand, the Internet discourages face-to-face interaction and can be used as a tool for governments to suppress. Moreover, the arrival of fast Internet can indirectly limit political violence through an income shock. The effect of fast Internet on political violence could differ per category of political violence and based on the quality of government.

Despite the vast body of research on this topic, finding a causal relationship between Internet and political violence remains difficult (Little, 2016). Many studies discussed above limited their research to one country or case, such as Egypt (Brym et al., 2014), Russia (Enikopolov et al., 2020), Iraq (Shapiro & Weidman, 2015), Rwanda (Yanagizaw-Drott, 2014) or Libya (Jones & Mattiacci, 2019). Above mentioned authors recognize the difficulty of extrapolating their results beyond this case study. Pierskalla and Hollenbach (2013) have done a broader cross-sectional analysis. However, in their study it remains difficult to account for static differences between the different locations in their dataset.

I will follow Chirstensen & Garfias (2018), Manacorda & Tesei (2018) and Shapiro & Weidman (2015). They use a difference-in-difference design that allows them to exploit variation within a location and eliminate the static differences between locations. Their studies focus on cell-phone coverage and protests, but I will look at improved Internet connectivity instead of cell-phone coverage and consider different categories of political violence instead of only protests. The variation in accessibility and availability of Internet varies within countries and is likely to affect patterns of mobilization (Gohdes, 2018). The spread of cell-phones throughout a country is ongoing, whereas accessibility to fast Internet has a clear treatment date: the arrival time of the submarine cables. This allows for a more straightforward identification process. The connection between fast Internet and political violence in Africa has, to my knowledge, not yet been investigated in a difference-in-difference analysis.

In this literature review, I have shown that there are several mechanisms through which the Internet can influence political violence. Where many of the studies on cell-phone connectivity single out the coordination cost mechanism, I consider both the stimulating and pacifying role of the Internet. To examine the strength of the different channels I have included different categories of political violence in the analysis: protests, riots, violence against civilians and battles. This allows me to test whether the Internet has differently affected these different categories of political violence. Specifically, earlier research on protest and riots leans more towards the activating role of improved connectivity because of reduced coordination costs. In the case of violence against civilians and battles, non-involved civilians are more likely to use the newfound connectivity to inform the government on rebel action and thus potentially reduce the frequency of these categories of political violence. Including indicators for the quality for the quality of government could also improve our understanding of the importance of the different channels through which fast Internet affects political violence. I will use indicators for freedom of press and the level of democracy in a country, where the suppressing or pacifying power of the Internet is expected to be stronger in countries that are considered less democratic or less free in terms of press freedom. Earlier, I described how fast Internet caused a local income shock in areas benefiting from the arrival of the submarine cables. By using night light density data as a proxy for economic development, the potential indirect channel through which this income shock could affect political violence is also examined. Using these extra sources could help improve the understanding of the different channels through which fast Internet and political violence are related and thus adds to the existing body of literature.

### III. Background

In this section, I elaborate on how the Internet is used in Africa and what the implications are of the arrival of submarine cables in Africa.

#### *The arrival of the submarine cables*

Submarine cables gradually arrived at the coast of Africa to provide faster Internet in the 2000s. The timing of the arrival of the cables differs per country and is depicted in Figure 1. When identifying the effect of fast Internet on political violence in these different countries, I will be looking at different time periods for each country. The arrival dates range from 2009 to 2010 and the sample period is in between 2006 and 2015. The exact sample period and arrival date of the submarine cables for every country is mentioned in Appendix Table A1 (TeleGeography, 2020).

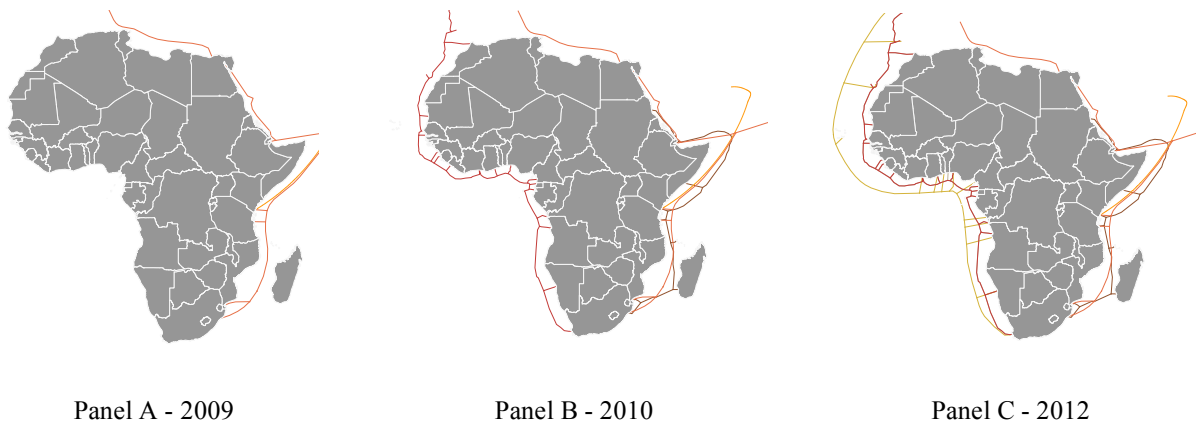


Figure 1 – Arrival of the submarine cables

*Note:* These figures show the gradual arrival of the relevant submarine cables within the sample. Panel A depicts the arrival of Teams and Seacom in 2009; Panel B depicts the arrival of MainOne and Eassy in 2010 and Panel C depicts the arrival of WACS and ACE in 2012.

#### *From submarine cable to the last mile*

These submarine cables were brought to shore at coastal landing points. Most landing points are located on the outskirts of a big city that is connected to the terrestrial network. Each country would typically have one landing point, and a single terrestrial backbone network. Once the data have travelled from Europe to Africa through the submarine cables, the Internet first travels through this national backbone network. From the backbone, the Internet then reaches the consumer through e.g. fiber cables, copper cables or wireless broadband, which I refer to as the last mile. At a local level, I do not have information on the exact infrastructure

of the last mile (Hjort & Poulsen, 2019). This last mile is relevant for how people access the Internet. Fixed access via cyber cafes was a popular way to access the Internet in Africa at the start of the sample period. At the end of the sample period, popularity of wireless broadband or mobile Internet to access the internet rose. In both cases the quality of the Internet depends on the capacity of the terrestrial backbone network, which in turn is greatly increased by the submarine cables. The cellphone penetration rates increased rapidly in Africa during the sample period. However, most of the phones in Africa were still feature phones during this period. From the 2010s onwards, there has been an increase in smartphones usage (Nyirenda-Jere & Biru, 2015).

#### *The implications of the national backbone structure*

The submarine cables are connected to countries through the terrestrial backbone network. The fiber cables of the backbone network are in almost all cases built by a national telecom company. The cable length of the backbone network does not significantly influence the quality or speed of the Internet. When networks in the backbone have different owners, for example in a connection between different countries, this can be a problem. Only when the two networks are collaborating, they are likely to transmit content. In most African cases, however, it is cheaper to transfer the content through another continent because of the high fees charged by African owners. Moreover, much of the locally relevant content in Africa is hosted internationally. This is even the case for locally generated content such as local news available in local languages (Kende & Rose, 2015). Because most African Internet traffic travels overseas and African countries have one single backbone network, the arrival of submarine cables could greatly increase the speed and capacity of the Internet in African countries and the danger of spillovers to neighboring countries lacking such cables is limited. This explain why the sample only contains coastal African countries. Moreover, there is a clear treatment date for each country, namely the date the first submarine cable arrived at each country.

#### *Internet speed and capacity*

International Internet connectivity is an important basis for advancement of the Internet in a country, specifically for developing country where much of the content is hosted internationally (Nyirenda-Jere & Biru, 2015). The starting point of this paper is this improved connectivity, as I investigate how this faster internet has affected the local development of political violence. Hjort and Poulsen (2019) further investigated if the arrival of the submarine cables did indeed change the use, speed and capacity of the Internet in the African countries included in my

sample. They show, in their cautious estimates, that the Internet speed increased by 38 percent and the daily and weekly take-up rates increased between 12 and 14 percent for locations connected to the terrestrial backbone network relative to unconnected locations after arrival of the cables.<sup>11,12,13</sup> Moreover, broadband subscriptions and connection prices fell after the arrival of submarine cables, while there was no trend in charges before the arrival.<sup>14</sup> Moreover, this new connection allowed, among other things, for a better functioning of social media by improving the usability of platforms as Facebook and Youtube (McCarthy, 2009). Together this suggests that both use and speed of Internet have risen due to the arrival of submarine cables in Africa. The effect of the arrival of the submarine cables was not only measured by Hjort and Poulsen, but also described in the news (McCarthy, 2009), on blogs (Heacock, 2009), and in reports (Nyirenda-Jere & Biru, 2015).

---

<sup>11</sup> Hjort and Poulsen (2019) retrieved data on Internet speed data from Internet service provider Akamai Technologies Inc. Akamai writes quarterly reports on Internet speeds experienced by residential users, educational institutions, government offices and firms on specific locations. They retrieved data on Internet use from the Afrobarometer Surveys on daily and weekly Internet use of correspondents (available from <http://www.afrobarometer.org>).

<sup>12</sup> These estimates are expected to be an underestimate of the true effect because only a fraction of the Akamai user speed tests was of data traveling through another continent. As mentioned above, most African data does travel through other continents. The submarine cables most positively affected speed of data traveling via another continent. Therefore, the Akamai data on Internet speed may lead to an underestimation of the true effect (Akamai, 2012).

<sup>13</sup> An area is considered connected when it is located within a 500-meter radius of the terrestrial backbone network.

<sup>14</sup> Hjort and Poulsen (2019) retrieved broadband subscription data from International Telecommunication Union (ITU).

## IV. Data

In this section, I describe the data used in this paper on the Internet infrastructure in Africa, political violence intensity, quality of government, night light density and other infrastructures.

### *Internet infrastructure*

For data on the Internet infrastructure, I build on the analysis of Hjort and Poulsen (2019). Information on the arrival and geography of submarine cables comes from Mahlkecht (2014) and TeleGeography (2020).<sup>15</sup> Appendix Table A1 provides an overview from all included countries and the timing of the arrival of the submarine cables. In this paper, I determine whether areas are connected to fast internet based on their distance from the terrestrial backbone network in a country. To determine the layout of the terrestrial backbone network, maps from AfTerFibre (2014) and [www.africanbandwidthmaps.com](http://www.africanbandwidthmaps.com) were used.<sup>16</sup> For all included countries, I have detailed geographical information on the terrestrial backbone network.

### *Political violence intensity*

The Armed Conflict Location and Event dataset (ACLED) provides information on political violence events (Clionadh et al., 2010).<sup>17,18</sup> The dataset consists of dates, actors, locations (longitude & latitude), fatalities and modalities of all reported political violence events in Africa. The included events are battles, explosions/remote violence, protests, riots, strategic

---

<sup>15</sup> Hjort and Poulsen concluded which submarine cables arrived at which country by using Greg's cable map (Mahlkecht, 2014). I used other sources to confirm this. TeleGeography (2020) was my main source, but I cross-referenced both maps with information on the original websites from the different submarine cables. All reporting on the cables matched, except for the Glo-1 cable which arrived in 2011. Where most sources did not report landing points for the Glo-1 cable in Benin and Togo, Greg's Cable Map did report this. This is an important difference as for both Togo and Benin the first cable in the country after Glo-1 arrived at least one year later in 2012. This would delay the arrival of the first cable in both countries with almost one year. I have been in contact with Hjort and Poulsen about their sources and they confirmed that Greg's Cable Map was their main source for the landing points of the submarine cables. For their analysis, the exact timing of the arrival of the cables was not as relevant as they use survey data from before and after the arrival of all cables. As other sources do not report on the landing points of Glo-1 in Togo and Benin, I assume Glo-1 did not arrive in Togo and Benin. Appendix Table A1 and Figure 1 give an overview of the timing of the cables as used in this paper.

<sup>16</sup> During the sample period, there could have been changes to the backbone network. To control for this Hjort and Poulsen have (2019) have compared the free map available from AfTerFibre of the backbone network in 2013 with information from [www.africanbandwidthmaps.com](http://www.africanbandwidthmaps.com) on the backbone network in 2009. They removed the (few) extensions to the network from the AfTerFibre map. The sample period I use is slightly different from Hjort and Poulsen. As the information from [www.africanbandwidthmaps.com](http://www.africanbandwidthmaps.com) is not freely available, it is challenging to reconstruct the map for the complete sample period. I therefore choose to use the map that Hjort and Poulsen constructed for the period between 2009 and 2013, even though my sample also contains data from 2006 till 2015. In Table 14, column (4) I check robustness the of my results for the sample period of Hjort and Poulsen and the main finding hold.

<sup>17</sup> The used data from ACLED have been retrieved from [www.acleddata.com](http://www.acleddata.com)

<sup>18</sup> Earlier authors performing comparable studies (e.g. Christensen & Garfias, 2018; Manacorda & Tesei, 2018) have used GDELT or UCDP data. I prefer ACLED over GDELT as ACLED provides exact GPS locations, whereas GDELT connects events to a city. The exact GPS location is important for the identification strategy. I prefer ACLED over UCDP as UCDP only reports on deadly events with at least 25 battle related casualties, this would limit the scope of the paper.

developments and violence against civilians. The dataset is constructed from various sources, such as local and regional media reports, research publications and reporting by humanitarian agencies. The sample used in this paper includes political violence event from three years before the arrival of the submarine cables in a certain country until three years after the arrival of the submarine cables. The ACLED is not immune to potential measurement errors (Weidmann, 2016; Berman et al., 2017). Reporting might happen more often in certain areas, countries or for some political events. Moreover, the available ICT infrastructure could facilitate the reporting of events.<sup>19</sup> Structural differences in reporting by country, region or event should, however, not be cause for concern with the difference-in-difference method applied in this paper.

Earlier I defined political violence as violent and organised forms of collective action. From the events reported in ACLED, I include violence against civilians, battles, protests and riots in my dataset. All events where an organised armed group uses violence against unarmed civilians are considered as violence against civilians. These armed groups can be state forces, but also rebels. Battles are defined as “a violent interaction between two politically organised armed groups,” (ACLED, 2019, p. 7). There is no casualty minimum applied by ACLED. An event is defined as a protest if it concerns a public demonstration, where those participating do not employ any violence. This does not rule out, however, that violence was used against the demonstrators. Individual acts, such as hunger strikes, are not included in this category. For an event to classify as a riot, the participating demonstrators need to use violence in a disruptive act. A riot could have started out as a peaceful protest. The rioters do not use sophisticated weapons, whereas armed groups do. Table 1 gives an impression of the share of the different political violence events in the sample. Most common in the dataset are protests, but there are relatively few reports of battles in the dataset. From ACLED, I do not include explosions/remote violence in my dataset, as these events do not fit my definition of political violence. Moreover, I leave strategic developments out of the analysis, as these events are not comparable across time and countries. Strategic developments provide information on the context of political violence, and capture developments beyond clear-cut events of political violence (ACLED, 2019).

---

<sup>19</sup> If this would be the case, this would lead to relatively more reported events of political violence in areas better connected to the terrestrial backbone network. However, I find a negative treatment effect: there are less events of political violence in areas connected to fast internet compared to areas not connected to fast internet. Consequently, if the improved connectivity does distort the relative reporting, this could only cause an underestimation of the treatment effect.

Table 1 – Political violence count per category

	Share of sample
Battles	14%
Protests	37%
Riots	27%
Violence against civilians	21%

*Note:* Per category of political violence, I report the share of the sample. Events are included that took place between three years before and after the arrival of the submarine cables for every country. The sample includes all political violence events that took place within a 10-kilometer radius around the terrestrial backbone.

With detailed location information on both the events of political violence and the backbone network, I have constructed the distance between the event of political violence and the closest backbone network connection.<sup>20</sup> Figure 2 shows the map of the terrestrial backbone network and the ACLED events I used to construct the dataset. This allowed me to label an event as either connected or unconnected based on its distance from the backbone network. In section V., I elaborate on when an area classifies as connected. Based on the date that the submarine cable arrived in a certain country and the date of the political violence event, I labelled events pre- or post-submarine cable arrival. Table 2 displays the share of political violence events in connected and unconnected areas, pre- and post-submarine cable arrival. From Table 2, it becomes clear that in both the connected and unconnected areas and in both the periods pre- and post-submarine cables events of political violence took place. Table 3 gives an overview of the share of political violence events included in the sample per country. The share of South African events in the data is remarkably large. This can be explained by the country size and the extensive terrestrial backbone network, as illustrated in Figure 2. Figure 2 and Table 3 confirm that every country in the sample has been politically unstable during the sample period. Appendix Table A2 gives background information on the political situation of the twelve African countries studied in this paper and further discusses noteworthy differences in country shares as displayed in Table 3.

The dependent variable used in this paper is *political violence intensity*. It is constructed by the yearly count of political violence events in both the connected and unconnected part of 0.1 x 0.1-degree grid-cells.<sup>21</sup> It should be noted that grid-cells were only included when there

<sup>20</sup> I used the QGIS plug-in NNJoin to calculate the distance (in degrees) between an event of political violence and the terrestrial backbone network.

<sup>21</sup> After creating the 0.1 X 0.1-degree grid-cells in QGIS, the join attributes by location tool helped assign the correct grid-cell to every event of political violence.

has been at least one political violence event within the sample period. Consequently, the treatment effect will only be identified for places where there has been political violence activity within the sample period. Figure 4 shows a snapshot of the grid map, the political violence events and the terrestrial backbone network that were used to create the dataset. This figure can help visualize how the *political violence intensity* variable was created.

Table 2 – Political violence, connectivity, and the arrival of submarine cables		
	Share of sample	
	<i>Before submarine</i>	<i>After submarine</i>
<i>Not connected</i>	28.1%	41.6%
<i>Connected</i>	14.7%	15.6%

*Note:* Per category, I report the share of the sample. Events are included if they took place between three years before and after the arrival of the submarine cables in that country. The sample includes all political violence events that took place within a 10-kilometer radius around the terrestrial backbone network and an event is considered connected if it took place within 500 meters of the terrestrial backbone network.

Table 3 – Political violence count per country	
	Share of sample
Benin	0.90%
D. R. Congo	5.0%
Ghana	1.5%
Kenya	23.5%
Madagascar	3.4%
Mozambique	1.9%
Namibia	5.7%
Nigeria	18.8%
Senegal	2.5%
South Africa	32.8%
Tanzania	1.8%
Togo	2.1%

*Note:* Per country, I report the share of the sample. Events are included that took place between three years before and after the arrival of the submarine cables in that country. The sample includes all political violence events that took place within a 10-kilometer radius around the terrestrial backbone network.

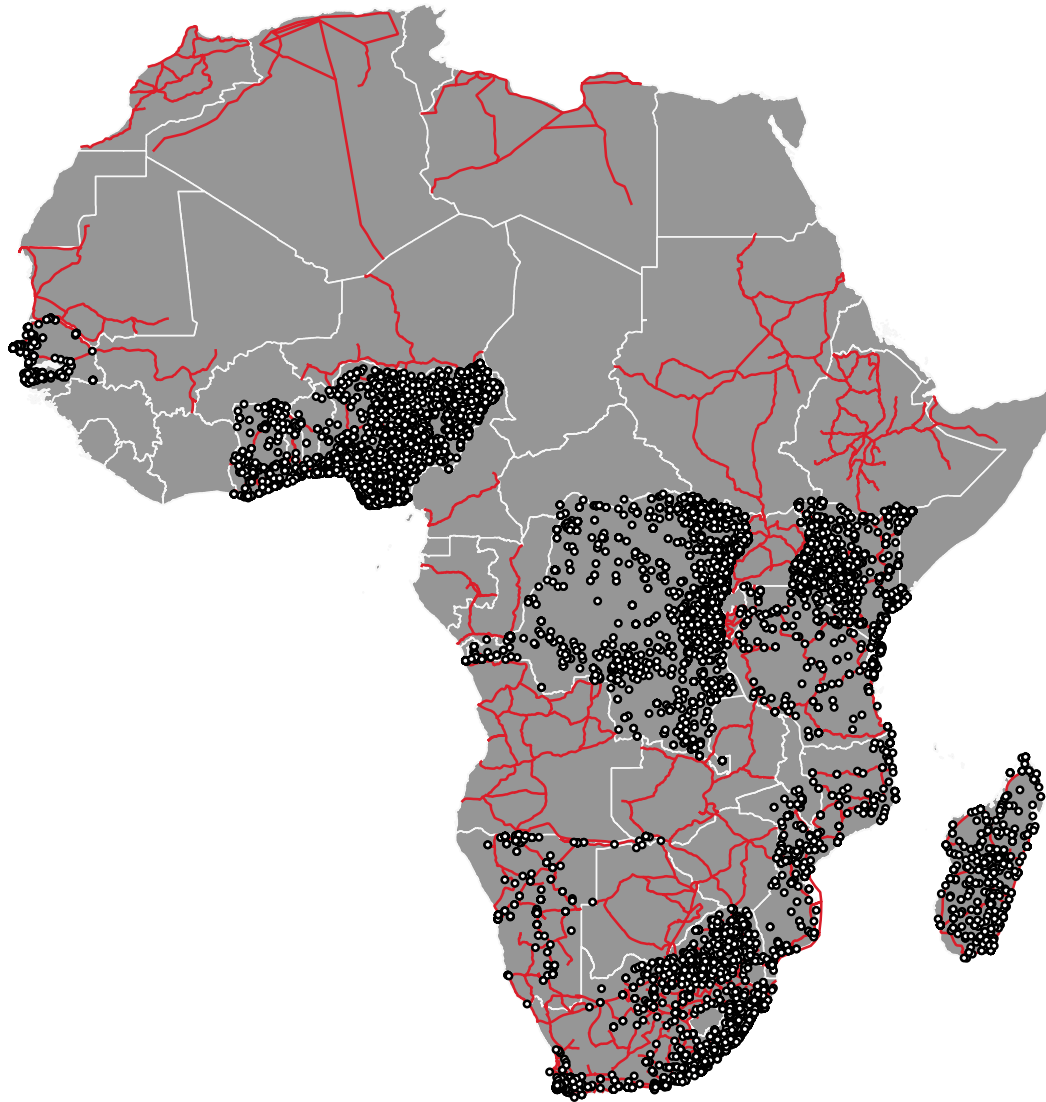


Figure 2 – Political violence events and the terrestrial backbone network

*Note:* This map depicts all ACLED violent events within the country sample in a three-year period before and after the arrival of the submarine cables and displays the terrestrial backbone network during this period.

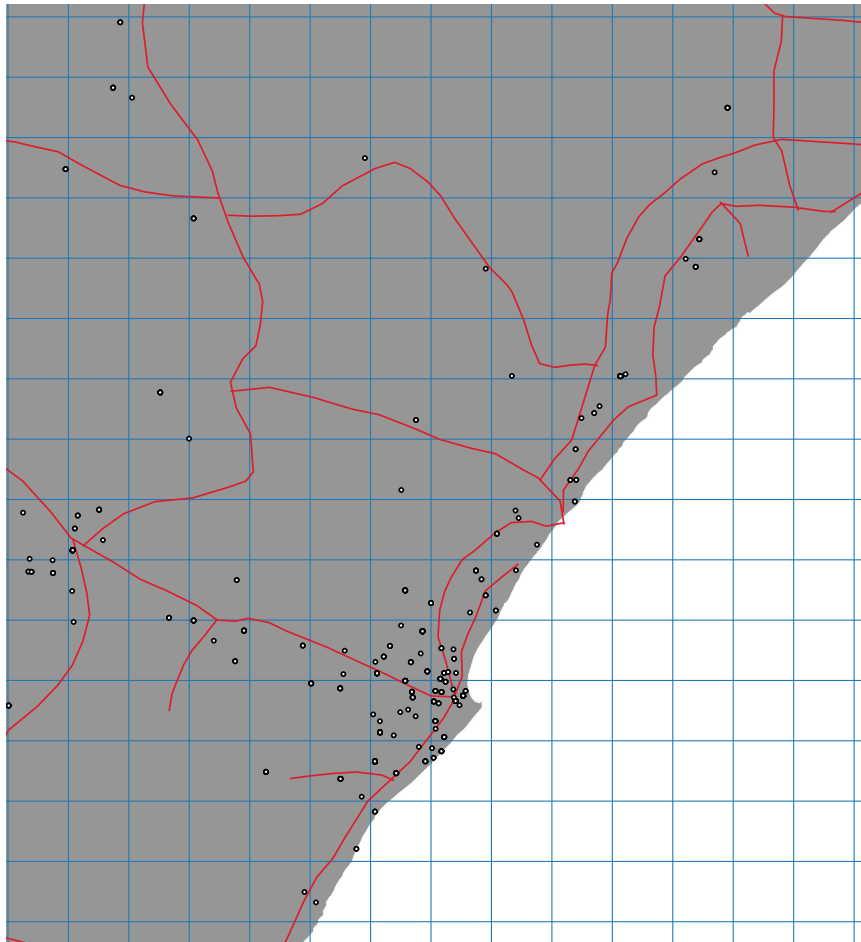


Figure 3 – Political violence events, grid-cells and the terrestrial backbone network

*Note:* This map depicts ACLED political violence events on the South-East border of South Africa with a 0.1 x 0.1-degree grid cell layer and the terrestrial backbone network.

### *Quality of government*

To test the role of the quality of the government on the estimated treatment effect, I have included country-year level indicators for democracy and media freedom. With these indicators, I can test whether there is a heterogeneous effect of fast Internet on political violence for countries with different levels of democracy and press freedom (Christensen & Garfias, 2018; Berman et al., 2018). To measure the state of democracy in a country, I have used the democracy score (0-10) provided by Polity IV (Marshall & Jaggers, 2019) which considers governance, behavior of civil servants, free elections and political participation. A country is considered *democratic* when it scores above 5 in a given year. Secondly, I have used an indicator for freedom of the press (Freedom House, 2019), which gives a numerical score (between 0-100) for the legal environment for the media (both online and offline) and the existing political pressures that influence reporting. A country can be considered *free* when it scores between 0 and 30, *partly free* when it scores between 31 and 60 and *not free* when it

scores between 61 and 100. For both indicators, the average country score is depicted in Figure 4.<sup>22</sup> In Appendix Table A2, I further elaborate on the country-specific scores for both indicators as displayed in Figure 4.

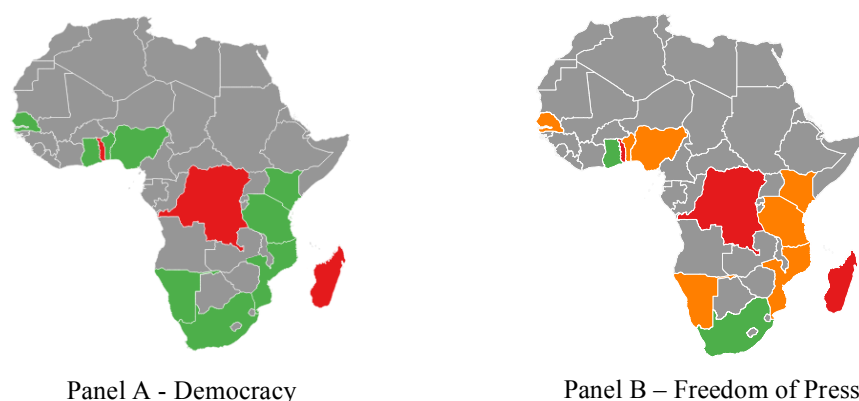


Figure 4 – Democracy and freedom of press

*Note:* These figures provide an overview of the state of democracy in Panel A and the freedom of the press in panel B for the countries included in the sample during the sample period. In panel A the green countries are considered *democratic* and the red countries are considered *undemocratic*. In Panel B freedom of press in red countries is *not free*, in orange countries *partly free* and in green countries *free*.

To formally test for a heterogeneous treatment effect based on the quality of government, I have generated two dummy variables for each country. These dummies split the countries by their scores on the two quality of government indicators in two different ways. Firstly, I have used the set standard described above. Countries are, in this case, considered *democratic*, when they scored above 5 on the democracy score and *free*, when they score below 50 on the freedom of press score. Secondly, I have divided countries based on their scores relative to the sample median in both categories, where countries who scored above the median are considered to perform well in each category.<sup>23</sup>

### *Night light density*

Earlier I discussed how the arrival of fast internet caused an income shock in the countries included in the sample. To estimate if this change in economic development has indirectly influenced political violence intensity, I have used data on night light density. Night light

<sup>22</sup> It should be noted that in some countries the label (e.g. democratic/undemocratic) of the country changed within the sample period. In this case, the map shows the label which the country held for the longest period within the sample.

<sup>23</sup> These variables were all collected from the Quality of Governance (QOG) Dataset (Teorell et al., 2020) (available at [www.qog.pol.gu.se](http://www.qog.pol.gu.se)).

density is a popular proxy for aggregate economic benefits (Hjort & Poulsen, 2019; Christensen & Gafias, 2018; Henderson et al., 2018). The National Oceanic and Atmospheric Administration (NOAA) provides data collected by the Defense Meteorological Satellite Program's Operational Linescan System (DMS - OLS) on pixel-level measures of average night light density from satellite images. Specifically, I have used the Average Lights X Pct, where light density is measured on a scale from 0 to 63, based on the cloud-free light detections multiplied by the percent frequency of light detection. This measure contains pixels of approximately one square kilometer. I retrieved night light data from the years 2006 to 2012.<sup>24</sup> Both for the connected part of a grid-cell and the entire grid-cell, I have constructed the average night light density.<sup>25</sup>

### *Road and electricity networks*

To test the robustness of the findings in this paper, I have created placebo treatment effects based on the distance between political violence events and the road network and electricity grids in Africa. The map for the electricity grids was retrieved from The Africa Infrastructure Country Diagnostic (AICD) and the map for the African road networks from the Socioeconomic Data and Application Center (SEDAC) at the Center of International Earth Science Information Network at Columbia University.<sup>26</sup> Using these maps, an event of political violence can now also be labeled connected or not connected to the electricity or road network.<sup>27</sup> For this placebo test, the count of political violence events is then not only divided in connected and unconnected areas based on the distance to the terrestrial backbone network, but also based on the distance to the network of electricity grids and the road network.

---

<sup>24</sup> I retrieved the data from <https://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html>. Image and Data processing was done by NOAA's National Geophysical Data Center. DMSP data was collected by the US Air Force Weather Agency. This dataset provides light data up to 2013. However, due to a downloading error in the data from the year 2013, I was not able to retrieve data from this year and I have thus collected data from 2006 to 2012.

<sup>25</sup> I used QGIS software to create evenly distributed pixel points in every grid-cell and created a buffer of 500 meters around the terrestrial backbone network to mark which part of the pixel points in every grid-cell was located in a connected area. With the point sampling tool, I then matched the Average Lights X Pct value to every pixel. Lastly, the average light density for both the entire grid-cell and the connected part was constructed using the pixel points and QGIS' Join attributes based on locations tool. For the computation of the average light density into the unconnected part of every grid-cell, pixel points from the connected area of the grid-cell were also included. As a grid-cell is 10 by 10 kilometers and the connection radius is 500 meters, the effect of including the connected pixel points of the grid-cell to the average for the whole gridcell will be relatively small.

<sup>26</sup> Both maps were obtained through the dataset of Hjort and Poulsen (2019), but originate from AICD and SEDAC.

<sup>27</sup> Events are considered connected to the electricity or road network if they took place within a 500-meter radius of the applicable network.

## V. Empirical strategy

In this section, I discuss the main empirical strategy, elaborate on the most important empirical choices I have made and explain the robustness checks I have performed.

### *Empirical strategy*

Building on the methodology of Hjort and Poulsen (2019), I compare the change in political violence in the areas in a country that gain access to fast Internet at a given point in time with areas in that same country that do not gain access to fast Internet at this point in time using equation (1).

$$(1) y_{i,j(i),c(i),t} = \alpha + \beta SubmarineCables_{c,t} \times Connected_i + \delta_{j(i)} \times Connected_i + \gamma_{c(i),t} + \epsilon_{i,j(i),c(i),t}$$

$y_{i,j(i),c(i),t}$  is *political violence intensity* of events  $i$ , in grid-cell  $j(i)$  of 0,1 X 0,1 degree cells, country  $c(i)$ , and time-period  $t$ , measured in years. *SubmarineCables* is a dummy variable equal to one if the backbone network in country  $c(i)$  has been connected to a submarine cable at time  $t$ , and *Connected* is a dummy variable equal to one if the events  $i$  took place in a location that is in close proximity of the backbone network. Regions are sorted by their proximity to the backbone network, so by their connectedness.  $\beta$  then measures the treatment effect, where an event  $i$  is considered treated if it took place after the arrival of the submarine cable in a connected area. If connection to fast Internet increases the probability of political violence,  $\beta$  would take a positive value.  $\delta_{j(i)} \times Connected_i$  controls for time invariant location specific differences in political violence intensity that are correlated with access fast Internet.<sup>28</sup>  $\gamma_{c(i),t}$  are country-specific, time-period fixed effects, which controls for country specific, but locally invariant trends in political violence intensity that could be correlated with gaining access to fast Internet. In most cases this is country x year fixed effects.<sup>29</sup> As mentioned before, only grid-cells where there has been at least one political violence event throughout the sample period are included. Standard errors are clustered at the grid-cell level.

---

<sup>28</sup> The notation  $\delta_{j(i)} \times Connected_i$  is a simplification, as I will interact  $\delta_{j(i)}$  with both the dummy for connected areas and the inverse dummy for unconnected areas in a grid-cell

<sup>29</sup> In creating the dataset, it was challenging to preserve the year variable for practical reasons. It was easier to preserve a variable that indicates how many years it has been since or until the arrival of the submarine cable for each country. Therefore, country x year fixed effects are in fact country x year since/until submarine cable arrival fixed effects. The consequence is that the fixed effects are not based on a calendar year but are calibrated on years since/until submarine cables arrived in a specific country. I have tested the robustness of my results to country x calendar year fixed effects in Appendix Table A3, and do not identify any cause for concern.

### *Connectivity*

As mentioned before, an event is considered treated if it took place after the arrival of the submarine cable in a connected area. In Appendix Table A1 the arrival time of the submarine cables in each county is described. However, one question that has remained unanswered until now is when an area should be considered connected. As information on the last mile infrastructure at the local level is not available, an event will be labeled connected depending on its distance to the backbone network. In section III., I explained that there are no serious concerns about a loss in connectivity based on the cable length of the terrestrial backbone. However, in the last mile infrastructure after the backbone network, connectivity does decrease based on its distance from the backbone network. To what extent the quality of internet decreases exactly depends on the last mile infrastructure. I have followed the approach of Hjort and Poulsen (2019) in this paper, who considered locations less than 500 meters from the backbone network connected. Since back-haul networks were not present during the sample period, it seems realistic to assume that most telephone and Internet exchange points were placed along the backbone network. With the last mile infrastructure of copper cables, the radius beyond the backbone network should be approximately 500 meters. This is less straightforward for other last mile infrastructures, making the 500-meter radius a conservative estimate that could lead to an underestimation of the true effect. I test the sensitivity of the results to a variety of connection radii to confirm that the results are not dependent on this chosen parameter.

### *The identifying assumption*

The identifying assumption in this empirical strategy are that locations somewhat closer and somewhat further away from the backbone network are on similar trends when it comes to political violence prior to the arrival of the submarine cables and that there is no other idiosyncratic shock during the sample period after the cables arrived affecting the development of political violence differently in connected and unconnected areas. By excluding events that took place more than 10 kilometers from the backbone network, it is more likely that this assumption of similar trends holds.<sup>30</sup> To ensure the results do not hinge on the choice of inclusion radius, I test the sensitivity of the results to other radii. Moreover, the assumption of

---

<sup>30</sup> In practice, I use a distance of 0.005 degrees instead of 500 meters and 0.01 degrees instead of 10 kilometers. I made this simplification (just like Hjort and Poulsen, 2019) because it is challenging to find an appropriate projected reference system for the whole of Africa, where distance can be measured in kilometers.

similar trends is verified with an event study with a placebo treatment in the years before the submarine cables arrived. The country profiles in Appendix Table A2 give no reason to assume that there has been an idiosyncratic shock disturbing the results. Still, robustness of the results to the exclusion of one country or cable group is considered. To further strengthen the results, I have also created a placebo treatment effect using the proximity of political violence events to roads and electricity networks. Concerns about a potential relation between the timing of the arrival of the submarine cables and political instability in the sample countries are mostly alleviated by studying Figure 1. This figure shows the timing of the arrival of the submarine cables at the different coastal countries included in the sample. This timing can be explained by both the size and geography of the countries. Submarine cables first arrived in larger countries and countries located closer to Europe. There is no reason to assume that political violence has steered the timing of the arrival of submarine cables in the different countries. Therefore, I assume that there is no correlation between the difference in arrival times and developments in political violence in the different countries.

#### *Spatial correlation*

Political violence is clustered in space. Moreover, the location where one accesses the Internet is not necessarily the location where one commits political violence. The distortionary effect of this is limited, as mobility in Sub-Saharan Africa was low during the sample period (Olvera et al., 2013). Still, it is important to consider spatial correlation. For the main analysis, I have clustered the standard errors at grid-cell level. However, to properly address the problem of spatial dependence, I have tested the robustness of the results to clustering the standard error with Conley's spatial HAC correction (1999), which allows for cross-sectional spatial correlation and location-specific serial correlation (Berman et al., 2018). By testing the sensitivity of the results to a variety of connection and sample radii and different grid-cell sizes, potential positive geographical spillovers of violence are further considered.

#### *Extensions*

By adding night light density data, data on the quality of government and distinguishing between different categories of political violence, I hope to shed more light on the channels through which political violence and Internet are related. To gain insight in the timing of the treatment effect, I perform an event study.

## VI. Results

In this section, I describe the main results of this paper and discuss several robustness checks that were performed to strengthen these results.

### *Main results*

Table 2 reports the baseline results for the standard sample: the estimated treatment effect of the arrival of fast Internet on political violence intensity in areas connected to the terrestrial backbone network as compared to areas not connected to the terrestrial backbone network. Column (1) reports a significant and negative treatment effect at a 1 percent level. The arrival of the submarine cables led to a relative decrease in political violence in connected areas as compared to unconnected areas. Country x year fixed effects control for country-wide, time-varying determinants of political violence and grid-cell x connected fixed effects are included to control for time invariant co-determinants of political violence at the local level. Standard errors are clustered at grid-cell level. Column (1) shows that the arrival of fast Internet led to a decrease of 0.25 events of political violence in connected areas as compared to unconnected areas.

Table 4 – Fast Internet and political violence	
Dependent variable	Political violence intensity
	(1)
Submarine x Connected	-0.246*** (0.0839)
Observations	9,169
R-squared	0.509
Country X Year FE	Yes
Grid-cell X Connected FE	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the yearly count of political violence events for a grid-cell. All political violence events that took place within a 10-km radius of the terrestrial backbone network are included. The grid-cells are 0.1 x 0.1 decimal degrees. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

Figure 5 depicts the trend in political violence intensity in the years before and after the arrival of the submarine cables and can help place these results in perspective. The arrival of fast Internet did not lead to an absolute decrease in political violence in connected areas, but to a smaller increase in political violence in connected areas as compared to unconnected areas.

Moreover, from Figure 5 it can be concluded that a 0.25 decrease in political violence events generates a quantitatively large impact as the average number of political violence events ranges from 0 to 1.2 in the sample period.

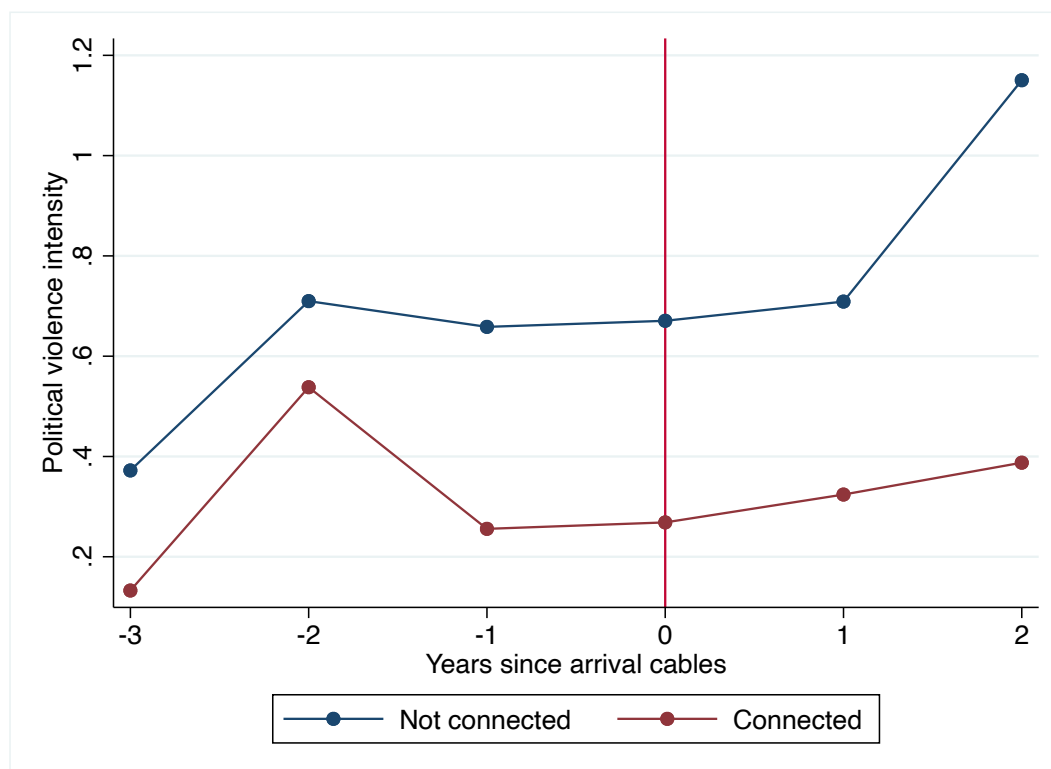


Figure 5 – Yearly political violence trends

*Note:* This graph depicts the trend in political violence intensity for all sample countries in a three-year period before and after the arrival of the submarine cables. Year 0 is the first year after the arrival of the submarine cables. All political violence events are included that happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network.

The events of political violence considered in this paper include battles, riots, protests and violence against civilians. As discussed in section II., the effect of Internet on political violence can differ per category of political violence. Table 5 reports how the arrival of fast Internet affects the intensity of the different kinds of political violence. Every column estimates the effect for a sample restricted to one of the categories of political violence. Table 1 showed that protests and riots are the most reported events in the sample. Column (2) and (3) of Table 5, where the sample is limited to either one of these categories, estimate a significant, negative treatment effects of a similar size to the baseline model. The sample of battles and violence against civilians, in column (1) and (4), both do not give any significant results. Moreover, the size of the estimated treatment effect in these columns is small compared to column (2) and

(3). There appears to be no significant difference between connected and unconnected areas in battle intensity or violence against civilians intensity after the arrival of fast Internet.

Dependent variable	Political violence intensity			
	(1) Battles	(2) Riots	(3) Protests	(4) Violence Against Civilians
Submarine X Connected	0.000347 (0.0891)	-0.195*** (0.0512)	-0.235** (0.0957)	-0.0263 (0.0588)
Observations	2,531	4,480	4,147	3,911
R-squared	0.369	0.468	0.500	0.430
Country X Year FE	Yes	Yes	Yes	Yes
Grid-cell X Connected FE	Yes	Yes	Yes	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the yearly count of political violence events for a grid-cell. In Column (1) only battles are considered, in column (2) only riots are considered, in column (3) only protests are considered and in column (4) only violence against civilians is considered. The grid-cells are 0.1 x 0.1 decimal degrees. Events are included if they happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

The relationship between access to fast Internet and political violence could be affected by the quality of government in a country. The improved access to information could fire up politically repressed countries even more, or the effect could be contained in countries with limited freedom of press. In Table 6, I have tested how the quality of government can modify the average effect of fast Internet on political violence by adding a triple interaction term between the quality of government indicator and the treatment effect. I use two indicators: freedom of press and level of democracy.

In column (1) and (2) of Table 6 countries are assigned a dummy of 1 for democracy and freedom of press if they score above the sample median level of democracy or freedom of press score. As almost all countries qualify identically (above/below median) for both democracy and freedom of press, I have not added a specification including both interaction terms. In column (3), (4) and (5) of Table 6 countries are assigned a dummy of 1 for democracy and freedom of press if they score above a set standard in both categories.<sup>31</sup> There is more variation in the dataset when I use the set standard for the two indicators. Figure 4 depicts how almost

<sup>31</sup> In section IV., I have further elaborated on the set standard for both categories.

all countries score above the set standard for level of democracy. However, for freedom of press there is more variation within the countries. Adding column (3), (4) and (5) could thus provide more insight in how freedom of press affects the relation between fast Internet and political violence.

From Table 6 I can conclude that the estimated coefficient for the triple interaction term with either the level of democracy or freedom of press is not significant in any of the columns. There appears to be no heterogeneous effect of fast Internet on political violence for countries based on their level of democracy or press freedom.

Dependent variable	Political violence intensity				
	(1)	(2)	(3)	(4)	(5)
Submarine X Connected	-0.185 (0.150)	-0.197 (0.147)	-0.748 (0.679)	-0.210 (0.155)	-0.748 (0.679)
Submarine X Connected X Democracy	-0.121 (0.169)		0.538 (0.683)		0.623 (0.694)
Submarine X Connected X Freedom of Press		-0.0991 (0.164)		-0.0671 (0.168)	-0.150 (0.157)
Observations	9,169	9,169	9,169	9,169	9,169
R-squared	0.510	0.510	0.510	0.509	0.510
Country X Year FE	Yes	Yes	Yes	Yes	Yes
Grid-cell X Connected FE	Yes	Yes	Yes	Yes	Yes
Sample median	Yes	Yes	No	No	No

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the yearly count of political violence events for a grid-cell. The grid-cells are 0.1 x 0.1 decimal degrees. All political violence events are included that happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. In column (1) and (2) country-level variables are dummies taking the value 1 if the country scores above the sample median of the corresponding variable in a certain year. In column (3), (4) and (5), country-level variables are dummies taking the value 1 if the country scores above a set score, described in section IV. Standard errors are clustered at grid-cell level.

As mentioned before, Hjort and Poulsen (2019) have shown that the arrival of submarine cables in Africa led to a rise in aggregate economic benefits in areas connected to faster Internet as compared to unconnected areas. They used night light density as a proxy to estimate the change in income after the arrival of fast Internet. In Appendix Table A3, I replicate their results for the sample of locations used in this paper and find an almost identical estimated effect: the arrival of fast Internet led to a 2.1% increase in income for connected areas as compared to unconnected areas. These results are particularly interesting because of the potential negative relation between political instability and average incomes. In Table 7, I investigate whether

fast Internet and political violence are related through the income shock discussed above. For both the connected and unconnected areas within a grid-cell, I constructed the average night light density for each year. Night light density data from after the year 2012 could not be obtained, therefore the sample is restricted to the years 2006 to 2012. Column (1) of Table (7) depicts the baseline results for the restricted sample, where all events that took place after 2012 are excluded. In column (2) of Table 7 light density at night is added as a control variable. The estimated effect of light density on political violence is significant and negatively signed at a 10 percent level. The addition of this extra variable has, however, little effect on the estimated treatment effect, which remains almost identical both in size and in standard error in column (2). The results in Table 7 give no reason to assume that the relation between political violence and fast Internet can indirectly be explained by an income change after the arrival of fast Internet in connected areas as compared to unconnected areas.

Table 7 – Economic development		
Dependent variable	Political violence intensity	
	(1)	(2)
Submarine X Connected	-0.158*** (0.0590)	-0.156*** (0.0590)
Light density at night		-0.0969* (0.0571)
Observations	11,252	11,252
R-squared	0.493	0.493
Country x Year FE	Yes	Yes
Grid-cell X Connected FE	Yes	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included from the years 2006 to 2012. The outcome variable is the yearly count of political violence events for a grid-cell. Light density at night proxies for average income within the connected and unconnected area of every grid-cell. The grid-cells are 0.1 x 0.1 decimal degrees. Events are included if they happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

### *Robustness*

To test the robustness of the main findings, I have tested the sensitivity of the results to several of the parameters of the estimation model. In section V., I discussed the choice for connection radius. In the baseline model, events are considered connected if they took place within a 500-meter radius of the terrestrial backbone network. Table 8 tests the sensitivity of the dataset to the choice of radius. The estimated treatment effect decreases in size when the connection radius increases and after a connection radius of 1100 meter the estimates become insignificant. This confirms that locations closer to the terrestrial backbone network are on a different trend in political violence intensity than locations further away from the terrestrial backbone network.

To strengthen the assumption of similar trends, events are only included if they occurred within a 10-kilometer radius of the terrestrial backbone network. Table 9 shows that the results are not sensitive to the choice of inclusion radius. In column (2) of Table 9 the sample is limited to events that took place within a 5-kilometer radius of the terrestrial backbone and in column (3), the sample is extended to all events that took place within a 20-kilometer radius of the terrestrial backbone. In all columns, the estimated treatment effect is of similar size, sign and significance. Adding more remote locations, that could be less comparable to the connected locations, does not affect the estimated treatment effect.

In Table 10, I test the sensitivity of the results to the choice in grid-size. For all grid-sizes tested the treatment effect remains significant and negative. The size of the estimated effect increases with grid-size. This could be explained by the results of column (1) in Appendix Table A4, where the grid-cell x connected fixed effects are not included in the column. When excluding grid-cell x connected fixed effects the treatment effect doubles in size compared to the baseline model. For Table 10 counts that the larger the size of the grid-cell, the less fine grained the control for regional differences will be. This brings the estimations in Table 10 closer and closer to column (1) from Table A4, where grid-cell fixed effects were excluded.

Column (2) of Table A4 uses another computation of country x year fixed effects. As mentioned before, the country x year fixed effects have not been computed using calendar years, but with the years since or until the arrival of the submarine cables. This could only significantly influence the estimation if there is an idiosyncratic shock influencing the estimated treatment effect that is timed exactly to a calendar year. There is, however, no reason

to expect this. Column (2) of Table A4 confirms that including country x calendar year fixed effects does not significantly change the estimated treatment effect when compared to the baseline model.<sup>32</sup>

Earlier, I mentioned that political violence is clustered in space. Conley (1999) argued that it is important to take this spatial correlation into account when computing the standard errors. Throughout this paper, standard errors are clustered on grid-cell level. In column (3) of Table A4, however, the standard errors were computed using Conley's method to correct for spatial correlation. The estimated effect in column (3) is almost identical to the baseline estimate and thus gives no cause for concern.

---

<sup>32</sup> In footnote 29 I have further elaborated on this.

Table 8 – Connection radius

Dependent variable	Political violence intensity															
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Connection radius	500m	600m	700m	800m	900m	1000m	1100m	1200m	1300m	1400m	1500m	1600m	1700m	1800m	1900m	2000m
Submarine X Connected	-0.246*** (0.0839)	-0.222*** (0.0837)	-0.212** (0.0834)	-0.186** (0.0845)	-0.193** (0.0846)	-0.181** (0.0848)	-0.165* (0.0849)	-0.121 (0.0849)	-0.0871 (0.0852)	-0.0991 (0.0853)	-0.120 (0.0826)	-0.114 (0.0828)	-0.126 (0.0822)	-0.123 (0.0826)	-0.0947 (0.0852)	-0.0818 (0.0848)
Observations	9,169	9,168	9,168	9,169	9,167	9,168	9,168	9,168	9,169	9,169	9,169	9,169	9,170	9,167	9,164	9,164
R-squared	0.509	0.510	0.510	0.510	0.509	0.509	0.508	0.509	0.511	0.511	0.513	0.513	0.513	0.514	0.518	0.519
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid-cell X Connected FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the yearly count of political violence events for a grid-cell. The grid-cells are 0.1 x 0.1 decimal degrees. All political violence events are included that happened within a 10-km radius of the terrestrial backbone network. Events are considered connected based on the connection radius mentioned above.<sup>33</sup> Standard errors are clustered at grid-cell level.

<sup>33</sup> The distance between political violence events and the terrestrial backbone network has been calculated in degrees, not in meters. If the connection radius mentioned in Table 8 is 500 meters the radius is 0.005 degrees.

Table 9 – Inclusion radius

Dependent variable	Political violence intensity		
	(1) 10km	(2) 5km	(3) 20km
Inclusion radius			
Submarine X Connected	-0.246*** (0.0839)	-0.239** (0.0984)	-0.244*** (0.0687)
Observations	9,169	7,497	11,478
R-squared	0.509	0.511	0.522
Country X Year FE	Yes	Yes	Yes
Grid-cell X Connected FE	Yes	Yes	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the yearly count of political violence events for a grid-cell. The grid-cells are 0.1 x 0.1 decimal degrees. Events are included based on the inclusion radius mentioned above.<sup>34</sup> Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

Table 10 - Gridsize

Dependent variable	Political violence intensity						
	(1) 10km	(2) 15km	(3) 20km	(4) 25km	(5) 30km	(6) 35km	(7) 40km
Gridsize							
Sugmarine X Connected	-0.246*** (0.0839)	-0.254** (0.114)	-0.297** (0.144)	-0.323** (0.150)	-0.358** (0.175)	-0.401* (0.205)	-0.446* (0.228)
Observations	9,169	8,586	7,395	6,968	6,143	5,684	4,740
R-squared	0.509	0.300	0.300	0.294	0.308	0.300	0.327
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid-cell X Connected FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the yearly count of political violence events for a grid-cell. The grid-cell size differs for every column, the size is mentioned above.<sup>35</sup> All political violence events are included that happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

<sup>34</sup> The distance between political violence events and the terrestrial backbone network has been calculated in degrees, not in meters. If the inclusion radius mentioned in Table 9 is 5 kilometers the radius is 0.05 degrees.

<sup>35</sup> The grids were generated in degrees, not in kilometers. If the grid size mentioned in Table 10 is 10 km, the size of the grid is 0.1 X 0.1 decimal degrees.

In Table 11, I perform a placebo test using the connectivity of political violence events to roads and electricity. Every event of political violence included in the sample is now also labeled either connected or disconnected to electricity and roads based on the distance between the events and the different networks. Events are considered connected to electricity or roads if they took place within a 500-meter radius of the relevant network. With this input, I generate placebo treatment effects for connectivity to roads and electricity. Table 11 reports the results when these placebo treatments are included.

In interpreting these results, it is important to note that the electricity and terrestrial backbone networks mostly overlap each other. There are relatively few observations that are considered connected to one of the two networks and not connected to the other network. The same cannot be said for the road network, which is much more extensive than the terrestrial backbone and the electricity network. Where only ~4% of the observations is connected to the terrestrial backbone but not connected to either the electricity or road network, ~37% of the observations is connected to the road network but not connected to the electricity or terrestrial backbone network. Because the variation in connectivity to the electricity and terrestrial backbone network is limited, it is difficult to clearly distinguish the placebo treatment effect of the electricity network from the “real” treatment effect of terrestrial backbone network.

In Table 11, the estimated “real” treatment effect is still negative and significant, but compared to the baseline estimate the size of the treatment effect is smaller. The estimate of the placebo treatment effect based on connectivity to electricity has taken the size and sign of the original treatment effect in the baseline estimate. The larger negative placebo treatment effect with respect to electricity should be seen in the context of the lack of variation in connectivity between the two networks. As there is more variation in road connectivity compared to the other two variables, the estimate of the road placebo could be more telling. Surprisingly, the placebo treatment effect for road connectivity is significant, small, and positive. This means that I find a positive relation between the arrival of fast Internet and political violence intensity for places connected to roads as opposed to place unconnected to roads. This could be explained if there was a trend change in the road network in the same period that the submarine cables arrived and the quality of the Internet improved. As the quality of roads has improved with time in Africa in general, it seems reasonable to assume that the quality of the roads before the arrival of the submarine cables was worse than after the arrival of the submarine cables in

Africa. Consequently, the count of political violence in areas located closer to the road network compared to areas located further away could be higher because of improved road quality.

Table 11 – Connectivity to roads and electricity	
Dependent variable	Political violence intensity (1)
Submarine X Connected	-0.0642*** (0.0214)
Submarine X Connected to Electricity	-0.174*** (0.0248)
Submarine X Connected to Roads	0.0761*** (0.0241)
Observations	35,771
R-squared	0.192
Country X Year FE	Yes
Grid-cell X Connected FE	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the yearly count of political violence events for a grid-cell. The grid-cells are 0.1 x 0.1 decimal degrees. All events are included that took place within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Events are considered connected to electricity if they took place within 500 meters of the electricity network and events are considered connected to roads if they took place within 500 meters of the road network. Standard errors are clustered at grid-cell level.

In Table 12, I exclude one country from the dataset in each column to investigate whether one country is driving the results. In Table 3, I reported the share of each country to the dataset. South Africa is the most prevalent in this respect; 32% of the political violence events included in the sample took place in South Africa. Column (11) of Table 12 shows that the estimated treatment effect is no longer significant when South Africa is excluded from the dataset. The large drop in observations can explain the loss of significance, as the sign and size of the estimated treatment effect is still similar to the baseline estimate when South Africa is excluded from the sample.

The results of Appendix Table A5 are in line with Table 12. Here, a set of countries connected by the same submarine cable is excluded from the sample in each column. Excluding Seacom, the first submarine cable to connect South Africa with Europe, has a similar consequence for the estimated treatment effect as dropping South Africa from the sample, as can be seen in column (7). The results of Table 12 and A5 question whether the baseline results are solely driven by the South African sample. To further investigate this, I study the treatment effect for a sample restricted to just South Africa in Appendix Table A6. If the treatment effect for the

South African sample is comparable to the treatment effect for the whole sample, the loss of data when excluding South Africa is likely to explain the insignificance of the results in column (11) of Table 12. I find that the size of the estimated treatment effect for a sample of just South Africa is larger, but still comparable to the baseline estimate. Consequently, the estimated treatment effect when excluding South Africa is not decidedly different from the baseline estimates but is estimated less accurately.

Table 12 – Excluding countries

Dependent variable	Political Violence Intensity												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Excluding	No countries	Benin	D.R. Congo	Ghana	Kenya	Madagascar	Mozambique	Namibia	Nigeria	Senegal	South Africa	Tanzania	Togo
Submarine X Connected	-0.246*** (0.0839)	-0.253*** (0.0845)	-0.241*** (0.0850)	-0.244*** (0.0857)	-0.344*** (0.0921)	-0.208*** (0.0738)	-0.247*** (0.0863)	-0.246*** (0.0859)	-0.225*** (0.0865)	-0.244*** (0.0855)	-0.192 (0.129)	-0.252*** (0.0872)	-0.255*** (0.0849)
Observations	9,169	9,084	8,950	8,934	7,095	8,913	8,897	8,720	7,978	8,920	5,536	8,795	9,037
R-squared	0.509	0.508	0.504	0.509	0.511	0.553	0.509	0.511	0.517	0.510	0.468	0.510	0.500
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid-cell X Connected FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. In column (1) the full sample of countries is included for a period of three years before and after the arrival of the submarine cables. In column (2) – (13) the country mentioned above is excluded from the sample. The outcome variable is the yearly count of political violence events for a grid-cell. The grid-cells are 0.1 x 0.1 decimal degrees. All political violence events are included that happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

An event study gives insight in the development of the treatment effect in the years after the arrival of the submarine cables. Table 13, column (1) depicts a simple event study with a triple interaction term between the treatment effect and a year dummy for each year since the arrival of the submarine cables. Surprisingly, the estimates in column (1) only show a significant, negative treatment effect in the third year after the arrival of the submarine cables. The size of the treatment effect is double the size of that in the baseline estimation. This hints to a delayed treatment effect. Only in the third year after the arrival of the submarine cables, a significant difference between political violence intensity in connected and unconnected areas is identified.

In column (2) of Table 13, I perform a placebo test where the submarine cable would arrive one year earlier (in year -1). To pass the placebo test, the estimated treatment effect at year -1 should not be significantly different from 0 and this is what I find. The estimate of the placebo treatment in column (2) for year -1 is insignificant. The large estimated significant treatment effect in year 3 remains and the estimated treatment effect in year 1 is now also significant.

Column (3) of Table 13 functions as a check on the identifying assumption of similar trends in political violence intensity between connected and unconnected areas before the arrival of submarine cables. It should be seen next to Figure 5, which is a simple plot of the development of political violence intensity before and after the arrival of the submarine cables in connected and unconnected areas. From Figure 5 alone the assumption of similar trends before the arrival of submarine cables is difficult to prove. It should be noted that country x year fixed effects and grid-cell x connected fixed effects are not considered in this simple plot. In column (3), I test more formally whether the connected and unconnected areas were on different trends before the arrival of the submarine cables, taking year -3 as the base year. The placebo treatment effect of year -2 and -1 is not significant. The treatment effect in year 1 is significant at a 10% level and the estimated treatment effect in year 3 remains large, negative, and significant.

The results of column (2) and (3) strengthen the identifying assumption of similar trends. There appears to be no significant difference in the trend in political violence intensity in connected and unconnected areas before the arrival of fast Internet.

Table 13 – Event studies

Dependent variable	Political violence intensity		
	(1)	(2)	(3)
No submarine X Connected X Year -2			0.0551 (0.162)
No submarine X Connected X Year -1		-0.172 (0.119)	-0.145 (0.0969)
Submarine X Connected X Year 1	-0.151 (0.0989)	-0.208* (0.124)	-0.180* (0.0919)
Submarine X Connected X Year 2	-0.105 (0.0951)	-0.163 (0.120)	-0.135 (0.0938)
Submarine X Connected X Year 3	-0.478*** (0.116)	-0.536*** (0.141)	-0.508*** (0.115)
Observations	9,169	9,169	9,169
R-squared	0.510	0.510	0.510
Country X Year FE	Yes	Yes	Yes
Grid-cell X Connected FE	Yes	Yes	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the yearly count of political violence events for a grid-cell. Column (1) is an event study where the treatment variable is multiplied by a dummy for the years since the arrival of the submarine cable. Column (2) is an event study with a placebo, where all events that happened a year before the arrival of the submarine cable are also considered treated. Column (3) is an event study with placebos, where all events are considered treated. The numbering of the years in this table is such that there is no year 0. Year -1 is the last year before the arrival of the submarine cables and year 1 is the first year since the arrival of the submarine cables. For all columns, the grid-cells are 0.1 x 0.1 decimal degrees. All political violence events are included that happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

Table 14 tests the sensitivity of the results to the chosen sample period. Column (1) depicts the baseline estimation with the standard sample period, which is three years before and after the arrival of submarine cables in Africa. In column (2), the period is extended to five years before and after the arrival of submarine cables. The treatment effect becomes smaller but remains significant. More interesting are the results in column (3), where the sample contains events from two years before and after the arrival of submarine cables. The coefficient of interest is still negative, but no longer significant. Table 13 helps explain these results. Connected areas experience the strongest treatment effect in the third year after the arrival of the submarine cables, and in column (3) this third year is excluded from the dataset.

In column (4), I test the sensitivity of the results to the sample period of Hjort and Poulsen (2019), because the map of the terrestrial backbone used in this paper is based on their sample

period.<sup>36</sup> The estimated treatment effect in column (4) is of similar size, sign and significance as the baseline estimation, and thus, does not give any cause for concern with respect to the choice for terrestrial backbone map.

Dependent variable	Political violence intensity			
	(1)	(2)	(3)	(4)
Sample period	3 Years	5 Years	2 Years	2009-2013
Submarine X Connected	-0.246*** (0.0839)	-0.167*** (0.0567)	-0.100 (0.0944)	-0.276*** (0.0645)
Observations	9,169	13,693	6,521	10,240
R-squared	0.509	0.511	0.433	0.455
Country X Year FE	Yes	Yes	Yes	Yes
Grid-cell X Connected FE	Yes	Yes	Yes	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables in column (1), for a period of five years before and after the arrival of the submarine cables in column (2), for a period of two years before and after the arrival of the submarine cables in column (3) and for the period between 2009 and 2013 in column (4). The outcome variable is the yearly count of political violence events for a grid-cell. The grid-cells are 0.1 x 0.1 decimal degrees. All political violence events are included that happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

In Appendix Table A7 and A8, I test how the choice for a yearly count of political violence intensity has affected the results. In Table A7, column (2) the dependent variable is the half-yearly count of political violence intensity and in column (3) this is the quarterly count of political violence intensity. For column (2), the treatment effect is still negative and significant, but about half the size of the yearly treatment effect. The results in column (3) are inconclusive, because the dataset is highly singular when using a quarterly count of political violence intensity. In Table A8, I have performed an event study using quarterly data. This estimation experiences similar problems with the data structure as column (3) in Table A7. The pattern from Table 13 concerning the development of the treatment effect over the years can, however, still be recognized in the results of Table A8. The treatment effect becomes larger in size in the last quarters in Table A8, so in year 3.

<sup>36</sup> In footnote 16 I have further elaborated on this.

## **VII. Discussion**

In this paper, I have performed a difference-in-difference analysis to estimate the effect of the arrival of submarine cables in Africa on the intensity of political violence. I have compared areas connected to faster Internet with areas not connected to faster Internet and found a strongly significant and quantitatively large negative relation between being connected to fast Internet and the count of political violence events. Areas located closer to the terrestrial backbone network experience a smaller increase in political violence than areas located further away from the terrestrial backbone network after the arrival of the submarine cables.

When considering different categories of political violence, the treatment effect holds, both in size and significance when the sample is restricted to either protests or riots, but becomes smaller and loses significance when the sample is restricted to either violence against civilians or battles. The effect of fast Internet on political violence might thus be limited to protests and riots. These results are surprising. Especially for protests and riots, earlier research hints towards the activating role of improved connectivity because of reduced coordination costs. In the case of violence against civilians and battles, non-involved civilians are more likely to use the newfound connectivity to inform the government on rebel action and thus potentially reduce the frequency of these categories of political violence. The results in this paper point in the opposite direction.

Moreover, I do not find any evidence for a heterogeneous treatment effect based on the quality of government, both in terms of freedom of press and level of democracy of a country. From these results, it is difficult to conclude how the state of press and political freedom in a country affects the impact of Internet on political violence.

The baseline estimates point to the pacifying role of the Internet. This could be due, for example, to the reduced face-to-face interaction, but could also be an indirect effect of the income shock generated by the arrival of fast Internet. I do not find any evidence for the dominance of this indirect channel: adding a proxy for aggregate economic development as a control variable to the baseline estimation has not significantly changed the estimated treatment effect.

The estimated treatment effect holds for a range of connection radii, sample radii, grid-cell sizes, and sample periods. Event studies show that the assumption of similar trends is likely to hold and depict a delayed treatment effect. Only in the third year after arrival of the submarine cables, there appears to be a significant negative relation between fast Internet and political violence. This could point towards the role of the indirect income shock in explaining the results, as this income shock is likely to have a delayed effect. However, as mentioned before, I find no evidence for a strong indirect income effect. A plausible interpretation of this delayed effect thus remains absent in this paper.

In a placebo test using connectivity to roads and the electricity network, the “real” treatment effect remains negative and significant, but the size of the coefficient of interest becomes much smaller. Here it is important to note that most areas labeled connected to fast Internet were also labeled connected to the electricity network, thus making it difficult to distinguish between the two effects. The fact that the placebo treatment effect based on connectivity to the electricity network takes the size and sign of the baseline estimation is therefore not shocking. A more serious cause for concern is the sensitivity of the results to excluding South Africa from the sample. Although the size and sign of the treatment effect remains the same, the estimate loses its significance when South Africa is not included in the sample. As almost one third of the political violence events considered in this paper took place in South Africa, the loss of data when excluding South Africa might be the easiest explanation of these results. To my knowledge, there has not been an idiosyncratic shock in South Africa at the same time as the arrival of the submarine cables that could cause political violence intensity in areas connected to the terrestrial backbone to develop differently from areas unconnected to the terrestrial backbone.

This study had focused on political violence and Internet in the late 2000s and the early 2010s. The spread and usage of Internet in Africa has changed since then. Future research could focus on the more recent developments in the role of the Internet in Africa. There are two trends I would like to emphasize here. Firstly, it is interesting to note that governments in Africa have become more and more aggressive in shutting down the Internet in the hope of shutting down the people since the mid 2010s. How these actions influence the development of political violence and the role of the Internet should be further investigated. This could shed more light on the channels through which Internet and political violence are related. Secondly, the use of smartphones in Africa only started to become more prevalent at the end of the sample period.

Since then, mobile devices have been the main driver of Internet expansion in Africa and the spread of smartphones in African society has made the internet more accessible. This could change the relation between political violence and access to fast internet. Both trends ask for an evaluation of the connection between the internet and political violence in a more recent time period.

In a time where the activating power of the Internet has been hailed throughout the world this year, from the protests in Hong Kong to the Black Lives Matter movement, I carry a less enthralling message. This paper finds no evidence for the stimulating power of the web and can only report on the pacifying effect of the arrival of fast Internet on political violence in Africa.

## VIII. Sources

ACLED. (2019). *Armed Conflict Location & Event Data Project (ACLED) Codebook*.

[https://acleddata.com/acleddatanew/wp-content/uploads/dlm\\_uploads/2019/04/ACLED\\_Codebook\\_2019FINAL\\_pbl.pdf](https://acleddata.com/acleddatanew/wp-content/uploads/dlm_uploads/2019/04/ACLED_Codebook_2019FINAL_pbl.pdf)

AfTerFibre. (2014). *African Terrestrial Fibre*. Retrieved November, 2014, from

<http://afterfibre.net/>

Akamai. (2012). *The State of the Internet: 4th quarter, 2012 report*.

<https://www.slideshare.net/AkamaiTechnologies/q4-2012-sotiweb>.

*Apple removes police-tracking app used in Hong Kong protests from its app store*. (2019, October 20). CNBC. <https://www.cnn.com/2019/10/10/apple-removes-police-tracking-app-used-in-hong-kong-protests-from-its-app-store.html>

BBC monitoring. (2018-2020). *BBC country profiles*. BBC. Retrieved April 24, 2020, from

[http://news.bbc.co.uk/2/hi/country\\_profiles/default.stm](http://news.bbc.co.uk/2/hi/country_profiles/default.stm)

Berman, N., Couttenier, M., Rohner, D., & Thoenig, M. (2017). This mine is mine! How minerals fuel conflicts in Africa. *American Economic Review*, 107(6), 1564-1610.

<https://doi.org/10.1257/aer.20150774>

Berman, N., & Couttenier, M. (2015). External shocks, internal shots: The geography of civil conflicts. *The Review of Economics and Statistics*, 97(4), 758-776.

[https://doi.org/10.1162/REST\\_a\\_00521](https://doi.org/10.1162/REST_a_00521)

Bond, R. M., Fariss, C. J., Jones, J. J., Kramer, A. D., Marlow, C., Settle, J. E. & Fowler, J. H. (2012). A 61-million-person experiment in social influence and political mobilization.

*Nature*, 489(7415), 295–298. <https://doi.org/10.1038/nature11421>

Brym, R., Godbout, M., Hoffbauer, A., Menard, G., & Zhang, T. H. (2014). Social media in the 2011 Egyptian uprising. *The British Journal of Sociology*, 65(2), 266-292.

<https://doi.org/10.1111/1468-4446.12080>

Cantoni, D., Yang, D. Y., Yuchtman, N., & Zhang, J. Y. (2019). Protest as strategic games: Experimental evidence from Hong Kong's anti-authoritarian movement. *The Quarterly Journal of Economics*, 134(2), 1021-1077. <https://doi.org/10.1093/qje/qjz002>

Cederman, L., Weidmann, N. B., & Gleditsch, K. S. (2011). Horizontal inequalities and ethnonationalist civil war: a global comparison. *American Political Review*, 105(3), 478-495. <https://doi.org/10.1017/S0003055411000207>

Christensen, D., & Garfias, F. (2018). Can you hear me now? How communication technology affects protest and repression. *Quarterly Journal of Political Science*, 13(1), 89-117. <http://dx.doi.org/10.1561/100.00016129>

CIPESA. (2019). *State of Internet freedom in Africa 2019*. <https://cipesa.org/2019/09/african-countries-broadening-control-over-the-Internet-2/>

Clionadh, R., Linke, A., Hegre, H., & Karlsen., J. (2010). Introducing ACLED-Armed Conflict Location and Event Data. *Journal of Peace Research*, 47(5), 651- 660. <https://doi.org/10.1177/0022343310378914>

Collier, P., & Hoeffler, A. (2004). Greed and grievance in civil war. *Oxford Economic Papers*. 56(4), 563-595. <https://doi.org/10.1093/oep/gpf064>

Collier, P., & Hoeffler, A. (2007). Civil war. In S. Todd, & K. Hartley (Eds), *Handbook of defense economics* (pp. 712-738). Elsevier B.V.

Conley, T. G. (1999). GMM estimation with cross sectional dependence. *Journal of Econometrics*, 92(1), 1-45. [https://doi.org/10.1016/S0304-4076\(98\)00084-0](https://doi.org/10.1016/S0304-4076(98)00084-0)

Diamond, L. (2012). Liberation technology. In L. Diamond & M. F. Plattner (Eds), *Liberation technology* (pp. 3-18). The John Hopkins University Press.

Economics, demography and social media only partly explain the protests roiling so many countries today. (2019, November 14). *The Economist*.

<https://www.economist.com/international/2019/11/14/economics-demography-and-social-media-only-partly-explain-the-protests-roiling-so-many-countries-today>

Enikopolov, R., Makrin, A., & Petrova, M. (2020). Social media and protest participation: Evidence from Russia. *Econometrica*, 88(4), 479-1514. <https://doi.org/10.3982/ECTA14281>

Freedom House. (2019). *Freedom in the world 2019*. <https://freedomhouse.org/report-types/freedom-world>

Freyburg, T., & Garbe, L. (2018). Blocking the bottleneck: Internet shutdowns and ownership at election times in Sub-Saharan Africa. *International Journal of Communication* 12, 3896-3916. <https://doi.org/1932-8036/20180005>

Gohdes, A. R. (2018). Studying the Internet and violent conflict. *Conflict Management and Peace Science*, 35(1), 89-106. <https://doi.org/10.1177/0738894217733878>

Hassanpour, N. (2014). Media disruption and revolutionary unrest: Evidence from mubarak's quasi-experiment. *Political Communication*, 31(1), 1-24. <https://doi.org/10.1080/10584609.2012.737439>

Heacock, R., (2009, September 7). *Nigeria: New Internet submarine cables land in Africa*. Global Voices. <https://globalvoices.org/2009/09/07/nigeria-new-submarine-Internet-cable-lands-in-lagos/>

Henderson, V., Squires, T., Storeygard, A., & Weil, D. (2018). The global spatial distribution of economic activity: nature, history, and the role of trade. *Quarterly Journal of Economics*, 133(1), 357-406. <https://doi.org/10.1093/qje/qjx030>

Hjort, J., & Poulsen, J. (2019). The arrival of fast Internet and employment in Africa. *American Economic Review*, 109(3), 1032-1079. <https://doi.org/10.1257/aer.20161385>

Howard, P. N., & Hussain, M. M. (2013). *Democracy's fourth wave?: Digital media and the Arab Spring*. Oxford University Press.

Jones, B. T., & Mattiacci, E. (2019). A Manifesto, in 140 characters or fewer: Social media as a tool of rebel diplomacy. *British Journal of Political Science*, 49(2), 739-76.

<https://doi.org/10.1017/S0007123416000612>

Kende, M., & Rose, K. (2015). *Promoting local content hosting to develop the internet ecosystem*. Internet Society. <https://www.internetsociety.org/resources/doc/2015/promoting-local-content-hosting-to-develop-the-internet-ecosystem/>

Kuran, T. (1997). *Private truths, public lies: The social consequences of preference falsification*. Harvard University Press.

Little, A. (2016). Communication technology and protest. *The Journal of Politics*, 78(1), 152-166. <https://doi.org/10.1086/683187>

Mahlknecht, G. (2014). *Greg's Cable Map*. Retrieved March 12, 2020, from <https://live.infrapedia.com/>

Manacorda, M., & Tesei, A. (2020). Liberation technology: Mobile phones and political mobilization in Africa. *Econometrica*, 88(2), 533-567. <https://doi.org/10.3982/ECTA14392>

Marshall, M. G., & Jaggers, K. (2019). *Polity5, Annual time-series, 1946-2018* (p5 2018) [Data set]. Polity5. <https://www.systemicpeace.org/>

McCarthy, D. (2009, July 27). *Cable makes big promises for African Internet*. CNN. <http://edition.cnn.com/2009/TECH/07/22/seacom.on/index.html>

Nyirenda-Jere, T., & Biru, T. (2015). Internet development and Internet governance in Africa. *Internet Society*. <https://www.Internetsociety.org>

Ogala, G., (2019). *Shutting down the Internet doesn't work – but governments keep doing it*. Quartz Africa. <https://qz.com/africa/1554643/Internet-shutdowns-dont-work-but-governments-still-do-them/>

Olvera, L. D., Plat, D., & Pochet, P. (2013). The puzzle of mobility and access to the city in Sub-Saharan Africa. *Journal of Transport Geography*, 32, 56-64.

<https://doi.org/10.1016/j.jtrangeo.2013.08.009>

Organisation for Economic Co-operation and Development (OECD). (2014). International cables, gateways, backhaul and international exchange points. *OECD Digital Economy Papers*, 232, OECD Publishing. <http://dx.doi.org/10.1787/5jz8m9jf3wkl-en>

Pierskalla, J. H., & Hollenbach, F. M. (2013). Technology and collective action: The effect of cell phone coverage on political violence in Africa. *American Political Science Review*, 107(2), 207-224. <https://doi.org/10.1017/S0003055413000075>

Qin, B., Strömberg, D., & Wu, Y. (2017). Why does China allow freer social media? Protests versus surveillance and propaganda. *Journal of Economic Perspectives*, 31(1), 117–40.

<https://doi.org/10.1257/jep.31.1.117>

QGIS.org. (2020). *QGIS Geographic Information System*. Open Source Geospatial Foundation Project. <http://qgis.org>

Siegel, D. A. (2011). When does repression work? Collective action in social networks. *The Journal of Politics*, 74(4), 993-1010. <https://doi.org/10.1017/S0022381611000727>

Shapiro, J. N., & Siegel, D. A. (2015). Coordination and security: How mobile communications affect insurgency. *Journal of Peace Research*, 52(3), 312-322.

<https://doi.org/10.1177/0022343314559624>

Shapiro, J. N., & Weidmann, N. B. (2015). Is the phone mightier than the sword? Cellphones and insurgent violence in Iraq. *International Organization*, 69(2), 247-274.

<https://www.jstor.org/stable/24758115>

TeleGeography. (2020). *Submarine Cable Map*. Retrieved May 4, 2020, from

<https://www.submarinecablemap.com/#/>

Teorell, J., Dahlberg, S., Holmberg, S., Rothstein, B., Pachon, N. A., & Axelsson, S. (2020). *The quality of government standard dataset* (version Jan20) [Data set]. University of Gothenburg: The Quality of Government Institute. <https://doi.org/10.18157/qogstdjan20>

Valenzuela, S., Halpern, D., Katz, J. E., & Miranda, J. P. (2019). The paradox of participation versus misinformation: Social media, political engagement, and the spread of misinformation. *Digital Journalism*, 7(6), 802-823. <https://doi.org/10.1080/21670811.2019.1623701>

Vincent, D. (2019, June 30). *How apps power Hong Kong's 'leaderless' protests*. BBC. <https://www.bbc.com/news/technology-48802125>

Warren, T. C. (2015). Explosive connections? Mass media, social media and the geography of collective violence in African states. *Journal of Peace Research*, 52(3), 297-311. <https://doi.org/10.1177/0022343314558102>

Weidmann, N. B. (2016). A closer look at reporting bias in conflict event data. *American Journal of Political Science*, 60(1), 206-218. <https://doi.org/10.1111/ajps.12196>

Wucherpfennig, J., Metternich, N. W., Cederman, L. E., & Gleditsch, K. S. (2012). Ethnicity, the state, and the duration of civil war. *World Politics*, 64(1), 79-115. <https://doi.org/10.1017/S004388711100030X>

Yanagizawa-Drott, D. (2014). Propaganda and conflict: Evidence from the Rwandan genocide. *Quarterly Journal of Economics*, 129(4), 1947-1994. <https://doi.org/10.1093/qje/qju020>

## IX. Appendix

Table A1 – Arrival timing of the submarine cables

Country	First submarine cable	First connected	Sample period
Benin	ACE	15-12-2012	15-12-2009 – 15-12-2015
D.R. Congo	WACS	11-05-2012	11-05-2009 – 11-05-2015
Ghana	MainOne	22-07-2010	22-07-2007 – 22-07-2013
Kenya	TEAMs	12-06-2009	12-06-2006 – 12-06-2012
Madagascar	Eassy	16-07-2010	16-07-2007 – 16-07-2013
Mozambique	Seacom	23-07-2009	23-07-2006 – 23-07-2012
Namibia	WACS	11-05-2012	01-05-2009 – 11-05-2015
Nigeria	MainOne	22-07-2010	22-07-2007 – 22-07-2013
Senegal	MainOne	22-07-2010	22-07-2007 – 22-07-2013
South Africa	Seacom	23-07-2009	23-07-2006 – 23-07-2012
Tanzania	Seacom	23-07-2009	23-07-2006 – 23-07-2012
Togo	WACS	11-05-2012	11-05-2009 – 11-05-2015

*Note:* This table shows all the countries included in the sample and provides information on the arrival of the submarine cables. It depicts which submarine cable first arrived in the country and the arrival date of that cable, where the main source for information on the arrival time of the cables is TeleGeography (2020). It also gives an overview of the exact sample period for every country: three years before and after the arrival of the first submarine cable in a country.

---



---

Table A2 – Country profiles

---

<i>Benin</i>	Benin is one of the poorest countries in the world and consequently a breeding ground for corruption. Instability in the border area with Burkina Faso is not uncommon (BBC Monitoring, 2019). Throughout the sample period, Benin scores high on its level of democracy and with respect to freedom of press.
<i>Democratic Republic of Congo</i>	In the Democratic Republic of Congo (D.R. Congo) there has been an ongoing conflict for decades. Civil war raged through the country between 1994 and 2003 and the country is still recovering. A proxy war continued till 2008 and especially the East remains unstable as D.R. Congo has a strained relationship with its neighbors Rwanda and Uganda. Rebels from the <i>Democratic Forces for the Liberation of Rwanda</i> (DFLR) have been active throughout the whole sample period. Rebel group M23 became increasingly active in the East of Congo in 2012, which led to a further deterioration of the relationship between Rwanda and Congo (BBC Monitoring, 2019). The Democratic Republic of Congo is categorized as <i>undemocratic</i> and obtained the status of <i>not free</i> with respect to freedom of press. Even though D.R. Congo is unstable throughout the sample period and is a relatively large country, the share of political violence events from D.R. Congo is limited. This can be explained by the terrestrial backbone network in D.R. Congo. Only events that took place within a 10-kilometer radius of the terrestrial backbone are included in the sample. The backbone network in D.R. Congo is not evenly distributed throughout the country, but located mostly in the west, while many of the events of political violence have taken place in the east. The distribution of political violence throughout D.R. Congo can also be seen in Figure 2.
<i>Ghana</i>	Ghana is considered a relatively stable country. In 2012, there was a spark of communal violence after the exhumation of the body of a Muslim cleric (BBC Monitoring, 2018). Relative to the rest of the sample countries, Ghana has the best score both for its level of democracy and freedom of press, qualifying as <i>democratic</i> and <i>free</i> .
<i>Kenya</i>	Kenya's ethnic diversity is identified as a source of conflict. Election violence after the 2007 elections led to more than 1500 deaths. In 2011, terrorist group Al-Shabab became increasingly active in Kenya and Kenya entered Somalia to attack rebel groups terrorizing Kenya, which complicated the relationship between Kenya and Somalia. In 2012, communal clashes led to more than 100 deaths (BBC Monitoring, 2018). Kenya is considered <i>democratic</i> throughout the sample period. It is considered <i>partly free</i> but approaches the <i>not free</i> category. This relatively unstable and large country reports almost a quarter of the events of political violence in the sample.
<i>Madagascar</i>	As Madagascar is an island, it is not tormented by spillovers from unstable neighbors. Nevertheless, political instability is prevalent; coups and violent unrest are not uncommon. Dozens were killed in anti-government demonstrations in 2009 and a coup in the same year led to a political standstill of 5 years (BBC Monitoring, 2019). Where Madagascar was still considered <i>democratic</i> and <i>partly free</i> in 2007,

there is a clear drop in scores after the coup in 2009. For the largest part of the sample period, Madagascar qualifies as *undemocratic* and *not free*.

- Mozambique* Mozambique is still scarred by the civil war that lasted from 1976 till 1992. Only in 2015 the government managed to dismantle the last land mines left from the war. The rebel group Remano has been active in the country throughout the sample period (BBC Monitoring, 2020). Mozambique can be seen as *democratic* and *partly free* during the sample period.
- Namibia* Namibia has been relatively stable since its independence in 1990 and political violence events are rare (BBC Monitoring, 2018). Its level of democracy and freedom of press is relatively high.
- Nigeria* Nigeria is Africa's most densely populated country, as such it is not surprising that many of the events of political violence from the sample took place in Nigeria. Religious tensions, looting and jihadist activity have terrorized the country for many years. In 2009, the Boko Haram movement launched violently and has remained active throughout the sample period. A low point was reached in 2012, when Boko Haram killed more than 100 people in one day during multiple bombings and shootings (BBC Monitoring, 2019). Nigeria qualifies as a *democratic* and *partly free* country.
- Senegal* Traditionally, Senegal is seen as one of the more stable democracies in Africa. However, the region Casamance has remained unstable throughout the sample period. There was increased activity in 2009 (BBC Monitoring, 2018). Senegal has grown more democratic and freer throughout the sample period and is considered *partly free* and *democratic* during the whole period.
- South Africa* South Africa is one of the largest countries in the sample and has the most extensive terrestrial backbone network, as illustrated in Figure 2. Consequently, a large share of the reported events of political violence in the sample took place in South Africa. South Africa is one of the most developed countries in Africa. The African National Congress (ANC) has governed South-Africa since 1994, but not without controversy. Several presidents have had to step down after corruption charges. Throughout the sample period there have been several larger protests. In 2007, the largest strikes in the post-apartheid era disrupted schools, hospitals and public transport for four weeks. In 2008, an outbreak of aggression against foreigners sent many Zimbabweans, Malawians and others home (BBC Monitoring, 2019). Judging by the quality of government indicators, South Africa performed well throughout the sample period, classifying as *democratic* and *free*.
- Tanzania* Tanzania has been relatively stable throughout the sample period. There have been several corruption scandals and reports of limited political violence (BBC Monitoring, 2018). Tanzania's level of democracy is just high enough to be considered *democratic* and *partly free*.

*Togo* Togo has remained politically unstable in the period of interest. Attempted coups in 2009 and 2011, uproar about election fraud in 2010 and violent clashes during demonstrations in 2010 and 2012 illustrate the instability (BBC Monitoring, 2020). Throughout the sample period *Togo* is considered *undemocratic*. Its scores with respect to freedom of press improve in the sample period. Togo is considered *unfree* in 2009 and *partly free* in 2015.

---

*Note:* These country profiles are based on the BBC country profiles from [http://news.bbc.co.uk/2/hi/country\\_profiles/default.stm](http://news.bbc.co.uk/2/hi/country_profiles/default.stm) by BBC monitoring, on democracy (democratic or undemocratic) and freedom of the press (free, partly free, or not free) indicators as visualized in Figure 4 and on the share of political violence events in each country as reported in Table 3. The sample period differs per country based on the arrival time of the submarine cables, but covers a period of three years before and after the arrival of the first submarine cable. The precise sample period per country is mentioned in Appendix Table A1.

Table A3 – Fast Internet and economic development

Dependent variable	Light density at night
	(1)
Submarine X Connected	0.0213*** (0.00423)
Observations	11,252
R-squared	0.986
Country X Year FE	Yes
Grid-cell X Connected FE	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included from the years 2006 to 2012. The dependent variable is yearly night light density. Light density at night proxies for average income within the connected and unconnected area of every grid-cell. The grid-cells are 0.1 x 0.1 decimal degrees. Grid-cells are included when there was at least one reporting of political violence within 10 kilometers of the backbone network in the sample period. An area is considered connected if it is closer than 500 meter to the backbone network. Standard errors are clustered at grid-cell level.

Table A4 – Fixed effects and Conley SE

Dependent variable	Political violence intensity		
	(1)	(2)	(3)
Submarine X Connected	-0.509*** (0.103)	-0.184*** (0.0619)	-0.240*** (0.0627)
Observations	9,169	11,824	9,289
R-squared	0.040	0.505	0.002
Country X Year FE	Yes	No	Yes
Country X Calendar Year FE	No	Yes	No
Grid-cell X Connected FE	No	Yes	Yes
Grid-cell Standard Error	Yes	Yes	No

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the yearly count of political violence events for a grid-cell. In column (1) grid-cell x connected FE are not included. Column (2) includes calendar year FE instead of “years since/until” FE. Column (3) shows the precision of the main results using Conley standard errors that account for spatial-autocorrelation. The cut-off window is 100 km, but the results remain virtually unchanged for a cut-off window of 50, 1000 and 10 km. For all columns, the grid-cells are 0.1 x 0.1 decimal degrees. All political violence events are included that happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network.

Table A5 – Excluding cables

Dependent variable	Political violence intensity						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Excluding	No cables	ACE	WACS	MainOne	Teams	Eassy	Seacom
Submarine X Connected	-0.246*** (0.0839)	-0.253*** (0.0845)	-0.250*** (0.0882)	-0.219** (0.0907)	-0.344*** (0.0921)	-0.208*** (0.0738)	-0.197 (0.145)
Observations	9,169	9,084	8,369	7,494	7,095	8,913	4,890
R-squared	0.509	0.508	0.495	0.517	0.511	0.553	0.467
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid-cell X Connected FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. In column (1) the full sample of countries is included for a period of three years before and after the arrival of the submarine cables. In column (2) - (13) countries connected by the same cable are excluded from the sample as mentioned above. The outcome variable is the yearly count of political violence events for a grid-cell. The grid-cells are 0.1 x 0.1 decimal degrees. All political violence events are included that happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

Table A6 –Fast Internet and political violence in South Africa

Dependent variable	Political violence intensity
	(1)
Submarine X Connected	-0.329*** (0.0809)
Observations	3,633
R-squared	0.633
Country X Year FE	Yes
Grid-cell X Connected FE	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. All the political violence events in South Africa for a period of three years before and after the arrival of the first submarine cable are included. The outcome variable is the yearly count of political violence events for a grid-cell. The grid-cells are 0.1 x 0.1 decimal degrees. All political violence events are included that happened within a 10-km radius of the terrestrial backbone network. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

Table A7 – Political violence intensity period

Dependent variable	Political violence intensity		
	(1)	(2)	(3)
Sample	Yearly	Half-yearly	Quarterly
Submarine x Connected	-0.246*** (0.0839)	-0.137*** (0.0437)	-0.0643 (0)
Observations	9,169	17,836	36,950
R-squared	0.509	0.430	0.342
Country x Year FE	Yes	No	No
Country x Half year FE	No	Yes	No
Country x Quarter FE	No	No	Yes
Grid-cell X Connected FE	Yes	Yes	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the yearly count of political violence events for a grid-cell in column (1), the half-yearly count of political violence events for a grid-cell in column (2) and the quarterly count of political violence events for a grid-cell in column (3). In column (1) country x year FE are included, in column (2) country x half year FE are included and in column (3) country x quarter FE are included. All political violence events that took place within a 10-km radius of the terrestrial backbone network are included. The grid-cells are 0.1 x 0.1 decimal degrees. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.

Table A8 – Quarterly event study

Dependent variable	Political violence intensity (1)
Submarine X Connected X Quarter 1	-0.0510 (0)
Submarine X Connected X Quarter 2	-0.0469 (0)
Submarine X Connected X Quarter 3	-0.0740 (0)
Submarine X Connected X Quarter 4	-0.0158 (0)
Submarine X Connected X Quarter 5	-0.0429 (0)
Submarine X Connected X Quarter 6	0.00583 (0)
Submarine X Connected X Quarter 7	-0.0226 (0)
Submarine X Connected X Quarter 8	-0.0727 (0)
Submarine X Connected X Quarter 9	-0.0740 (0)
Submarine X Connected X Quarter 10	-0.104 (0)
Submarine X Connected X Quarter 11	-0.273 (0)
Submarine X Connected X Quarter 12	-0.134 (0)
Observations	36,950
R-squared	0.342
Country X Quarter FE	Yes
Grid-cell X Connected FE	Yes

*Note:* Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The full sample of countries is included for a period of three years before and after the arrival of the submarine cables. The outcome variable is the quarterly count of political violence events for a grid-cell. All political violence events that took place within a 10-km radius of the terrestrial backbone network are included. Column (1) is an event study where the treatment variable is multiplied by a dummy for the quarter since the arrival of the submarine cable. The grid-cells are 0.1 x 0.1 decimal degrees. Events are considered connected if they took place within 500 meters of the terrestrial backbone network. Standard errors are clustered at grid-cell level.