Fast Internet and Gender Norms: Evidence from Sub-Saharan Africa

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Abstract

Is internet a tool for women's empowerment or does it exacerbate discriminatory gender norms? I answer this question by exploiting the gradual arrival of fast internet between 2008-2012 on African coasts via submarine cables from Europe to retrieve a causal effect of internet on gender norms around attitudes towards intimate-partner-violence (IPV). Specifically, I compare individuals' attitudes towards violence in locations with high internet penetration and those without, exploiting differences in the timing of the high-speed internet arrival. Results show that fast internet leads to more regressive gender norms. Individuals located in connected areas are more likely to find violence justifiable. This effect is stronger for males. I then explore the potential mechanisms behind this result. The most likely mechanism to be at play in this setting is that internet causes more regressive gender norms because it might change the balance of power within the household, by affecting labour market opportunities for men and women differently.

Keywords: Intimate-Partner-Violence, Gender Norms, Internet infrastructure
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1 Introduction

The Internet - the greatest invention of our times -has transformed many aspects of our society. The rise of the internet enabled new forms of social interaction and has transformed how individuals get, produce and exchange information. These fundamental transformations have led to a growing interest among policymakers and researchers about its impact on social and economic life. In particular, a vast literature focuses on the link between internet and politics (Campante et al. (2018), Larcinese et al. (2012), Farrell (2012)). Yet, little is known about the effect Internet plays on gender equality.

In this paper, I exploit the arrival of high-speed internet through submarine cables[1] to African coasts between 2008-2012, to investigate whether the internet can transform gender norms around the acceptability of intimate-partner-violence (IPV).[2] The net effect of internet on gender norms is an open empirical question. On the one hand, the internet may open new opportunities for women to gain social, political, and economic power. The spread of digital technology could connect marginalized women to the modern economy, generating new occupations and human capital accumulation. Furthermore, the internet could act as a coordination tool that increases women's awareness around gender equality (e.g. #MeToo movement). On the other hand, internet could exacerbate existing gender disparities, especially if access to the internet benefits more men than women. Moreover, internet could create yet another platform for abuse or violence targeting women.[3]

I address gender norms by looking at the acceptability of violence. I believe this is a relevant gender norm as one out of every three women worldwide has experienced intimate-partner-violence (*WHO 2013*, n.d.). In Europe and the US, almost between 20 and 25% of women report being physically or sexually abused by their partners. The prevalence of intitmate-partner-violence is the highest in the African region (as well as in South-East Asia), where approximately 37% of ever-partnered women reported having experienced physical and/or sexual violence by their partners at some point in their lives (*WHO 2013*, n.d.). Attitudes towards the acceptability of IPV are highly correlated with the prevalence of violence (García-Moreno et al., 2005), however, there is limited evidence on what drives the variation in these attitudes (Alesina et al. (2016), Gulesci, Meyersson, & Trommlerová (2020)).

[1] There are many Internet infrastructures that reach the users (*the last mile*, as for example fiber cables, cell towers, and satellites. Prior to the last mile, Internet travels through national backbones. Once the submarine cables arrived on each country, they increase the capacity and speed of the terrestrial backbone. In this study, I use *internet* and *fast internet/high-speed internet* as synonym. More detail in Section 2.

[2] In this study *violence* and *Intimate partner violence* are used interchangeably

[3] The inventor of the world wide web, Berners-Lee warned that "the web is not working for women" mainly because of two reasons. First, the digital divide that keeps more than half of the world's women offline. Second, the online safety: according to a survey by Berners-Lee's Web Foundation, more than half of women have experienced violence online *The Guardian, March 2020* - https://www.theguardian.com/global/2020/mar/12/internet-not-working-women-girls-tim-berners-lee

To understand whether and if so how the internet affects attitudes towards violence, I use a difference-in-differences approach. Specifically, I exploit the variation over time and space in the arrival of fast internet between 2008-2012 on African coasts via submarine cables from Europe to estimate the causal effect of internet on gender norms. I draw the identification strategy from Hjort & Poulsen (2019). This difference-in-differences strategy compares individuals' attitudes around gender norms in locations in Africa that were on the terrestrial network of internet cables to those that were not, before and after the arrival of submarine cables that greatly increased the speed and the capacity of the national terrestrial network, that is the infrastructure through which the internet becomes available.[4]

I use the 2008 and 2013 waves of Demographic and Health Survey (DHS) for Benin, Ghana, Kenya, Namibia, Nigeria. The DHS dataset contains geo-coded information on respondents' attitudes towards intimate-partner-violence (IPV), as well as many background characteristics. This enables me to perform a difference-in-differences estimation to compare outcomes of respondents before and after the internet arrival in Africa.

The findings show that internet causes individuals to have less egalitarian gender views. I find that treated individuals are 4 percentage points more likely to think that a man is justified in beating his wife if she neglects the children, and 3.7 percentage points more likely to find violence acceptable in case a married woman goes out without her husband's permission. These are both statistically and economically significant, corresponding respectively to a 17% and 18.5% increase in acceptance of IPV relative to the mean level of the outcome. I present results that support the robustness of these findings to different specifications. I also estimate placebo difference-in-differences models that support the validity of the parallel trend assumption.

I then explore the mechanisms that could explain the findings of this paper. The arrival of high-speed internet in Sub-Saharan Africa led to more regressive views around IPV - especially among men. This result might be explained by various mechanims at work that have been discussed further on. Specifically, I test for two possible channels. First, fast internet causes more regressive gender norms because it might change the balance of power within the household, by affecting labor market opportunities for men and women differently. Second, stronger effect of internet on gender norms for males might be explained by a higher access to internet for males compared to females. Results suggests that the first mechanism is the most likely to be at play in this setting. I find some evidence that internet benefited more the men's rather than the women's employment. This could lead to an intra-household imbalance of power, affecting males' attitudes towards violence. I do not find evidence to support the second potential channel.

[4]The national terrestrial networks are those infrastructures through which Internet travels prior to the last mile, as explained in Note 1. More detail in Section 2.

The main contribution of this work is to provide evidence of the potentially adverse effects of connectivity for women in Sub-Saharan Africa. Previous research has demonstrated that Internet has improved a number of economic outcomes (Hjort & Poulsen (2019), Riley (2020), Jack & Habyarimana (2018), Lipscomb & Schechter (2018)). This paper shows that fast internet does not necessarily improve gender equality or reduce the prevalence of gender-biased norms.

Another contribution to the literature is showing *how* gender norms can change. A large literature shows that social norms, especially gender norms, can shape behaviors and economic outcomes (Alesina et al. (2013), Bertrand et al. (2015), Charles et al. (2018)). However, we have less evidence on what drives *change* in gender norms. Several works studied how media can be an important vehicle for sensitizing people on education (Zavodny, 2006), and how TV or radio can affect norms and behaviors (e.g., Banerjee et al. (2019), Chong & Ferrara (2009), La Ferrara et al. (2012) Jensen & Oster (2009)). I contribute to this literature by showing that the diffusion of internet can be another driver of change in gender norms.

The paper also relates to a growing literature on the role internet and social media play on social movements and hate crimes. Manacorda & Tesei (2020) find that mobile coverage increased protest participation in various African states. Enikolopov et al. (2020) show that higher social media penetration increased the likelihood of political protests in Russia by reducing coordination costs. Acemoglu et al. (2018) find that the protests on Tahir Square in Egypt were preceded by protest-related activity on Twitter.[5] Müller & Schwarz (2018) study the relationship between social media and hate crimes in Germany. Müller & Schwarz (2020) find that anti-Muslim hate crimes in the US increased in locations with higher Twitter penetration. Allcott & Gentzkow (2017) and Yanagizawa-Drott (2014) provide evidence that social media makes individuals' opinions more polarized. To the best of my knowledge, this is the first paper that investigates the role of internet on gender norms in Africa, focusing on the long-run effects of internet penetration.

The paper is organized as follows. In section 2, I present the background on gender norms and internet infrastructure in Sub-Saharian Africa. In section 3, I explain the data used for the analysis, and in section 4 the empirical strategy. Section 5 discusses the results and section 6 the potential mechanisms. Section 7 concludes.

[5]This paper is not too far from the vast literature which focuses on the impact of media on political and social outcomes. While traditional media has been shown to increase political participation (Gentzkow et al. (2011), Internet seem to lead to lower political turnout, most likely due to an increase in entertainment and displacing other media with greater news content (Falck et al. (2014), Campante et al. (2018), Gavazza et al. (2019)). A recent paper by Allcott et al. (2020) find that Facebook deactivation for 4 weeks before the 2018 midterm elections in the US, reduces online activity, which is substituted to offline and socializing activity, increases the subjective well-being, and reduces political polarization.

2 Background

Gender Norms

I use the acceptability of intimate-partner-violence as a proxy for gender norms. To this purpose, I exploit a set of questions included in the Demographic and Health Survey around the justification of violence in different scenarios. Data on the justification of IPV have been used by Jayachandran (2015), Gulesci et al. (2020), Benshaul-Tolonen (2019) in different countries. It is important to point out that justification of domestic violence is distinct from experiences of violence. Focusing on the acceptability of violence, rather than the experience of it presents some advantages. First, looking at the justification of violence reduces the risk of underreporting; second, within this analysis, focusing on attitudes enables greater geographic coverage as the attitudes module is more often collected by the DHS. The main disadvantage though is that the link between justification of violence and the actual experience of it is still not clear. However, self-perceived rights or perceptions about bodily integrity are important outcomes themselves (Benshaul-Tolonen, 2019). Indeed, existing evidence shows that cultural barriers and aspirations could play a key role in women's empowerment (Jayachandran, 2020).

Internet Infrastructure

Internet connectivity in Africa has dramatically increased in the past decade. Nowadays the Internet penetration in Africa is estimated at an average rate of 24%, remaining the only continent where half of its population does not have internet access. However, this figure represents a significant improvement given that internet penetration was around the 2% in 2005. Today, the Internet reaches the users in Africa through fiber cables, copper cables, wireless transmission, and satellites (the last mile). Prior to the last mile, the Internet in Africa travels through the terrestrial backbones, which were built by the national telecom in all the countries (ITU, 2013).

Between 2008-2012 submarine cables gradually arrived on African coasts, as shown in Figure 1. Submarine fiber optic cables represent the most suitable technology for carrying data over large distances in and between countries which are separated by oceans (*Beyond the first mile: where your Internet comes from*, 2014). Indeed, one single intercontinental cable is more efficient in terms of capacity and latency than combining all the world's active communications satellites together. In the 2000s, submarine cables linking Europe to Africa were built by consortia made up of private investors and governments. The submarine cables were brought to shore at landing points along the coast, typically one in each country passed by the cable. Many countries in Africa have access to submarine cable systems, either directly through local landing points or through terrestrial connections (ITU, 2018). Once introduced, there is evidence that submarine cables brought much faster speed and

traffic capacity to areas which were connected to the terrestrial Internet network (Hjort & Poulsen, 2019).

Internet Use

According to the World Bank,[6] the Internet use in Sub-Saharan Africa increased significantly in the period of the analysis. In 2008, 4% of the African region used Internet. In 2013 it increased to the 12 %. Figure 2 shows the growth of Internet use in the analyzed countries, using Afrobarometer data. As we can see, in 2008 (prior the arrival of the Submarine cables) the internet use was almost 14% of the sample, and in 2014 (just after the arrival of the cables) the percentage of internet use almost doubled, reaching the 30 % of the internet users.
Furthermore, Hjort & Poulsen (2019) documented that the arrival of submarine cables in Africa increased both the average speeds and the use of the Internet. The authors explain that this could be due to two reasons. First, technology becomes more accessible and more useful for individuals. Second, the arrival of the cables led to a drastic fall in the cost of internet provision, which the Internet Service Providers partly pass on to users via lower prices (Kende & Rose, 2015).

3 Data

Gender Norms data : Demographic and Health Survey

I use data from the last round before the arrival of submarine cables and just after it[7] from the Demographic and Health Survey (DHS) to measure gender norms. DHS are nationally representative repeated cross-sections. DHS has the advantage of having GPS coordinates for the surveyed individuals' clusters, and this allows me to define the connected individuals, calculating the distance between them and the terrestrial network. Women and men between 15-64 years old are interviewed. Data contain information on individual economic and demographic background. Furthermore, the respondents were asked whether the husband is justified in beating his wife in the following circumstances:

- if the wife goes out without telling him
- if the wife neglects the kids
- if the wife argues with him

[6] https://data.worldbank.org/indicator/IT.NET.USER.ZS?end=2019&locations=ZG-BJ-CD-GH-NA&start=2008

[7] More precisely I use the DHS rounds before the submarine cables arrival collected in 2001 for Benin, in 2006 for Namibia, 2008 for Ghana, Kenya and Nigeria. I use the DHS rounds after the submatine arrival in 2012 for Benin, 2013 for Namibia and Nigeria, and 2014 for Ghana and Kenya. For simplicity I will often refer to 2008 as the pre-treatment period and 2013 as the post-treatment period.

- if the wife burns food
- if the wife refuses to have sexual intercourse

Table 1 reports summary statistics in the last DHS wave before the arrival of the submarine cables on each country in the estimating sample. The variable labeled *Attitude Index*, is constructed as the sum of the circumstances in which the respondents think intimate-partner-violence is acceptable, following Alesina et al. (2016). The average number of episodes in which spousal violence is deemed as acceptable is 0.966 (out of 5) for female respondents, and 0.55 for males.

The variable labeled *Attitude Weighted Indicator* is a weighted index where the weights are proportional to the mean of the attitudes variables. Thus, the index puts more weight on the circumstances in which the respondents are on average more likely to find violence more justifiable. The average of the *Attitude Weighted Indicator* is 0.21 for female and 0.125 for male respondents.

From the upper Panel of Table 1, we notice that IPV is justified more among women than men. It is possible that men's attitudes towards violence may be affected by underreporting. As noted by Alesina et al. (2016), men could hinder their true views in order to not be negatively perceived in front of the interviewer. Nevertheless, this could be true for female respondents too.

The bottom panel of Table 1 shows the summary statistics of the attitudes towards wife-beating in five distinct scenarios. These are dummy variables taking value 1 if the respondents think wife-beating is acceptable in one of each situations. We can notice that female respondents find IPV more justified than their male counterparts. The most common circumstance in which spousal violence is justified for both female and male respondents is when the wife neglects the children, with 28.2% of the interviewed women and 18% of men reporting that wife-beating is justified in that context. More than one fifth of the female interviewed justify violence in case the woman goes out without the permission of her husband and in case she argues with him. The share of female respondents that believe wife-beating is justifiable in these two scenarios is more than twice the share of male respondents agreeing with the statements.

While violence has high acceptance rates in the aforementioned situations, other reasons for wife-beating seem to be less acceptable. In particular, wife-beating for refusing to have sexual intercourse with their husband or burning food have relatively lower acceptability rates of 12.5% and 11.5%, respectively for female respondents, and 6.5% and 5.3% for male respondents. Overall, the descriptive patterns shown in Table 1 suggest that the acceptability of violence is relatively widespread at the baseline of my analysis (before the arrival of submarine cables). These figures are even more striking if we consider that they

are likely affected by underreporting.

Table 2 displays the overall acceptability rate of wife-beating for some reasons, the labor market outcomes and education rate by connected versus unconnected areas before the arrival of submarine cables. The average age is 29.4 for individuals in unconnected locations, and 28.9 for those residing in the connected locations. The share of females is 66% in both connected and unconnected areas. Differences in employment between connected and unconnected areas are statistically signficant but small. The share of individuals who work in the unconnected areas is 68%, while the share of those living in the connected areas is 66%. Differences in skilled employment and education outcomes are small and insignificant.
Differences in gender norms are small but statistically significant, with the exception of the *Norm Sex* and *Norm Food*. These differences, even though they are statistically significant, are quite small. Moreover, it is important to have in mind that these differences are in level; therefore, we should not be too concerned about the validity of the parallel assumption, that I am going to test in the next section.

Internet Data

I use data from Hjort & Poulsen (2019). Data on submarine network infrastructure is available on Greg Mahlknecht's Cable (see Figure 1). The Greg Cable map is freely downloadable from the Mahlknecht web-site. The shape file contains information of the geocoded landing points, timing of the cables' deployment, and segment lines of the submarine cables. Once installed, the submarine cables increase the capacity on Internet traffic to areas connected to the terrestrial network. Data of the terrestrial network come from AfTerFibre[8] and Africa Bandwidth Maps.[9] Data of terrestrial network in 2013 -after the submarine arrival- come from the AfterFibre map, whose GIS shape file is freely available online. Hjort & Poulsen (2019) used the map of backbone network from Africa Bandwidth Maps (available upon purchase) for 2009 and 2013, in order to identify and remove the backbone which have been built during the period of interest. I rely on the shape file of the final map which has been provided online by the authors.
Following Hjort & Poulsen (2019), I calculated the shortest distance between the individuals' clusters and the terrestrial network, through NN-Join in QGis. I define an individual to be *Connected* if her (or his) location is within 500 meters from the terrestrial backbone, as shown in Figure 5. 500 meters is considered to be a reasonable proxy for high-speed internet to reach beyond the backbone cables for copper-cable last mile technologies.[10]

[8] https://afterfibre.nsrc.org/

[9] www.africabandwidthmaps.com

[10] or last mile transmission via microwaves, the distance-connectivity relationship beyond the backbone is less clear-cut. In line with Hjort & Poulsen (2019), I choose a conservative radius based on copper-cable

4 Empirical Strategy

Identification Strategy

I use a difference-in-differences empirical strategy to estimate the causal effect of fast internet on gender norms. I compare individuals' attitudes towards intimate partner violence in areas connected to submarine internet cables via the terrestrial backbone network and those not connected, exploiting the gradual and geographically driven arrival of submarine cables in certain areas.

Using the identification strategy of Hjort & Poulsen (2019), I estimate the following equation via Ordinary Least Squares:

$$Y_{i,j,c,t} = \beta_0 + \beta_1 SubmarineCables_{c,t} \times Connected_i + \beta_2 \mathbf{X_i} + \delta_j \times Connected_i + \tau_{c,t} + \epsilon_{i,j,c,t} \quad (1)$$

$Y_{i,j,c,t}$ are the attitudes towards violence of respondent i, residing in cell j (0.1 x 0.1 degrees),[11] in county c, at time t.
The $SubmarineCables_{c,t}$ is a dummy variable which takes value one if the terrestrial network in country c, has been connected to the submarine cable at time t. $Connected_i$ is a dummy variable which takes value one if the individual's location is connected to the terrestrial backbone or not.
The coefficient of interest is the interaction of $SubmarineCables_{c,t}$ and $Connected_i$. This is equivalent to a treatment that takes value one if (i) the submarine cable arrives in country c at time t and (ii) if the individual's location is connected (that is, it is less than 500 meters further from the terrestrial backbone). The interaction between the cell δ_j and $Connected_i$ controls for any time invariant characteristics that might me correlated with the arrival of fast internet. τ controls for country-specific time fixed effects. $\mathbf{X_i}$ includes a set of individuals' characteristics. Standard errors $\epsilon_{i,j,c,t}$ are clustered at the cell level.
Locations that are further away from 10 km to the terrestrial backbone have been excluded in the analysis.

Validity of the parallel trends: a placebo test

In line with Hjort & Poulsen (2019), the identification strategy relies on the assumption that locations close to and slightly further away from the terrestrial network would have had parallel trends concerning attitudes towards violence if it weren't for the arrival of the submarine cables. To verify the validity of the parallel trends assumption, I run a placebo difference-in-differences regression where I use information from the DHS waves about attitudes towards intimate partner violence in 2000-2003 and 2006-2008. The waves refer

technologies.)

[11] 0.1 degrees correspond roughly 10 km

to the period before the arrival of submarine cables in Africa.
This placebo experiment tests whether the attitudes towards IPV between 2000-2003 and 2006-2008 are associated with the submarine cables arrival. Pre-treatment rounds are only available in four countries: Ghana, Kenya, Nigeria and Namibia.
Estimates in Panel A and B of table 3 provide evidence in favor of this assumption. The outcome was not changing differently before the arrival of submarine cables, across connected and not-connected areas. Hence, it is possible to infer that the results presented in the following section are not biased by pre-existing parallel trends in attitudes towards IPV across individuals residing in locations close to or further way from the terrestrial backbones (i.e. *connected* and *not-connected* locations).

5 Results

Main Results

Results for the baseline specification described in equation 1 are reported in Panel A and B of table 4.

The main outcomes of interest are attitudes towards intimate-partner-violence in five different scenarios: (i) if the woman goes out without the husband's permission, (ii) if she neglects the kids, (iii) if she argues with the husband, (iv) if she burns food, (v) if she refuses to have sexual intercourse.
In the first column of Panel A of Table 4 the dependent variable is the *Attitude Index* (constructed following Alesina et al. (2016)) that counts the number of situations in which the respondents justify the intimate partner violence. The index suggests the intensity of the gender-biased norms and it ranges from 0 to 5. The impact of the arrival of submarine cables leads to an increases in the index by 0.128 (equivalent to an increase by 2.6 percentage points). This effect is statistically significant at the 10% level. In the second column of table 4, the dependent variable is the *Weighted Attitude Indicator*, where the weights are proportional to the mean of each single attitude variable. The estimate suggests that treated individuals are 3 percentage points more likely to find violence acceptable. This corresponds to a 16 percent effect relative to the sample size at the baseline - i.e. before the arrival of the submarine cables.

In order to have a better understanding of the results, Panel B shows the estimated effect of fast internet in the African countries around the acceptability of IPV in the 5 different situations, taken separately. The arrival of fast internet is associated with an increase in the likelihood that the respondents find wife-beating acceptable if women go out without the husband permission and if they neglect their children of 3.7 percentage points (that cor-

respond to 18 percent relative to the mean) and 4.1 percentage points (16 percent relative to the mean), respectively. Columns (3), (4) and (5) depict the attitudes towards domestic violence in case the wife argues with the husband, if she refuses sex intercourse and if she burns food, respectively. Their estimated coefficients have a positive sign, but they are statistically insignificant.

The evidence thus suggests that attitudes towards wife-beating in Africa become more gender regressive when fast internet becomes available. These results show that internet and more connectivity per se does not improve female empowerment. Before discussing the potential channels behind this finding, I explore whether high-speed Internet has a differential effect among women versus men.

Females and Males attitudes

In order to investigate whether fast internet has a different effect among women vs men, I estimate the following equation.

$$\begin{aligned} Y_{i,j,c,t} = \beta_0 + \beta_1 Male_i + \beta_2 SubmarineCables_{c,t} \times Connected_i + \\ \beta_3 SubmarineCables_{c,t} \times Connected_i \times Male_i + \beta_4 \mathbf{X_i} + \\ \delta_j \times Connected_i + \tau_{c,t} + \epsilon_{i,j,c,t} \end{aligned} \tag{2}$$

Table 5 shows heterogeneous effects between female and male respondents.
Results suggest that the effect of fast internet arrival on African coasts is stronger for males, as evident from the interaction term $SubmarineCables_{c,t} \times Connected_i \times$ Male.
The estimated coefficients of the interaction terms in column (1) and column (2) of table 5 suggest that the difference between female and male repondents is statistically significant and that the effect fast internet is stronger for males. The coefficient of the interaction term on *Attitude Index* is 0.182 and it is statistically significant at 10% level. The effect of the treatment on the *Attitude Weighted Indicator* (column 2) is 4 percentage points higher for males, compared to females. When we sum the treatment effect ($SubmarineCables_{c,t} \times Connected_i$) with the interaction term ($SubmarineCables_{c,t} \times Connected_i \times$ Male), we see that the effect of more connectivity is positive and statistically significant for males. In particular, the effect of the treatment on males increases the *Attitude Index* by 0.25 (equivalent to 5 percentage points) and by 5.6 percentage points the *Attitude Weighted Indicator* (30 percent of the outcome at the baseline).

Table 6 shows each variable of attitudes towards domestic violence in a separate way. The interaction terms $SubmarineCables_{c,t} \times Connected_i \times$ Male show the different effect fast internet has on females vs males' attitudes. Overall, the interaction terms seem to suggest that the effect of more connectivty is stronger for males, in line with the results shown in table 5.

Tables A.1 and A.2 show the results when we split the sample between female and male respondents. As we can see in table A.1 the fast internet seems to have no effect on females, whereas it is possible to observe a positive and statistically significant effect of internet arrival on males. Table A.2 shows that the coefficient on *Attitude Index* is 0.154, significant at the 10% level. Looking at the *Weighted Indicator* in the second column, we notice that the arrival of fast internet increases the males' acceptability towards wife-beating by 3.7 percentage points (that is equivalent to 30 percent relative to the sample mean). This seems to suggest that the results shown in the previous section could be mainly driven by male respondents.

When we unpack the attitudes variables and we observe the female sample, as shown in table A.3 we see that fast internet has no effect on females' attitudes. However, when we look at table A.4, we see that the effect of fast internet makes the males are more likely to find wife-beating acceptable if the woman goes out without the husband's permission and if she neglects their children. In particular, in the male sample, the acceptability of intimate partner violence increases by 3.9 percentage points in the first case, and by 6.8 percentage points in the second one.

Robustness Checks

For the sake of conciseness, I reported only the specifications including the full set of controls as the main results.

A sensitivity analysis of the main results to different specifications is reported in tables A.5 and A.6. In table A.7 the dependent variable is an Index that is the principal component of all the variables of attitude towards domestic violence in the different scenarios. The result is significant at the 10% level and consistent with the main ones.

Bertrand et al. (2004) observe that spatial correlation can bias standard errors in difference-in-differences method. Conley (1999) and Bester et al. (2011) develop a method to correct the standard errors to address spatial autocorrelation. Tables A.9 and A.10 present the estimates and standard errors calculated through the Conley's method. The estimated effect of fast internet on attitudes towards domestic violence remains statistically significant.

Moreover in tables A.11 and A.12, I clustered the standard errors at the administrative level, rather than the grid-cells and the estimated coefficient is significant and consistent with the main results presented in the previous section.

I also test whether the estimated effect of Fast Internet on gender norms is sensitive or not to the radius around the terrestrial network used to define the connection status (lower than 500m in the main specification). In Figure 6 I display the point estimates and confidence intervals for different ranges of radii : 500m, 600m, 700m, 800m, 900m and 1000m. The point estimates go all in the same directions, but they become insignificant beyond 700 meters.

6 Mechanisms

The findings described in the previous section reveal that the arrival of fast internet on African coasts lead to more regressive gender norms, especially among males. These results can be explained by various mechanisms in play. In this section, I discuss and test two potential channels. I also discuss other potential channels that, unfortunately, are not testable due to data availability.

Bargaining Power One potential mechanism is that the arrival of internet might have changed the labour market outcomes differently for males and females. Therefore, the arrival of fast internet could have transformed the balance of power within the household and this in turn could have increased the acceptability of domestic violence. Existing literature on intimate partner violence typically classifies violence as *expressive* when it generates a direct utility to the perpetrator (Tauchen et al. (1991), Farmer & Tiefenthaler (1997)), or, it perceives domestic violence as an *instrument* to extract resources from the spouse and to increase the bargaining power of the perpetrator (Tauchen et al. (1991), Eswaran & Malhotra (2011), Bloch & Rao (2002)). Therefore, in this study, if the internet had any spill-over effects on treated females and males, it may also affect their attitudes towards violence. On the one hand, it could be the case that if fast Internet had a positive effect on female labour market outcomes, this financial empowerment may also invite a backlash from the extant power structures within the family leading to higher acceptability (and incidence) of domestic violence (Amaral et al., 2015). On the other hand, if fast internet improves males' labour market outcomes more than it did for females', this could lead to an intra-household imbalance of power. Thus, when husbands become more economically powerful, they derive pleasure in engaging violence as a way to assert dominance. When I test for the effect of fast Internet on employment,[12] as shown in table 7, it can be seen that high-speed Internet increases employment by 3.5 percentage points (in line with main findings from Hjort and Poulsen 2019).[13] In Panel B of Table 7, I include an interaction term, in order to understand whether internet affects differently women and men's employment. The interaction term shows that the effect on men is 3 percentage points higher than the effect on women, although the difference is not precisely estimated at conventional levels. Panel B of table 7 shows that the arrival of fast internet has no effect on women's employment, whereas men are 5.47 percentage points more likely to be employed. Overall, this result provides some evidence that internet benefited more the men rather than the women. As men are more economically powerful, they might feel entitled to assert their dominance. This might affect men's attitudes towards intimate-partner-violence.

Internet Access A second potential channel is that it exists a gender gap in the access to the internet. It could be the case that the effect of internet on gender norms is stronger for males because they have a greater access to internet compared to females. To test for this mechanism I use data from Afrobarometer data. The dataset is readily available at `www.afrobarometer.org`. When I test whether high-speed internet increased the internet

[12] Employment is measured looking at the variable v714 in the DHS, where the respondents were asked *Are you currently working?*

[13] My results slightly differ from Hjort & Poulsen (2019) because my analysis in conducted on a reduced number of countries

usage, we find that it increased the overall internet use. However it does not affect males and females differently, as shown in table 8. As such, I conclude that this mechanism is unlikely to be at work in this setting.

Internet as information shock Another potential channel is that the internet could act as an information tool, through the spread of social media. There is now growing evidence suggesting that social media increases polarization, intolerance and hate crimes (Bursztyn et al. (2019), Müller & Schwarz (2020)). In this case, internet can be seen as an information shock. In particular, it could be the case that social media change people's perceptions of which actions are socially acceptable. In the data section, we can see how males at the baseline tend to have more egalitarian gender views compared to their females counterpart (see 1). Thus, it could be the case that social media make individuals more willing to express views they previously were reluctant to express. Therefore, internet exposure and social media could potentially amplify already regressive gender norms.
Alternatively, another potential mechanism is that internet -and the information embedded in it- exposes individuals to more information, through for example the news, role models on social media etc...This information shock could potentially affect women and make them more empowered. This effect could represent a drawback; more information can lead to more women empowerment and males could feel threatened about this. These are all potential mechanisms that are worth exploring in future research, as the data at the moment do not allow to test these channels.

7 Conclusions

In this paper, I analyse the impact of fast Internet on gender norms around the acceptability of intimate-partner-violence in five countries of Sub-Sahran Africa. I addressed the concerns on potential endogeneity, exploiting the variation over time and space in the arrival of high-speed connectivity through submarine cables between 2008-2012 on African coasts from Europe, using a difference-in-differences approach, in line with Hjort & Poulsen (2019). I compare individuals' attitudes around gender norms in locations in Africa that are on the terrestrial networks to those that are not. I compare the two groups before and after the arrival of submarine cables on African coasts, that greatly increased the speed and capacity of the backbones.

My findings suggest that the arrival of fast Internet in Africa led to more regressive gender norms around the acceptablity of violence. This effect is stronger for males. These findings are robust to various model specifications.

While I do not find strong evidence of the mechanism behind this finding, I see some evidence for an increase in males' employment, after fast internet arrival. This improve in

labor market opportunuties for males could have increased the intra-household imbalance of power and played a role in the higher acceptability of violence among men.
The main contribution of this paper is that internet and more connectivity per se does not improve female empowerment. Internet, if not accompanied with other forms of gender improving policies, can replicate existing pervasive norms.

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8 Tables

TABLE 1: SUMMARY STATISTICS ATTITUDES TOWARDS DOMESTIC VIOLENCE AT THE BASELINE

	(1) Women		(2) Men		T-test Difference
Variable	N	Mean/SE	N	Mean/SE	(1)-(2)
Attitudes towards violence					
Attitude Index	13118	0.966	6669	0.555	0.412***
		(0.013)		(0.014)	
Attitude weighther Indicator	13118	0.212	6669	0.125	0.087***
		(0.003)		(0.003)	
Wife beating is justified if...					
The wife goes out without permission	13118	0.231	6669	0.139	0.093***
		(0.004)		(0.004)	
The wife neglects the children	13118	0.282	6669	0.178	0.105***
		(0.004)		(0.005)	
The wife argues with her husband	13118	0.213	6669	0.126	0.087***
		(0.004)		(0.004)	
The wife refuses sex intercourse	13118	0.125	6669	0.060	0.065***
		(0.003)		(0.003)	
The wife burns food	13118	0.115	6669	0.053	0.063***
		(0.003)		(0.003)	

Sources: Demographic and Health Survey.

Notes: The table shows the descriptive statistics of the outcome variables, before the arrival of the subamarine cables in Benin, Ghana, Kenya, Namibia, Nigeria. The variable *Attitude Index* is constructed as the sum of the circumstances in which the respondent thinks it would be acceptable for a man to beat his wife. The variable *Attitude Weighted Indicator* is an index with weights proportional to the mean of the attitudes variables.

TABLE 2: BALANCE TEST - CONNECTED AND UNCONNECTED AT THE BASELINE

Variable	(1) Unconnected Mean/SE	(2) Connected Mean/SE	T-test Difference (1)-(2)
Age	29.372	28.928	0.445**
	(0.079)	(0.168)	
Gender	0.664	0.660	0.003
	(0.004)	(0.008)	
Employed	0.680	0.660	0.020**
	(0.004)	(0.008)	
High Skilled	0.596	0.590	0.006
	(0.004)	(0.008)	
Primary Education	0.392	0.381	0.011
	(0.004)	(0.008)	
Higher Education	0.331	0.321	0.010
	(0.004)	(0.008)	
Attitude Weighted Indicator	0.186	0.168	0.018***
	(0.002)	(0.005)	
Attitude Index	0.841	0.763	0.079***
	(0.011)	(0.023)	
Norm Home	0.203	0.184	0.019**
	(0.003)	(0.007)	
Norm Kid	0.250	0.231	0.020**
	(0.003)	(0.007)	
Norm Argue	0.188	0.162	0.027***
	(0.003)	(0.006)	
Norm Sex	0.104	0.096	0.009
	(0.002)	(0.005)	
Norm Food	0.095	0.091	0.004
	(0.002)	(0.005)	

Notes: The value displayed for t-tests are the differences in the means across the groups fo many background characteristics (age, gender, employment, skill employment, education dummies) and the dependent variables (Attitude weighted indicator, Attitude Index, Attitudes towards wife beating if the wife goes out without permission (Norm Home), if she neglects kids (Norm Kid), if she argues with the husband (Norm Argue), if she refuses sex (Norm Sex), if the burns food (Norm Food). ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

TABLE 3: PLACEBO TEST - ATTITUDES TOWARDS GENDER NORMS

PANEL A		
	Attitude Index	Attitude Weighted Indicator
$SubmarineCables_{c,t} \times Connected_i$	-0.042	-0.011
	(0.121)	(0.027)
	[0.732]	[0.691]
Country×Year FE	✓	✓
Grid Cell×Connected FE	✓	✓
Adj R-squared	0.153	0.154
Observations	21912	21912

PANEL B					
	(1) Home	(2) Kid	(3) Argue	(4) Sex	(5) Food
$SubmarineCables_{c,t} \times Connected_i$	-0.0190	-0.0139	-0.0056	-0.0112	0.0081
	(0.0291)	(0.0320)	(0.0292)	(0.0295)	(0.0153)
Country×Year FE	✓	✓	✓	✓	✓
Grid Cell×Connected FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
Adj R-squared	0.112	0.117	0.108	0.084	0.064
Observations	21912	21912	21912	21912	21912

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Background controls: age, age square, religion, gender. The constant is included. Robust standard errors account for clustering at the grid level. p-value in square brackets. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 4: POOLED SAMPLE - ATTITUDES TOWARDS GENDER NORMS

PANEL A		
	Attitude Index	Attitude Weighted Indicator
$SubmarineCables_{c,t} \times Connected_i$	0.128*	0.030*
	(0.077)	(0.017)
	[0.100]	[0.082]
Mean Outcome	0.828	0.183
Country×Year FE	✓	✓
Grid Cell×Connected FE	✓	✓
Controls	✓	✓
Adj R-squared	0.136	0.136
Observations	47714	47714

PANEL B					
	(1)	(2)	(3)	(4)	(5)
	Home	Kids	Argue	Sex	Food
SubmarineCables_ct × Connected_i	0.037*	0.041*	0.033	0.007	0.010
	(0.020)	(0.023)	(0.022)	(0.014)	(0.011)
	[0.059]	[0.080]	[0.126]	[0.613]	[0.376]
Mean Outcome	0.199	0.247	0.1837	.0803	.0672
Adj R-squared	0.110	0.109	0.078	0.103	0.094
Observations	47714	47714	47714	47714	47714
Country×Year FE	✓	✓	✓	✓	✓
Grid Cell×Connected FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Background controls: age, age square, religion, gender. The constant is included. Robust standard errors account for clustering at the grid level. p-value in square brackets. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 5: POOLED SAMPLE - ATTITUDES TOWARDS GENDER NORMS WITH INTERACTIONS

	Attitude Index	Attitude Weighted Indicator
Male	-0.354***	-0.075***
	(0.052)	(0.011)
	[0.000]	[0.000]
$SubmarineCables_{c,t} \times Connected_i$	0.066	0.016
	(0.084)	(0.018)
	[0.434]	[0.389]
$SubmarineCables_{c,t} \times Connected_i \times$ Male	0.182*	0.041*
	(0.108)	(0.024)
	[0.094]	[0.086]
Treatment + Treatment × Male	0.248**	0.0567**
	(0.1061)	(0.0234)
	[0.020]	[0.016]
Mean Outcome	0.828	0.183
Mean Outcome Female	0.966	0.212
Mean Outcome Male	0.554	0.125
Country×Year FE	✓	✓
Grid Cell×Connected FE	✓	✓
Controls	✓	✓
Adj R-squared	0.138	0.138
Observations	47714	47714

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Background controls: age, age square, religion, gender. The constant is included.

Robust standard errors account for clustering at the grid level in parentheses. p-value in square brackets. (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

TABLE 6: UNPACKING

	(1) Home	(2) Kids	(3) Argue	(4) Sex	(5) Food
Male	-0.079***	-0.087***	-0.076***	-0.057***	-0.055***
	(0.014)	(0.016)	(0.013)	(0.009)	(0.008)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$SubmarineCables_{c,t} \times Connected_i$	0.024	0.023	0.019	-0.008	0.010
	(0.023)	(0.026)	(0.023)	(0.016)	(0.013)
	[0.310]	[0.381]	[0.415]	[0.598]	[0.468]
$SubmarineCables_{c,t} \times Connected_i \times$ Male	0.040	0.055	0.042	0.046**	-0.000
	(0.030)	(0.034)	(0.029)	(0.022)	(0.017)
	[0.188]	[0.108]	[0.143]	[0.041]	[0.980]
Treatment + Treatment × Male	0.0635**	0.077**	0.061**	0.037*	0.009
	(0.0257)	(0.0324)	(0.0299)	(0.0198)	(0.0140)
	[0.014]	[0.018]	[0.042]	[0.063]	[0.510]
Mean Outcome	0.199	0.247	0.183	0.103	0.094
Mean Outcome Female	0.231	0.282	0.213	0.125	0.115
Mean Outcome Male	0.138	0.554	0.177	0.06	0.052
Country×Year FE	✓	✓	✓	✓	✓
Grid Cell×Connected FE	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
Adj R-squared	0.111	0.110	0.080	0.082	0.075
Observations	47714	47714	47714	47714	47714

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Background controls: age, age square, religion, gender. The constant is included. Robust standard errors account for clustering at the grid level. p-value in square brackets. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE 7: MECHANISM : EMPLOYMENT

	PANEL A: Pooled sample
	Employed
$SubmarineCables_{c,t} \times Connected_i$	0.0350**
	(0.0161)
Country×Year FE	✓
Grid Cell×Connected FE	✓
Adj R-squared	0.062
Observations	47751
	PANEL B: Pooled sample with Interactions
	Employed
Male	0.1219***
	(0.0160)
$SubmarineCables_{c,t} \times Connected_i$	0.0213
	(0.0194)
$SubmarineCables_{c,t} \times Connected_i \times$ Male	0.0335
	(0.0272)
Treatment + Treatment× Male	0.0547**
	(0.022)
Country×Year FE	✓
Grid Cell×Connected FE	✓
Adj R-squared	0.073
Observations	47751

Notes: This table shows the effect of fast internet arrival on employment. Robust standard errors account for clustering at the grid level. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

TABLE 8: MECHANISM : INTERNET USE

	Panel A: Pooled Sample		
	(1)	(2)	(3)
	Internet	Week Use	Daily
$SubmarineCables_{c,t} \times Connected_i$	0.0448**	0.0322*	0.0130
	(0.0183)	(0.0164)	(0.0118)
Year FE	✓	✓	✓
Region FE	✓	✓	✓
Adj R-squared	0.088	0.072	0.049
Obs	7958	7958	7958

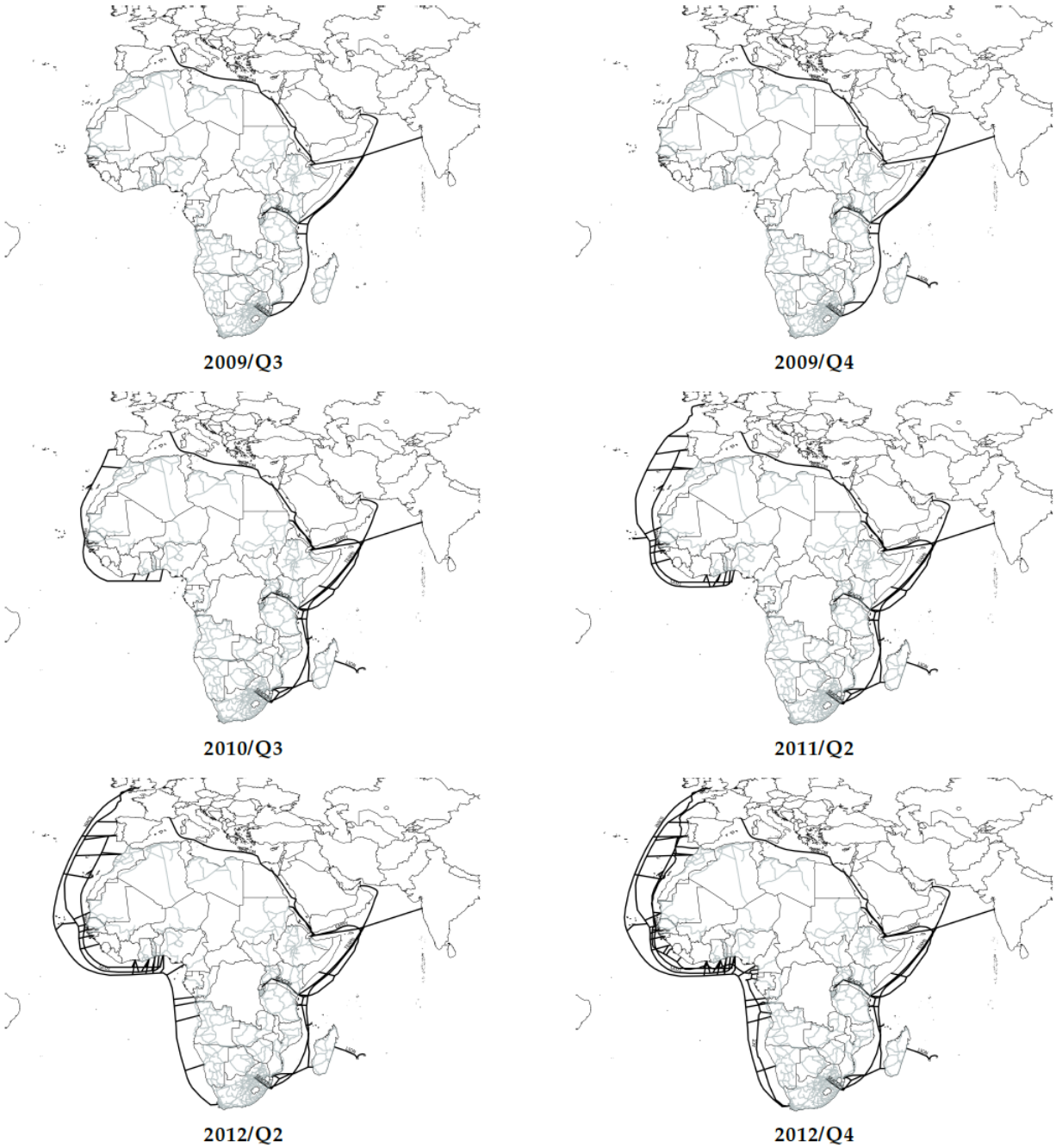
	Panel B: Pooled Sample with Interactions		
	(1)	(2)	(3)
	Internet	Week Use	Daily
Male	0.0663***	0.0418***	0.0263***
	(0.0130)	(0.0121)	(0.0067)
$SubmarineCables_{c,t} \times Connected_i$	0.0179	-0.0027	-0.0145
	(0.0328)	(0.0288)	(0.0179)
$SubmarineCables_{c,t} \times Connected_i \times$ Male	-0.0524	0.0024	0.0299
	(0.0400)	(0.0348)	(0.0220)
Treatment + Treatment$\times$ Male	-0.034	-0.0003	0.015
	(0.039)	(0.030)	(0.021)
Year FE	✓	✓	✓
Region FE	✓	✓	✓
Adj R-squared	0.107	0.091	0.067
Obs	4554	4554	4554

This table shows the effect of fast Internet on the Internet Use in Benin, Ghana, Kenya, Namibia, Nigeria.
Internet is takes value 1 if the respondent uses Internet few times in a month and 0 otherwise
Week Use takes value 1 if the respondent uses internet few times in a week and 0 otherwise
Daily Use takes value 1 if the respondent uses internet everyday and 0 otherwise
Robust standard errors in parentheses clustered at the city level.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

9 Figures

Figures

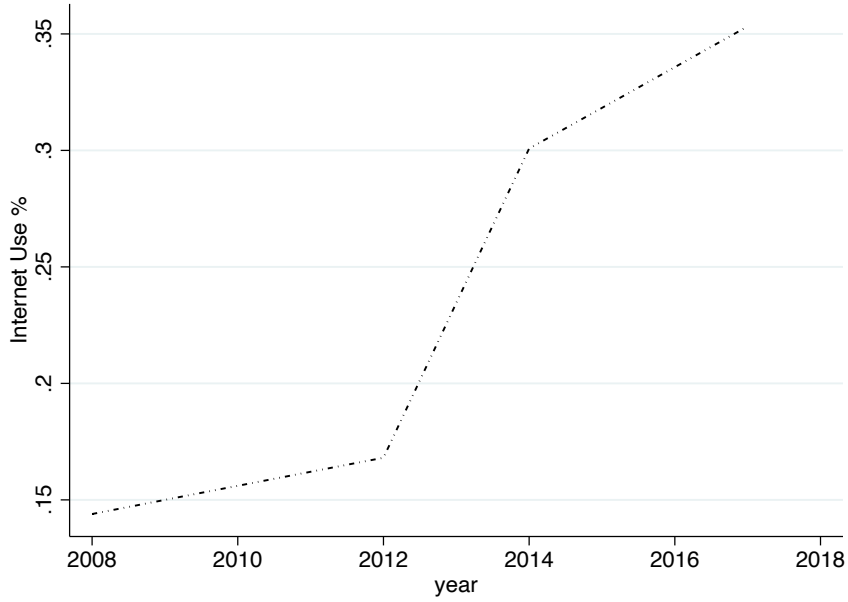
FIGURE 1



This figure shows the arrival of submarine Internet cables in Africa over time. The first two cables during our analysis period arrived in 2009/Q3 and the last in 2012/Q4. The submarine cables are Seacom and Teams (2009/Q3), Lion (2009/Q4), Eassy and MainOne (2010/Q3), Glo1 (2011/Q2), WACS (2012/Q2), and ACE (2012/Q4).

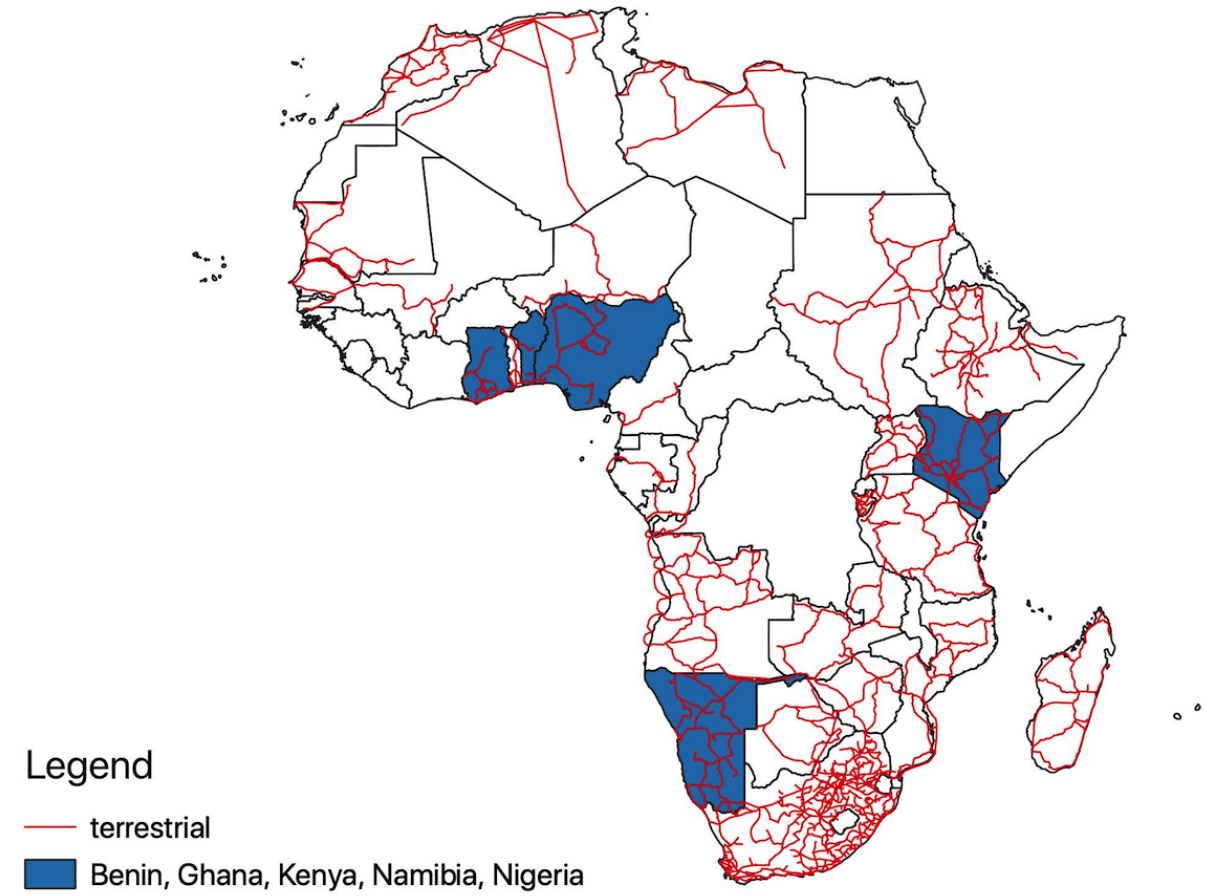
Note This figure shows the gradual arrival of submarine cables on African coasts between 2008-2012. Hjort & Poulsen (2019)

FIGURE 2



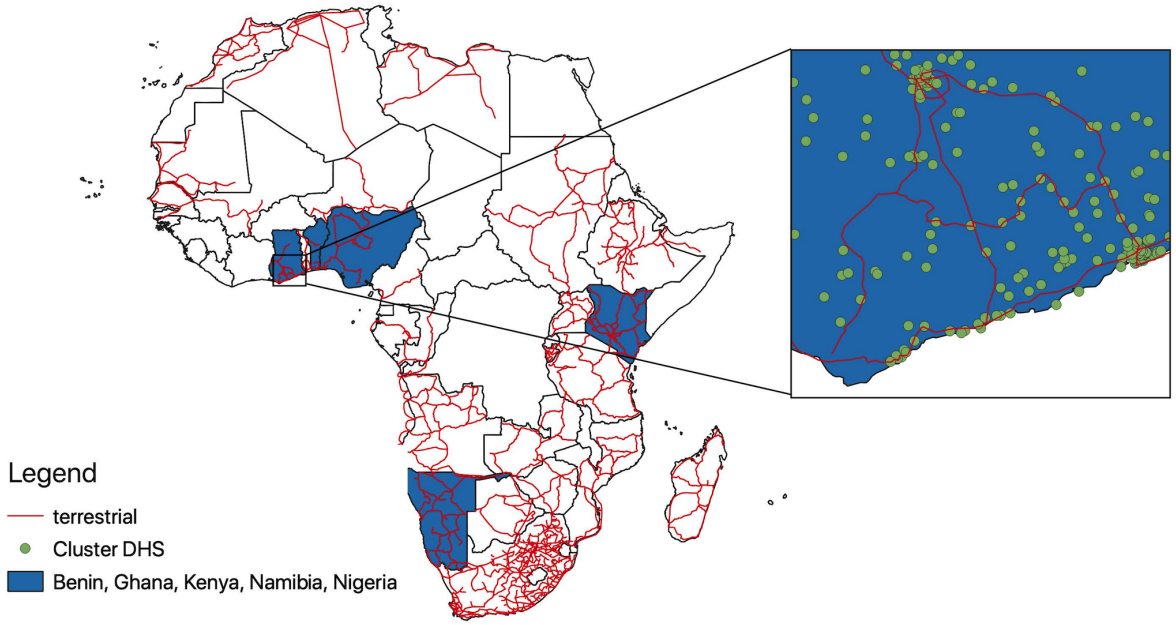
Note: My calculations based on Afrobarometer data (Round 4, Round 5, Round 6, Round 7) in Benin, Ghana, Kenya, Namibia, Nigeria.
The figure shows the share of individuals who reported to use the Internet at least a few times a month.

FIGURE 3



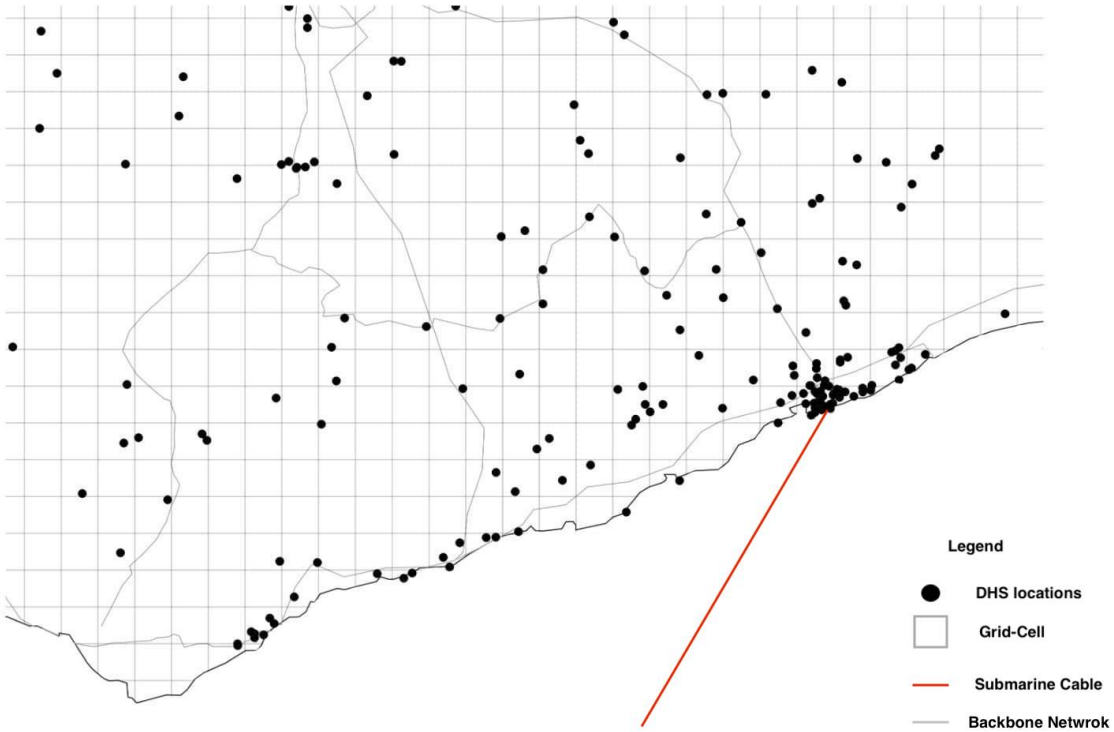
Note: The figure displays the country of the analysis in blue, and the terrestrial networks in red.

FIGURE 4



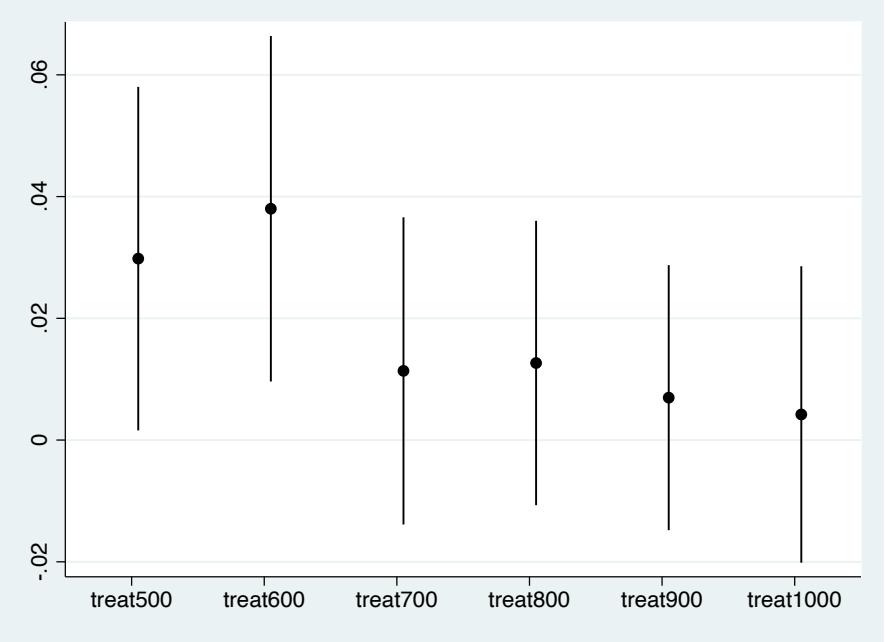
Note: The figure displays the country of the analysis in blue, and the terrestrial networks in red and the DHS clusters in green.

FIGURE 5



Note: This figure shows submarine Internet cables arriving to the Accra region in Ghana, the country's terrestrial backbone network, and locations from the DHS. Grid-cells are 0.1 $\times$0.1 decimal degrees, which is roughly 10 $\times$10 km, and are used for location fixed effects.

FIGURE 6



Note: This figure plots the coefficients using varying connection radii. The coefficients thus come from separate regressions.

A Appendix

TABLE A.1: FEMALE SAMPLE - ATTITUDES TOWARDS GENDER NORMS

	Attitude Index	Attitude Weighted Indicator
$SubmarineCables_{c,t} \times Connected_i$	0.086	0.020
	(0.086)	(0.019)
	[0.317]	[0.292]
Mean Outcome	0.966	0.212
Country×Year FE	✓	✓
Grid Cell×Connected FE	✓	✓
Adj R-squared	0.177	0.178
Observations	32116	32116

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Background controls: age, age square, religion, gender. The constant is included.

Robust standard errors account for clustering at the grid level in parentheses. p-value in square brackets. (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

TABLE A.2: MALE SAMPLE - ATTITUDES TOWARDS GENDER NORMS

	Attitude Index	Attitude Weighted Indicator
$SubmarineCables_{c,t} \times Connected_i$	0.154*	0.037*
	(0.087)	(0.020)
	[0.075]	[0.065]
Mean Outcome	0.554	0.125
Country×Year FE	✓	✓
Grid Cell×Connected FE	✓	✓
Adj R-squared	0.117	0.119
Observations	15598	15598

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Background controls: age, age square, religion, gender. The constant is included.

Robust standard errors account for clustering at the grid level in parentheses. p-value in square brackets. (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

TABLE A.3: FEMALE SAMPLE - UNPACKING

	(1) Home	(2) Kids	(3) Argue	(4) Sex	(5) Food
SubmarineCables_ct × *Connected_i*	0.030	0.015	0.034	-0.003	0.009
	(0.025)	(0.026)	(0.022)	(0.016)	(0.014)
	[0.216]	[0.560]	[0.126]	[0.863]	[0.552]
Mean Outcome	.161	.2046	.1484	.0928	.0794
Adj R-squared	0.143	0.140	0.119	0.104	0.094
Observations	32116	32116	32116	32116	32116
Country× Year FE	✓	✓	✓	✓	✓
Grid Cell ×Connected	✓	✓	✓	✓	✓

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Background controls: age, age square, religion, gender. The constant is included. Robust standard errors account for clustering at the grid level.

TABLE A.4: MALE SAMPLE - UNPACKING

	(1) Home	(2) Kids	(3) Argue	(4) Sex	(5) Food
SubmarineCables_ct × *Connected_i*	0.039*	0.068**	0.021	0.020	0.006
	(0.023)	(0.030)	(0.024)	(0.015)	(0.013)
	[0.089]	[0.023]	[0.383]	[0.176]	[0.671]
Mean Outcome	.106	.1429	.110	.0546	.0419
Adj R-squared	0.102	0.106	0.059	0.086	0.060
Observations	15598	15598	15598	15598	15598
Country× Year FE	✓	✓	✓	✓	✓
Grid Cell ×Connected	✓	✓	✓	✓	✓

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Background controls: age, age square, religion, gender. The constant is included. Robust standard errors account for clustering at the grid level.

TABLE A.5: POOLED SAMPLE - ATTITUDES TOWARDS GENDER NORMS - NO CONTROLS

	Attitude Index	Attitude Weighted Indicator
$SubmarineCables_{c,t} \times Connected_i$	0.119	0.028*
	(0.076)	(0.017)
	[0.119]	[0.099]
Mean Outcome	0.828	0.183
Country×Year FE	✓	✓
Grid Cell×Connected FE	✓	✓
Adj R-squared	0.126	0.127
Observations	47818	47818

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. The constant is included.

Robust standard errors account for clustering at the grid level in parentheses. p-value in square brackets. (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

TABLE A.6: POOLED SAMPLE - UNPACKING - NO CONTROLS

	(1)	(2)	(3)	(4)	(5)
	Home	Kids	Argue	Sex	Food
SubmarineCables_ct × *Connected_i*	0.035*	0.038*	0.032	0.006	0.008
	(0.019)	(0.023)	(0.021)	(0.014)	(0.011)
	[0.074]	[0.099]	[0.137]	[0.642]	[0.437]
Mean Outcome	0.199	0.247	0.1837	.0803	.0672
Adj R-squared	0.103	0.101	0.074	0.075	0.069
Observations	47818	47818	47818	47818	47818
Country× Year FE	✓	✓	✓	✓	✓
Grid Cell ×Connected	✓	✓	✓	✓	✓

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. The constant is included. Robust standard errors account for clustering at the grid level.

TABLE A.7: PRINCIPAL COMPONENT INDEX

	PCA Index
$SubmarineCables_{c,t} \times Connected_i$	0.099
	(0.060)
	[0.10]
Controls	✓
Country×Year FE	✓
Grid Cell×Connected FE	✓
Adj R-squared	0.136
Observations	47714

Robust standard errors account for clustering at the grid level.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE A.8: INDICATOR

	Indicator
$SubmarineCables_{c,t} \times Connected_i$	0.030
	(0.024)
	[0.216]
Controls	✓
Country×Year FE	✓
Grid Cell×Connected FE	✓
Adj R-squared	0.127
Observations	47714

Robust standard errors account for clustering at the grid level.
Indicator = 1 if at least one of the scenario is deemed as acceptable
The coefficient of the treatment is not statistically signficant.
This is probably due to the fact that there is no much variation.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

TABLE A.9: POOLED SAMPLE - ATTITUDES TOWARDS GENDER NORMS - SPATIAL AUTOCORRELATION

	Attitude Index	Attitude Weighted Indicator
$SubmarineCables_{c,t} \times Connected_i$	0.127**	0.030**
	(0.062)	(0.014)
	[0.039]	[0.030]
Adj R-squared	0.009	0.009
Observations	48152	48152
Country×Year FE	✓	✓
Grid Cell×Connected FE	✓	✓
Adj R-squared	0.009	0.009
Observations	48152	48152

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Controls: Age, Age sq., Gender. The constant is included.

Standard errors calculated with Conley Method. p-value in square brackets. (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

TABLE A.10: POOLED SAMPLE - UNPACKING - ALTERNATIVE STANDARD ERRORS: SPATIAL AUTOCORRELATION

	(1)	(2)	(3)	(4)	(5)
	Home	Kids	Argue	Sex	Food
SubmarineCables_ct × *Connected_i*	0.036**	0.040**	0.034**	0.007	0.009
	(0.016)	(0.019)	(0.017)	(0.010)	(0.009)
	[0.024]	[0.034]	[0.049]	[0.481]	[0.316]
Adj R-squared	0.006	0.007	0.004	0.005	0.005
Observations	48152	48152	48152	48152	48152
Country× Year FE	✓	✓	✓	✓	✓
Grid Cell ×Connected	✓	✓	✓	✓	✓

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Controls: age, age squared, gender. The constant is included. Standard Errors calculated with the Conley Method.

TABLE A.11: POOLED SAMPLE - ATTITUDES TOWARDS GENDER NORMS - ALTERNATIVE STANDARD ERRORS: ADMINISTRATIVE LEVEL

	Attitude Index	Attitude Weighted Indicator
$SubmarineCables_{c,t} \times Connected_i$	0.128*	0.030*
	(0.072	(0.016))
	[0.080]	[0.065]
Country×Year FE	✓	✓
Grid Cell×Connected FE	✓	✓
Adj R-squared	0.136	0.136
Observations	47714	47714

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Background controls: age, age square, religion, gender. The constant is included.

Robust standard errors account for clustering at the administrative level in parentheses. p-value in square brackets. (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

TABLE A.12: POOLED SAMPLE - UNPACKING - ALTERNATIVE STANDARD ERRORS: ADMINISTRATIVE LEVEL

	(1)	(2)	(3)	(4)	(5)
	Home	Kids	Argue	Sex	Food
SubmarineCables_ct × *Connected_i*	0.037*	0.041*	0.033*	0.007	0.010
	(0.020)	(0.021)	(0.019)	(0.013)	(0.010)
	[0.071]	[0.060]	[0.093]	[0.588]	[0.344]
Adj R-squared	0.110	0.109	0.078	0.081	0.074
Observations	47714	47714	47714	47714	47714
Country× Year FE	✓	✓	✓	✓	✓
Grid Cell ×Connected	✓	✓	✓	✓	✓

Notes: Individuals (locations) are considered connected if they are closer than 0.5 km to the backbone network. Background controls: age, age square, religion, gender. The constant is included. Robust standard errors account for clustering at the administrative level.