Connecting the Unconnected: Facebook Access and Female Political Representation in Sub-Saharan Africa *

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Abstract. Can social media promote female access to political positions? Using data on 8,814 electoral races from 64 parliamentary elections in 17 sub-Saharan African countries, we answer this question in a context of significant political under-representation of women, and which experienced a rising penetration of Facebook over the past decade. We leverage the staggered introduction of Facebook's Free Basics -i.e. free access to Facebook through partner mobile operators- across constituencies and time, and document the success of this connectivity shock and its subsequent effect on female political representation. We find that Facebook's Free Basics significantly fosters the election of female candidates, but only in the medium-run. This effect is driven by female candidates endorsed by the established political parties, and running for the first time. We uncover several mechanisms. Using survey data, we show that Free Basics generated sharp changes in attitudes towards gender norms and female political participation. Studying online network structure of users we show that Free Basics? effect is driven by exposure to diverse and progressive content. Finally, we find that its impact is enabled by the holding of fair elections but is magnified when traditional press freedom is limited.

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1 Introduction

Can social media promote female access to political leadership in developing democracies? Over the past 20 years, the rapid expansion of mobile internet has deeply reshaped communication technologies and fueled the democratization of social media,[1] causing profound societal changes. By revolutionizing the way people obtain information and interact, it has greatly accelerated the evolution of gender norms (Washington and Marcus, 2022). In parallel, such structural transformation has considerably lowered the cost of political mobilization and communication (Manacorda and Tesei, 2020), affecting both established actors and traditionally underrepresented populations. Together, this has opened the door to significant potential for the empowerment of women in the political sphere and the fostering of more gender-equal political representation.

By facilitating direct communication with voters, social media platforms can, in this context, help bypass the obstacles faced by female candidates in achieving electoral success through traditional media, such as barriers to entry in the media sphere and editorial biases. Despite strong evidence that female political leadership is associated with economic development and societal well-being (Duflo, 2012), under-representation of women in politics is still as of today a near-universal issue, women representing in 2022 only 23% of government ministers and 26% of parliamentarians (IPU, 2023). This long-lasting representation inequality is particularly striking in many fragile democracies, where women regularly represent less than 10% of members of parliament (MP).[2]

In parallel, and despite its recent sharp availability and take-up increase, there still exist strong mobile connectivity inequalities worldwide. In particular, most sub-Saharan African countries fall short in terms of internet usage, with only 22% of its population using mobile internet in 2021, compared to 55% worldwide (GSMA, 2022). While this figure has doubled from 11% in 2014, the rapid increase in mobile broadband coverage over the territory has reduced the share of uncovered population from 50% to 17% over the same period. This important usage gap finds its main explanation in the low affordability of mobile broadband : in sub-Saharan Africa, one gigabyte of mobile internet cost on average 6.5% of monthly income in 2016 and 3.4% in 2021 (compared to less then 1% in Europe and South Asia). In this context, Facebook introduced Free Basics, a zero-rating policy designed to connect the developing world to the internet. By partnering with local mobile operators, Facebook's Free Basics initiative allowed regular SIM card owners in areas with at least 2G coverage to access a Facebook-centered "light" version of the internet without incurring additional data costs (Nothias, 2020).[3]

In this paper, we investigate the impact of the connectivity shock resulting from Facebook's Free Basics initiative on the electoral prospects of female candidates in national parliamentary elections in 17 sub-Saharan Africa countries. In particular, we ask if women are more likely to get elected and whether they receive higher vote shares following the introduction of Free Basics.

[1] In 2023, 4.7 billion people worldwide had a social media account, representing close to 90% of active internet users (We are Social, 2023).

[2] For instance, women represented in 2022 4% of parliamentarians in Nigeria, 7% in Benin or 9% in Gambia. It is nonetheless important to note that this is not generalized across the African continent, with some countries performing very well compared to international standards such as Rwanda (64%), Namibia (44%), Senegal (44%) (IPU, 2023).

[3] Other examples of zero-rating policies include for example Wikipedia Zero, allowing users to browse Wikipedia without incurring data charges, or Google Free Zone, a short lived zero-rating policy around Google products which was discontinued in 2014.

To do so, we assemble a constituency-election-level panel dataset of 8,814 parliamentary races, across 17 sub-Saharan countries over the 2001 to 2022 period, with detailed information on gender, political affiliation and candidacy history of parliamentary candidates. We measure constituencies' yearly internet and Free basics population coverage by combining data on cellular antennas with population counts at a 1km $\times$ 1km resolution.

In order to causally estimate the impact of Free Basics availability on parliamentary candidate and winner identity in sub-Saharan Africa, we leverage its staggered roll-out in a modern difference-in-differences setting. In particular, we exploit two types of variation: temporal variation in the timing of the partnerships between Free Basics and individual mobile operators, and spatial variation in the local coverage of each partner operator over the territory. Crucially, our strategy allows us to differentiate out invariant constituency characteristics and to control for other time-varying factors. Under the assumption that the timing of Free Basics availability is orthogonal to drivers of local politics, our estimation strategy thus allows us to provide causal estimates of the impact of the connectivity shock generated by Free Basics on female political representation in sub-Saharan Africa. Crucially, Free Basic partnerships are determined at the national or continental level, providing strong support for this assumption.

Our main finding is that Free Basics availability significantly increased female political representation in covered constituencies. Specifically, a constituency exposed to Free Basics has a 10.2pp higher likelihood to elect a female MP in the second election following its introduction. Following the media literature (DellaVigna and Kaplan, 2007; DellaVigna and Gentzkow, 2010), we show that this amounts to a 6% persuasion rate.[4] Consistent with this finding, we uncover similar effects when looking at vote shares received by women. When exploring heterogeneities, we find that this effect is driven primarily by women running for the first time and endorsed by parties already represented in parliament. In addition, we document converse effects for male candidates, starting in the first election following the introduction of Free Basics and of larger magnitude in the second. Specifically, we show that the winning margin of men when facing a female candidate is reduced, already in the first election. Put together, these findings are compatible with the hypothesis that political parties learn from the first election about the increased demand for female politicians and endorse more women in the subsequent election.

Importantly, we document how these results are enabled by the presence of fair elections and are amplified in the presence of censoring of the traditional press. These findings corroborate both the necessity of free and fair elections in driving appropriate political representation as well as the potential for social media to act as a catalyst for change in contexts of low agency of traditional media.

Throughout this paper, we investigate mechanisms at play explaining our results. Firstly, we use survey data to show that the connectivity shock induced by the introduction of Free Basics generated sharp changes in attitudes towards gender norms and female political participation. In particular, we find that Free Basics significantly increased agreement with the statement that women should have the same chances of being elected to political office as men. Consistent with this finding, survey respondents affected by Free Basics are more supportive of gender equality

[4]In our setting, the persuasion rate (DellaVigna and Kaplan, 2007; DellaVigna and Gentzkow, 2010) answers the question "what is the share of constituencies covered by Free Basics which were *convinced* by its introduction to elect a women ?". The magnitude of our uncovered effect is consistent with studies on the impact of internet on political attitudes (Guriev et al., 2021).

on other dimensions (employment access, land rights, domestic tasks) and declare less tolerance towards gender violence. In parallel, we also show that Free Basics has had a negative impact on the approval of and trust in MPs, highlighting an impact on demand for political renewal.[5]

Finally, in the latter part of the paper, we study how Free Basics' impact is dependent on the online network structure of Facebook users. By showing how increased local concentration of the network dampens Free Basics' impact, we show that diversity of content plays a key role in enabling online norms transmission. Going further we document how exposure to higher levels of female political representation exacerbates the electoral consequences of this connectivity shock.

Literature review. By documenting how Facebook's Free Basics initiative affects women's electoral prospects in sub-Saharan Africa, our paper contributes to the literature in several ways. Firstly, it builds on the rich literature on the importance of women leaders, which documents a striking societal ambiguity between the shown beneficial effects of gender equal political representation and yet the struggle faced by women entering politics. In particular, an important strand of literature highlights the positive policy consequences of female political leadership : public spending more aligned with the needs of local populations (Chattopadhyay and Duflo, 2004), health policies decreasing neonatal mortality (Bhalotra and Clots-Figueras, 2014), lower corruption (Brollo and Troiano, 2016), and higher growth in economic activity (Baskaran et al., 2024). Furthermore, higher female political representation can trigger virtuous cycles, increasing future women's representation (Baskaran and Hessami, 2018) and competence among elected politicians (Besley et al., 2017). Despite these findings, female politicians continue to face strong impediment throughout their careers. Indeed, compared to their male counterparts women in politics are more likely to face violence, both from the public (Daniele et al., 2023) and fellow politicians (Krook, 2018), less likely to stand for reelection at the end of their term (Baskaran and Hessami, 2022) and appointed to less prestigious offices (Krook and O'Brien, 2012; Goddard, 2019). It is important to bear in mind that all these papers document effects on women already running for political office. Undoubtedly, such barriers already play a crucial role in the selection of citizen deciding to run for political office.[6] Le Barbanchon and Sauvagnat (2022) show furthermore that political parties often exacerbate existing voter biases against women when endorsing candidates. While we have seen over the years an increasing number of jurisdictions imposing gender quotas at various political levels, it has been shown that these fail to effectively remove barriers to gender equality in politics (Bagues and Campa, 2020, 2021).

Secondly, our paper contributes to the literature on the impact of internet and social media on politics in fragile democracies and autocratic regimes, which has been shown to be ambiguous.[7] While it has, on the one hand, fueled government disapproval, protests and political violence (Enikolopov et al., 2020; Fergusson and Molina, 2019; Cariolle et al., 2024), a finding also associated with Facebook's Free Basics (Tähtinen, 2024).[8]

Our paper bridges these two strands of the literature by showing how a non-political tool such

[5] A finding in line with recent literature on the impact of internet on political participation (Falck et al., 2014; Gavazza et al., 2019; Campante et al., 2018) and government disapproval (Guriev et al., 2021).

[6] See Gulzar (2021) for a review of work on selection into political careers.

[7] For detailed reviews of the political effects of internet and social media, see Zhuravskaya et al. (2020) and Campante et al. (2023).

[8] This is not limited to fragile democracies and autocratic regimes. In mature democracies, the expansion of internet has had a negative impact on turnout (Falck et al., 2014; Gavazza et al., 2019) and has participated in the rise of populist parties (Campante et al., 2018; Guriev and Papaioannou, 2021; Guriev et al., 2021).

as social media can help improve female representation in parliament, through increased access to information. As such, we extend the existing literature on the impact of traditional media on gender norms (Chong and Ferrara, 2009; Ferrara et al., 2012; Okuyama, 2021), which serve as stepping stones to norm transitions (Gulesci et al., 2023). Crucially, this further highlights the importance of overcoming the *missing women syndrom* in media coverage: by allowing far less coverage to women in political news and, when doing so, by paying more attention to their appearance and personal life (Van der Pas and Aaldering, 2020), traditional media have a significant impact on the development of gender stereotypical behaviors among adolescents (Ward and Grower, 2020).

Finally, we help contribute to the understanding of electoral politics in sub-Saharan Africa, a region characterized by high levels of parliamentary turnover and often low political accountability (Bowles and Marx, 2022). In this context, Mougin (2024) shows the importance of television during times of political crisis. Extensive work has also documented in the African context the role of competitive elections in shaping project delivery (Marx et al., 2018), public good provision and economic performance (Bates and Block, 2013; Burgess et al., 2015).

The paper is organized as follows. Section 2 provides background information on connectivity developments in sub-Saharan Africa and on the Free Basics initiative. Section 3 describes the data used throughout the analysis and provides descriptive statistics. Section 4 documents the role of Free Basics in altering attitudes. Section 5 presents the empirical strategy deployed for our main analysis on the election of female parlementarians. Section 6 reports the corresponding results. Section 7 investigates the role of online network structure as a mechanism at play. Section 8 concludes.

2 Background

Connectivity and internet affordability in sub-Saharan Africa. Over the past decade, sub-Saharan African countries have witnessed a quick increase in the deployment of communication technology infrastructures, allowing to reduce the share of population not covered by mobile internet technology from 50% in 2014 to 16% in 2022 (GSMA, 2022). Consequently, mobile internet usage doubled over the same period. Still, only 40% of the adult population uses mobile internet in 2022 in the region, an important reason for this being the very high cost of mobile broadband subscriptions. In sub-Saharan Africa, one gigabyte of mobile internet would cost on average 6.5% of monthly GDP per capita in 2016 (GSMA, 2022). While technological progress has permitted to drive this cost down to 3.4% in 2021,[9] this still entails a significant barrier to generalized mobile connectivity, both at the intensive and extensive margins.

The size of the potential sub-Saharan market has driven major global tech companies to undertake large investments in the region in parallel of the government- and local operator-led network expansion, allowing to further drive down internet costs and connect remote regions. Led by Google, Microsoft and Facebook, these initiative have taken the form, among others, of submarine cable and fiber infrastructure, the establishment of internet exchange points, and the

[9] As a comparison point, one gigabyte of mobile broadband costs on average less then 1% of monthly GDP in Europe, North America and South Asia (GSMA, 2022).

deployment of innovative technologies, such as Google's WiFi-emitting balloons. In addition to such physical infrastructures, high-priced internet data created a market for "zero-rating policies" – i.e. programs allowing users to access certain internet services without incurring mobile data charges (Bates et al., 2017). At the forefront of these policies lies Facebook's Free Basics initiative, the focus of this paper.

A brief history of the Free Basics partnerships. Initiated by Facebook in 2013 as *Internet.org* and rebranded in 2015,[10] Free Basics allows SIM card owners from partner mobile operators in areas with at least 2G coverage to access a Facebook-centered "light" version of the internet without the need to have an active internet plan nor incurring data costs. The first partnership was established in Zambia in 2014 with the Airtel operator and has since been extended to 65 countries worldwide, with 30 of them in Africa (Nothias, 2020). The original Zambian partnership allowed users to browse 13 online services, which included "Facebook, Wikipedia, a Johnson & Johnson-sponsored maternal health site, the Zambian government's app, a local job portal, and a women's rights organization" (Nothias, 2020). Since then, the program has evolved, and any website administrator can apply to propose a Free Basics version of its service (Singh et al., 2017). Importantly for us, a strong emphasis is put on the actual Facebook app within Free Basics, both though the design of the app[11] and the operator advertising campaigns following Free Basics partnerships (Gebhart, 2016). This translates into a use of Free Basics mostly centered around the light-Facebook website.[12] Eventually, this Facebook-centered connectivity shock helped the company gain millions of new users in the Global South.[13]

3 Data and Descriptive Statistics

In this section, we describe the main data sources used in this paper. In particular, we start by presenting the electoral and mobile connectivity data used in our main analysis of the electoral consequences of Free Basics. We then describe the cross-sectional individual survey data which allows us to quantify both the size of the Free Basic connectivity shock as well as its impact on individual attitudes. Finally, we present data sources for constituency-level characteristics which we include as controls throughout our analysis.

[10] The *Internet.org* name remained for the global project encompassing all of Facebook's connectivity initiative, *Free Basics* being it's flagship project.

[11] This emphasis is already present in the name of the app, with it being called "Free Basics by Facebook" on the Google Play Store platform (https://play.google.com/store/apps/details?id=com.freebasics). Within the app, Facebook is also listed first, prior to the main list of available services: https://advox.globalvoices.org/2017/07/27/facebooks-free-basics-doesnt-connect-you-to-the-global-internet-but-it-does-collect-your-data/

[12] As described in the New York Times here: https://www.nytimes.com/2017/09/26/opinion/facebook-free-basics.html. See also Romanosky and Chetty (2018)

[13] Internal documents revealed by the Wall Street Journals in 2022 suggests that, in the second semester of 2021, Free Basics generated the entry of an estimated 10 million users per month. (https://www.wsj.com/articles/facebook-free-india-data-charges-11643035284). From 2016-Q3 to 2017-Q4, quarterly earnings reports by Facebook also systematically highlighted that the *Internet.org* initiatives were at the forefront of Facebook's Monthly Active User growth (see for instance: https://s21.q4cdn.com/399680738/files/doc_financials/2016/Q3/FB-Q316-Earnings-Transcript.pdf. All earnings reports since 2016Q1 are available here : https://investor.fb.com/investor-events/default.aspx). This explains why Facebook has faced accusations of potential violation of internet neutrality, which led to the service being banned in India in February 2016: https://www.nytimes.com/2016/02/09/business/facebook-loses-a-battle-in-india-over-its-free-basics-program.html

Parliamentary election data. We collect detailed data on electoral races at the constituency level for 64 parliamentary elections across 17 sub-Saharan countries over the period 2001-2022.[14] In particular, we focus on First-Past-The-Post (FPTP) races in single-member constituencies.[15] Since we will be interested in candidate and winner identity, this restriction allows us to ensure that votes cast map directly into support for a single individual (which is not trivial in party-list systems), and that these votes directly decide of winners (which is not the case with second-round run-offs). In addition we further limit ourselves to electoral races for which we were able to obtain shapefiles of the constituency boundaries.[16] The resulting sample consists of 8,814 constituency-level electoral races. Crucially, we exploit information on winner identity as well as presence on the ballot and vote shares along the gender,[17] party-type endorsement and candidacy history dimensions. In particular, we measure whether a candidate is endorsed by a party already represented in parliament or not, by the incumbent party in one's constituency, or if candidate is running as an independent. We also measure for each candidate the number parliamentary races it has already ran since we observe elections.[18] Table 1 provides descriptive statistics of constituency-level data used throughout our analysis.

A quick glance at these statistics suffices to notice the sharp under-representation of women in parliamentary politics in our sample, with women representing only 11% of elected MPs. Further then not being elected, no women appear on the ballot in around half (46%) of the electoral races studied and, when running, the best-ranking woman obtains on average 10% of votes. Table 1 further breaks down these figures by candidacy type and provides the corresponding numbers for male candidates.

Internet and Free Basics coverage. At the center of our analysis lies the ability to measure both Free Basics and overall mobile internet coverage in our sample of constituencies. We start by collecting unique information on the date and mobile operator associated with each partnership with Facebook, for a total 28 deals starting in July 2014 with Airtel in Zambia. These partnerships cover 17 individual mobile companies operating in 12 of the countries in our sample.[19]. We then map such partnerships as well as overall coverage as follows: We firstly collect cellular tower level data from the *OpenCelliD* project[20] and extract for each tower its geographic coordinates, the internet technology (GSM, UMTS or LTE) it provides, its operating company and the date of first measured emission. Secondly, we compute coverage areas by creating buffers of 12 kilometers

[14]The complete list of countries is : Botswana, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Lesotho, Liberia, Madagascar, Malawi, Nigeria, Seychelles, Sierra Leone, Tanzania, Uganda, Zambia, Zimbabwe. We obtain election data from the *Constituency-Level Election Archive* (CLEA), the Psephos electoral archive and electoral commission. See Table A2 for the detailed list of sources by election

[15]Some countries in our sample have mixed electoral systems (Guinea, Lesotho, Madagascar, Seychelles and Zimbabwe), while others have a limited number of multi-member constituencies (Ivory Coast and Madagascar), in such cases we limit ourselves to the races whose rule satisfy FPTP and single member.

[16]See Appendix Table A2 for the complete list of sources we obtained shapefiles from.

[17]For some elections in the sample, gender is not directly observed in the electoral data at hand. In such case, we use the *Gender API* (https://gender-api.com/) in order to predict the candidates' gender based on their name and country

[18]We identify a candidate as having ran in a previous election if a candidate with the same first and last name has previously ran in the same constituency.

[19]See page A1 for the complete list of Free Basics partnerships in sample.

[20]https://www.opencellid.org/

around 2G towers and 4 kilometers around 3G and 4G towers.[21] Based on the operator and technology associated with each tower, this allows us to have a mapping of the areas covered by each mobile internet technology, and the subsample covered by Free Basics. In order to disentangle fast internet coverage from previous generations of connectivity, we distinguish 2G and 3G/4G internet coverage.[22] It is important to note that, Free Basics having been designed to function also with 2G mobile internet (Sen et al., 2016), we consider as covered by it all areas receiving at least 2G internet. Finally, we combine these information with population counts at a 30 $\times$ 30 arc-second resolution (approximately 1 $\times$ 1 km at the Equator) from the *WorldPop* database (Tatem, 2017) allowing us to compute the population living in covered areas. The resulting data therefore consists of yearly maps reporting the shares of population covered by (i) overall mobile internet (namely 2G and 3G/4G, separately) and (ii) Free Basics-compatible mobile internet at the constituency level.

Descriptive statistics presented in Table 1 show that 49% of the constituency $\times$ election-year dyads of our sample have some population covered by any mobile internet, and 26% by Free Basics. Interestingly, the "Free Basics operators" cover large segments of population in the constituencies where they operate and at the time of elections, which is our primary interest in this paper. On average, in the first election following the introduction of Free Basics in a constituency, 70% of its population is covered by a "Free Basics operator", and the coverage amounts to 84% of the population in the median constituency. In the constituencies that we observe for a second election after the introduction of Free Basics, it peaks to 80% of the population on average, and 97% in the median constituency For this reason, we investigate the average electoral effects of switching from no Free Basics to "some" Free Basics coverage in baseline (and hence exploit binary treatment status).

Citizen connectivity and attitudes data. We use geocoded individual data from the Afrobarometer survey to estimate the size of the connectivity shock of Free Basics on individuals, but also to assess the relationship between Free Basics coverage and citizens' political attitudes. The Afrobarometer is a series of cross-sectional nationally representative surveys ran in 35 African countries since 1999, measuring public attitudes on an array of societal and political issues. In order to construct our variables of interest, we leverage questions from survey rounds 6 to 8 (2014-2021) relating to citizens' use of social media and internet, political perception as well as perception of gender norms.[23] Crucially, it also reports the geographic coordinates of respondents' place of residence (i.e. enumeration area). By matching these coordinates with mobile internet and Free Basics coverage maps, we are therefore able to measure individual access to such services. In addition, it provides detailed individual characteristics such as age, gender, education level, and religion, which we control for throughout our analysis. We restrict our analysis to individuals living in constituencies which are part of our constituency-level data described here-above. This yields a sample of 61,675 respondents across 2,216 constituencies in 16 countries.[24] Table 2

[21] The choice of buffer size follows the use of OpenCelliD data in the Bartholomew Collins (2021) dataset. We show below the robustness of our treatment effect to larger buffers (i.e. buffers expanded by 2km, 4km and 8 km).

[22] The literature documents important social consequences of the introduction of fast mobile internet, through 3G technology, with respect to 2G networks. See for instance Guriev et al. (2021); Tabellini et al. (2023)

[23] As we detail below, data constraint prevent us from exploiting earlier rounds of the Afrobarometer, as questions about social media consumption only appeared starting from the sixth round (2014-2015).

[24] This represents all the countries in the main analysis on parliamentary elections, with the exception of Sey-

Table 1: Summary statistics for the election analysis: constituency × election-year level

	Observations	Mean	Standard deviation	Min	Max
Mobile broadband technology available					
Free Basics	8814	0.26	0.44	0	1
Internet coverage	8814	0.49	0.50	0	1
Electoral outcomes: female candidates					
Winner is a woman	8814	0.11	0.31	0	1
... in a parliamentary party	8814	0.08	0.27	0	1
... independent or in a minor party	8814	0.03	0.17	0	1
Vote shares of first-ranked female	3725	0.22	0.24	0.00	1.00
... in a parliamentary party	1531	0.36	0.25	0.00	1.00
... independent or in a minor party	2835	0.11	0.16	0.00	0.89
At least one woman on the ballot	8806	0.46	0.50	0	1
... in a parliamentary party	8814	0.19	0.39	0	1
... independent or in a minor party	8814	0.35	0.48	0	1
Winner is a man					
... in a parliamentary party]	8814	0.61	0.49	0	1
...independent or in a minor party	8814	0.28	0.45	0	1
Vote shares of first-ranked man					
... in a parliamentary party	7299	0.49	0.23	0.00	1.00
... independent or in a minor party	7633	0.24	0.21	0.00	1.00
At least one man on the ballot					
... in a parliamentary party	8814	0.90	0.30	0.00	1.00
... independent or in a minor party	8814	0.93	0.25	0.00	1.00
Population and nighttime light					
Log of total population	8814	5.09	1.73	0.16	11.16
Mean nighttime light, weighted by pop. density	8814	5.73	3.58	0.00	15.29

presents summary statistics of the survey data used throughout our analysis.

Constituency-level characteristics In order to support the causal interpretation of our estimation, we control in our main specifications for two important time-varying constituency characteristics : population density and nighttime light. We compute the former for each constituency-year by simply averaging yearly population density estimates at a 30 × 30 arc-second resolution (approximately 1 × 1 km at the Equator) provided by the *Worldpop* dataset (Tatem, 2017) within constituency boundaries. Following the literature (Chen and Nordhaus, 2011; Henderson et al., 2012; Michalopoulos and Papaioannou, 2014), we chose to proxy economic development using measures of nighttime light. In particular, we use satellite imagery data at the 30 arc-second resolution from Li et al. (2020) in order to compute the population-density-weighted mean nighttime light for each constituency-year observation. That is, when computing the mean nighttime light of a constituency-year, we weigh each pixel by its population density, using the Worldpop data described previously. Table 1 provides descriptive statistics of the population and nighttime

chelles which has, to date, never been surveyed by the Afrobarometer.

light measures used throughout this analysis.

Table 2: Summary statistics for the Afrobarometer analysis: individual level

	Observations	Mean	Standard deviation	Min	Max
Mobile broadband technology					
Free Basics	61675	0.29	0.45	0	1
3G/4G	61675	0.19	0.39	0	1
2G	61675	0.13	0.34	0	1
Connectivity					
Get news from social media	61675	0.26	0.44	0	1
Get news from internet	61675	0.24	0.43	0	1
Uses internet frequently	61675	0.24	0.43	0	1
Owns mobile phone	61675	0.77	0.42	0	1
Heard about social media	19177	0.70	0.46	0	1
Political attitudes					
Equal chance for women in politics	41567	0.50	0.50	0	1
Social media informs people	18528	0.63	0.48	0	1
Social media impacts politics	18528	0.55	0.50	0	1
MPs are corrupt	54911	0.40	0.49	0	1
Trust in the parliament	54911	0.24	0.43	0	1
Voted in the last national election	54911	0.73	0.44	0	1
Gender norms					
Men should be prioritized in labor market	16323	0.41	0.49	0	1
Equal land rights for women	16323	0.79	0.41	0	1
Women should take care of HH	16323	0.52	0.50	0	1
Beating wife never justified	16323	0.77	0.42	0	1

Exposure to Facebook content and female leadership. The potential political impact of increased access to Facebook relies heavily on the blend of content users encounter online. To investigate this, we leverage differences in the degree to which Facebook presents users with content reflecting progressive norms towards female leadership using two data sources. We firstly use the Facebook Social Connectedness Index (SCI) (Bailey et al., 2018) in order to measure the intensity of bilateral Facebook connections across regions. Specifically, the SCI measures the relative frequency of Facebook friendship links between almost every pair of ADM1 regions across the world. Formally, the SCI is defined as :

$$SCI_{ij} = \frac{FacebookConnections_{i,j}}{FacebookUsers_i \times FacebookUsers_j}$$

Where $FacebookConnections_{i,j}$ is the number of Facebook connections between users in regions i and j , $FacebookUsers_i$ is the number of Facebook users in region i and conversely for region j. This allows us to directly measure the concentration of a region's typical user's network. In

particular, we leverage the share of Facebook friends in one's own region, which gives a first indication of the diversity of views represented on one's social media feed. Importantly, we measure the SCI at the regional level, we therefore associate to every constituency within a given region the SCI and associated statistics of the region.

Secondly, we measure exposure to female leadership through foreign connections. To construct a measure of relative exposure to a certain type of content, we follow Bailey et al. (2024). This is done in two steps. We start by approximating the Facebook connection intensity of a user in region i with foreign country k as follows:

$$PerUserConnect_{i,k} = \sum_{j \in k} SCI_{i,j} \times Pop_j$$

The computed $PerUserConnect_{i,k}$ can be seen as the mean number of Facebook friendship links of the average user living in region i with individuals located in country k. We then approximate the share of connections of a user in region i to content posted by users in countries with trait T as such :

$$Share\ of\ friends\ with\ trait\ T_i = \frac{\sum_{k \in K}(PerUserConnect_{ik} \times \mathbb{1}(Trait = T)_k)}{\sum_{k \in K} PerUserConnect_{ik}}$$

In particular, we will be investigating two traits through our analysis: friends in the same region and friends in countries with higher political representation of women. While the former does not require additional data then the SCI, we measure the latter using the Women's Power Index (Vogelstein and Bro, 2021).[25] The Women's Power Index measures gender parity in political representation for all UN member states. It is constructed based on data on the gender of the head of state, the proportion of women serving in governments, in national and local legislatures as well as the share of female candidates in national elections. In addition, we show robustness of our results using the share of women in parliament as an alternate measures of representation.[26] Table 3 presents summary statistics on the average Facebook network of our sample of constituencies.

Table 3: Summary statistics for the Social Connectedness Analysis: constituency level

	Observations	Mean	Standard deviation	Min	Max
Share of friends ...					
in same ADM1 region	2532	0.11	0.07	0.01	0.51
abroad	2532	0.40	0.17	0.04	0.81
in countries with higher women representation	2532	0.07	0.05	0.00	0.37
in countries with higher women representation: $>$ 1SD	2532	0.04	0.04	0.00	0.34
in countries with higher women representation: $\leq$ 1SD	2532	0.03	0.03	0.00	0.19

[25] The data can be accessed at: https://www.cfr.org/article/womens-power-index

[26] Data on the share of women in parliament is obtained from the Interparliamentary Union. Data from 2019 onwards can be found at https://data.ipu.org/women-ranking/. Data from previous years can be accessed from the IPU archive : http://archive.ipu.org/wmn-e/classif-arc.htm

4 Free Basics, online behaviors and political attitudes

In this section, we begin by assessing whether the availability of Free Basics influences online behaviors, particularly social media usage. Next, we examine how the connectivity shock introduced by Free Basics affected political attitudes, especially towards female politicians, as well as broader gender norms. These shifts, we argue, create a fertile ground for the election of women in national elections, a topic explored further in Section 6.

4.1 The connectivity shock: Free Basics availability and online behaviors

Identification. We leverage the staggered roll-out of Free Basics, driven by partnerships with mobile companies operating in the region, to quantify the extent of the connectivity shock. We combine this measure of Free Basics availability with individual-level data on online behavior and connectivity from rounds 6 to 8 of the Afrobarometer surveys.[27] Our first goal is to estimate the following relationship:

$$Online\ Behavior_{i,t} = \beta\ Free\ Basics_{i,t} + \mathbf{C}_{i,t}.\ \gamma + \eta_{c,t} + \varepsilon_{i,t} \tag{1}$$

where i, t, and c index individuals, years and countries, respectively. $Online\ Behavior_{i,t}$, captures various aspects of online behavior and connectivity for individual i interviewed in year t.[28] Specifically, this variable consists of five indicator variables measuring: the use of (1) social media or (2) internet as a source of information, (3) frequent internet use, (4) mobile phone ownership, and (5) awareness of social media.[29] Our primary regressor of interest is a dummy variable indicating whether the respondent was within the coverage area of a mobile phone operator antenna that provided access to Free Basics at the time of the survey ($Free\ Basics_{i,t}$). The control set includes country-year fixed effects ($\eta_{c,t}$), along with a comprehensive set of individual-level predictors of online behavior ($\mathbf{C}_{i,t}$), such as the respondent's age, gender, primary education completion, rural location, and religious affiliation. We adjust the standard errors to account for spatial and temporal correlation. As the treatment stems from partnerships signed at the country-year level, affecting individuals differently across regions, we employ two-way clustering of standard errors at the country-year and enumeration area levels.[30]

To account for two key potential confounding factors–level of development and the availability of public services–we include the population-density-weighted mean nighttime light, measured at the constituency-year level, as well as a set of enumeration area-level indicator variables for the

[27] Data limitations prevent the use of earlier Afrobarometer rounds, as questions related to social media were only introduced in Afrobarometer 6 (2014-2015), as detailed below.

[28] Throughout this paper (unless otherwise stated), observations in individual-level regressions are weighted using Afrobarometer within-country survey weights. These weights "*adjust the distribution of the sample based on individual selection probabilities (i.e. based on religion, gender, urban-rural distribution, and size of household and enumeration area)*" (source: Afrobarometer codebook).

[29] We use the following questions from the Afrobarometer surveys: "*How often do you get news from the following sources : Social media such as Facebok or Twitter?*" (variable `Q12E` in Afro. 6 and 7, and `Q55E` in Afro. 8); "*How often do you get news from the following sources : Internet?*" (variable `Q12D` in Afro. 6 and 7, and `Q55D` in Afro. 8); "*How often do you use: The Internet?*" (variable `Q92B` in Afro. 6, `Q91B` in Afro. 7, and `Q92I` in Afro. 8); "*Which of these things do you or anyone in your household own: Mobile phone?*" (variable `Q91D` in Afro. 6, `Q89F` in Afro. 7, and `Q92F` in Afro. 8); and "*Have you heard about social media, for example, Facebook, Twitter, and WhatsApp?*" (variable `Q59A` in Afro. 8, not asked in previous survey rounds).

[30] We also demonstrate the robustness of our results when accounting for arbitrary spatial correlation (Conley, 1999; Colella et al., 2023), using thresholds of 50, 100, and 250 km.

presence of public facilities, including post office, police station, health clinic, market stalls, bank or money services, and paid transport options (e.g., bus, taxi, or moped).[31] Crucially, we also incorporate mutually exclusive individual-level indicator variables for 3G/4G and 2G coverage, which equal one if the respondent is covered by 3G/4G and not Free Basics, or by 2G only and not Free Basics, respectively. This approach allows us to capture the net effect of each mobile broadband technology and enables a comparison of the connectivity impact of Free Basics with that of mobile broadband internet in the absence of the zero-rated policy.

Given the inclusion of these controls, β identifies the effect of Free Basics on online behaviors by comparing the adoption of online technologies between individuals who are effectively covered by both mobile broadband internet and Free Basics, and those from the same country and year, with similar demographic and socio-economic characteristics, who live in areas with comparable economic development and access to public facilities, but without Free Basics coverage (i.e., they are covered by either 3G/4G, 2G, or no mobile internet).

Free Basics enhances connectivity. Table 4 reports the baseline estimation results, where we observe positive and significant effects of Free Basics availability on all five outcomes. Estimates presented in column 1 implies that Free Basics availability increases the likelihood of social media use for news by 4.8 percentage points, which corresponds to 18.5% of the sample mean. A similar pattern is observed in columns 2 and 3, where Free Basics coverage significantly increases both internet use as a monthly source of information and general weekly internet use. Interestingly, while 3G/4G availability also has a positive effect on social media and internet usage, its impact is smaller and less precisely estimated, producing roughly half the effect of Free Basics. Overall, without Free Basics, 2G technology does not support adequate social media use, likely due to its limited data capacity. However, 2G is positively correlated with mobile phone ownership and awareness of social media platforms, similar to the associations observed for 3G/4G and Free Basics.

As described above, coverage measures for Free Basics, 3G/4G, and 2G are constructed using buffers around the GPS coordinates of cell towers. Our choice of buffer sizes aligns with the methodology used in the Bartholomew Collins (2021) dataset, specifically 12 km for 2G towers and 4 km for 3G/4G towers. To test the robustness of our results, we compute coverage measures using larger buffer sizes. This exercise assesses the robustness of our findings against potential measurement errors from two sources: the GPS coordinates of OpenCelliD mobile phone towers and those of Afrobarometer enumeration areas. Furthermore, even in the absence of misgeolocation, this approach helps assess the robustness of our estimates with regard to the potential for individuals to commute and access social media during their travels. Results reported in Table B1 support our initial findings: expanding the buffers by 2 km (Panel A) or 4 km (Panel B) yields very similar results. As anticipated, increasing the buffer size to 8 km–representing a 200% increase for 3G/4G buffers and a 66.7% increase for 2G buffers–results in smaller estimated effects (Panel C).

Finally, the significance of our main effect remains robust under alternative assumptions about the variance-covariance matrix. Given the spatial nature of the data, we account for spatial corre-

[31] Enumeration area is the primary sampling unit in Afrobarometer surveys. Note that we use enumeration area GPS coordinates to define individual-level measures of treatment/coverage.

lation in the error term using thresholds of 50, 100, and 250 km, as reported in Table B2. Overall, these results convey that Free Basics constituted a significant and sizeable connectivity shock.

Table 4: Free Basics fuels connectivity

Dependent variable	Gets news from social media	Gets news from internet	Uses internet frequently	Owns mobile phone	Heard about social media
	(1)	(2)	(3)	(4)	(5)
Free Basics	0.048***	0.046***	0.039***	0.033***	0.057**
	(0.011)	(0.012)	(0.011)	(0.012)	(0.020)
3G/4G	0.021	0.024*	0.020	0.022*	0.078**
	(0.017)	(0.013)	(0.017)	(0.012)	(0.035)
2G	0.000	0.003	-0.007	0.021**	0.043*
	(0.007)	(0.007)	(0.008)	(0.010)	(0.021)
Individual controls	✓	✓	✓	✓	✓
Constituency controls	✓	✓	✓	✓	✓
Country-year fixed effects	✓	✓	✓	✓	✓
Observations	61675	61675	61675	61675	19177
Mean dep. var.	0.260	0.245	0.244	0.773	0.698
R^2	0.274	0.251	0.257	0.260	0.237
(*p-val.*) Free Basics = 3G/4G	0.193	0.245	0.316	0.583	0.623
(*p-val.*) Free Basics = 2G	0.000	0.001	0.001	0.471	0.559

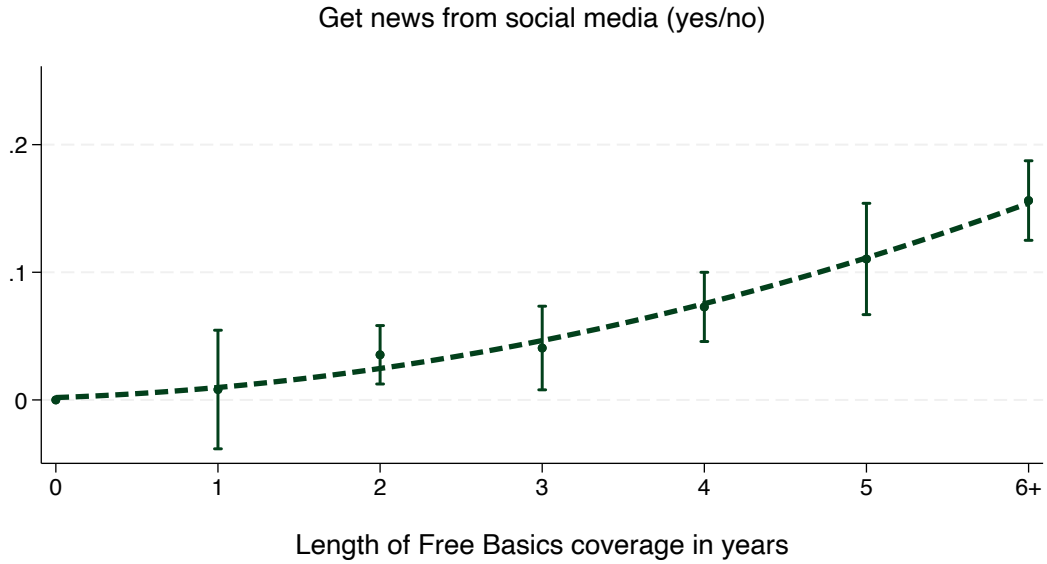
Notes: OLS estimations. *** p<0.01, ** p<0.05, * p<0.10. Two-way clustered standard errors at country-year level and enumeration area level in parentheses. The unit of observation is an individual surveyed in a given year between 2014 and 2021 (Afrobarometer data, rounds 6 to 8). Observations are weighted using Afrobarometers within country survey weights. "Get news from Social Media" = 1 if an individual gets news from social media at least a few times a month. "Get news from Internet" = 1 if an individual gets news from internet at least a few times a month. "Frequent use of Internet" = 1 if an individual uses internet at least a few times a week. "Owns mobile phone" = 1 if an individual personally owns a mobile phone. "Heard about social media" = 1 if an individual has heard about social media, for example, Facebook, Twitter, and WhatsApp. This last question is asked in Afrobarometer 8 (2019-2021) only. "Free Basics" = 1 if an individual is covered by a mobile phone operator providing access to Free Basics. "3G/4G" = 1 if an individual is covered by a mobile phone operator providing access to 3G/4G (without Free Basics). "2G" = 1 if an individual is covered by a mobile phone operator providing access to 2G (without Free Basics). We report the p-values of t-tests of equality of Free Basics and 3G/4G coefficients as well as Free Basics and 2G coefficients in the penultimate and the last row of the table, respectively. Individual controls include age, gender of the respondent, primary education, religion dummies, a dummy indicating rural location, as well as several enumaration area level dummy variables indicating the presence of facilities (post office, police station, health clinic, market stalls, bank or money services, and any kind of paid transport, such as a bus, taxi, moped, or other form). Constituency controls consist of the log transformation (i.e. log 1+x) of the constituency-year-level population-density-weighted mean nighttime light. Estimations also include country-year fixed effects.

Length of exposure to Free Basics. In the second step, we investigate the dynamic effects of the Free Basics connectivity shock. To do this, we estimate a version of Equation 1 in which we interact our Free Basics coverage variable, $FreeBasics_{i,t}$, as well as the 3G/4G and 2G variables, with an array of exposure-length dummies.[32] The estimated coefficients are reported in Figure 1. We observe a clear linear dynamic over the duration of exposure, with a significant increase in social media consumption as early as one year after exposure to Free Basics. Notably, while only

[32]Length of exposure is measured in years since the first coverage of a respondent's place of residence by Free Basics, 3G/4G, or 2G at the time of the survey.

12.6% of individuals not covered by any mobile broadband technology report accessing news via social media on a monthly basis, we estimate a substantial connectivity shock of 4.1 percentage points (or +33% relative to the mean of uncovered individuals) after just three years of exposure. Furthermore, according to our estimates, social media usage more than doubled (+15.6 percentage points or +124% relative to the mean of uncovered individuals) after six years of exposure. These results suggest that Free Basics constituted a significant connectivity shock right from its launch, one that not only persisted but also strengthened over time.

Figure 1: Effects of Free Basics availability on social media use, over years of exposure



Notes: The figure presents the results of the OLS estimates for the effect of Free Basics on the likelihood of getting new from social media.

Compliers. Finally, we investigate whether certain segments of the population were more responsive to the connectivity shock. We analyze differences in responses to Free Basics availability, based on individual characteristics such as education, age, urban versus rural residence, and religion. Additionally, we explore variations based on local development, proxied by the population-density-weighted mean nighttime light in a constituency.[33] To assess these differences, we estimate Equation 1 on subsamples split along these dimensions.[34]

The estimates, reported in Table 5, suggest that all segments of the population responded positively to the connectivity shock. However, we do observe some heterogeneities. First, the effect of Free Basics is considerably larger in relative terms for individuals who did not complete primary education. Specifically, the probability of using social media increased by 33% for those without primary education, compared to a 14% increase for those with higher education. Second, we find that women were more responsive to Free Basics than men, with connectivity shocks of +21% for women compared to +14% for men. Third, the effect was stronger in rural areas

[33]We compute this measure by multiplying nighttime light data at a 30x30 arc-second resolution (approximately 1x1 km at the equator) (Li et al., 2020) with the corresponding population density at the same resolution (Tatem, 2017), and averaging within constituency borders. We log-transform this variable as follows: "$log(1+x)$".

[34]Note that Afrobarometer sampling weights are not applied when splitting the sample.

compared to urban areas, with increases of +24% and +11%, respectively. This rural-urban divide is less pronounced when comparing individuals in constituencies with high versus low levels of nighttime light (i.e., above or below the second tertile of the sample). Interestingly, we find no significant age-related heterogeneity, with individuals below and above the median age of 34 responding similarly to the connectivity shock (+14% and +17% in relative terms, respectively). We show in Table B3 that the same holds true for religion. Individuals from all major religious groups in SSA responded similarly to the introduction of Free Basics, with increases in social media consumption ranging from +14% for Catholics to +17% for non-Catholic Christians.[35]

Overall, these results suggest that Free Basics successfully connected segments of the population that were less likely to use social media, notably due to data affordability issues–specifically non-educated, female, and rural individuals–thereby also affecting the composition of social media users in the treated areas.

4.2 Free Basics, social media use and political attitudes

One key way that access to Free Basics may impact the electoral prospects of women is by shifting attitudes toward female leaders and increasing demand for democratic renewal, although little is known about how social media users in Sub-Saharan Africa (SSA) perceive female leaders. To empirically investigate this hypothesis, we analyze individual responses to questions from the Afrobarometer survey, which capture political attitudes–particularly toward women leaders–as well as broader dimensions such as the role of social media and trust in political institutions.

Empirical strategy. We estimate this relationship using a version of Equation 1:

$$Political\ Attitude_{i,t} = \beta\, X_{i,t} + \mathbf{C}_{i,t}.\,\gamma + \eta_{c,t} + \varepsilon_{i,t} \tag{2}$$

where the dependent variable is now an indicator for whether respondents: (1) strongly agree that women should have the same chances of being elected to political office as men; (2) agree that social media makes people more informed about current events; (3) agree that social media helps people have an impact on political processes; (4) believe that most MPs are corrupt; (5) trust parliament; or (6) report having voted in the last national election.[36]

[35]The effect size is approximately +20% for agnostic/atheist individuals, though it is less precisely estimated due to the smaller sample size.

[36]Specifically, we use the following questions: "*Which of the following statements is closest to your view? Choose Statement 1 or Statement 2. Statement 1: Men make better political leaders than women, and should be elected rather than women. Statement 2: Women should have the same chance of being elected to political office as men.*" (variable `Q18` in Afro. 6, and `Q16` in Afro. 7, not asked in Afro. 8); "*Regardless of whether you personally use social media, please tell me whether you agree or disagree that social media: Makes people more informed about current events?*" (variable `Q59B` in Afro. 8, not asked in previous survey rounds); "*Regardless of whether you personally use social media, please tell me whether you agree or disagree that social media: Helps people have more impact on political processes?*" (variable `Q59D` in Afro. 8, not asked in previous survey rounds); "*How many of the following people do you think are involved in corruption, or haven't you heard enough about them to say: Members of Parliament?*" (variable `Q53B` in Afro. 6, `Q44B` in Afro. 7, and `Q42B` in Afro. 8); "*How much do you trust each of the following, or haven't you heard enough about them to say: Parliament?*" (variable `Q52B` in Afro. 6, `Q43B` in Afro. 7, and `Q41B` in Afro. 8); "*Understanding that some people were unable to vote in the most recent national election in [20xx], which of the following statements is true for you?* (dummy = 1 if answer is "*You voted in the elections*")" (variable `Q21` in Afro. 6, `Q22` in Afro. 7, and `Q13` in Afro. 8).

Table 5: Free Basics fuels connectivity - Compliers

Dependent variable	Gets news from social media									
	Education		Age		Gender		Residence		Nightlight	
	None	Primary	$\leq$ med.	$>$ med.	Male	Female	Urban	Rural	$> 2^{nd}$ ter.	$\leq 2^{nd}$ ter.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Free Basics	0.020**	0.051***	0.023**	0.061***	0.041***	0.046***	0.049***	0.035***	0.079***	0.035***
	(0.009)	(0.012)	(0.010)	(0.014)	(0.010)	(0.013)	(0.012)	(0.010)	(0.023)	(0.009)
3G/4G	0.001	0.032*	-0.002	0.033**	0.022	0.008	0.011	0.052**	0.048**	0.056***
	(0.012)	(0.018)	(0.020)	(0.016)	(0.017)	(0.017)	(0.018)	(0.020)	(0.023)	(0.016)
2G	-0.006	0.015	-0.014**	0.018	0.010	-0.008	0.002	0.019*	0.048*	0.016**
	(0.006)	(0.010)	(0.006)	(0.011)	(0.009)	(0.010)	(0.014)	(0.010)	(0.025)	(0.007)
Individual controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Constituency controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Country-year fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	20286	41389	30175	31500	30909	30766	24533	37142	20466	41209
Mean dep. var.	0.061	0.357	0.162	0.354	0.302	0.217	0.434	0.145	0.435	0.173
R^2	0.130	0.238	0.221	0.279	0.291	0.252	0.240	0.181	0.246	0.218
(*p-val.*) Free Basics = 3G/4G	0.246	0.381	0.272	0.175	0.305	0.103	0.063	0.441	0.200	0.243
(*p-val.*) Free Basics = 2G	0.004	0.013	0.002	0.010	0.014	0.002	0.003	0.234	0.232	0.057

Notes: OLS estimations. *** p<0.01, ** p<0.05, * p<0.10. Two-way clustered standard errors at country-year level and enumeration area level in parentheses. The unit of observation is an individual surveyed in a given year between 2014 and 2021 (Afrobarometer data, rounds 6 to 8). Observations are weighted using Afrobarometers within country survey weights. "Social Media" = 1 if an individual gets news from social media at least a few times a month. "Free Basics" = 1 if an individual is covered by a mobile phone operator providing access to Free Basics. "3G/4G" = 1 if an individual is covered by a mobile phone operator providing access to 3G/4G (without Free Basics). "2G" = 1 if an individual is covered by a mobile phone operator providing access to 2G (without Free Basics). We report the p-values of t-tests of equality of Free Basics and 3G/4G coefficients as well as Free Basics and 2G coefficients in the penultimate and the last row of the table, respectively. Individual and constituency controls, as well as fixed effects are defined in Table 4. In this table, we regress our baseline specification (i.e. column 1 in Table 4) on several subsamples: individuals with no primary education in column (1); individuals with at least primary education in column (2); individuals aged below (or equal to) the sample median (i.e. 34 y.o.) in column (3); individuals aged above the sample median (i.e. 34 y.o.) in column (4); male individuals in column (5); female individuals in column (6); individuals living in an urban area in column (7); individuals living in a rural area in column (8); individuals living in a constituency with a population-density-weighted mean nighttime light above the sample second tertile in column (9); and individuals living in a constituency with a population-density-weighted mean nighttime light below (or equal to) the sample second tertile in column (10).

Our main explanatory variable of interest, $X_{i,t}$, is either $SocialMedia_{i,t}$, a dummy variable indicating whether a respondent uses social media as a source of information,[37] or $FreeBasics_{i,t}$, a dummy variable indicating Free Basics availability at the individual level in the year of the survey. All regressions include the same set of controls as presented in subsection 4.1, including individual socio-demographic characteristics, the level of economic development in the constituency, local availability of public services, and country-year fixed effects, which capture key drivers of connectivity and political trends at the macro level. While attitudes toward MPs and voting behavior in the last election can be tracked over the Free Basics roll-out period (2014-2021), attitudes toward female leaders can only be measured in the short run (2014-2018).[38] In contrast, attitudes toward social media's impact on information and political processes are captured only in the latest Afrobarometer wave (2019-2021).

Effects on political attitudes. Panel A of Table 6 presents estimates of the effect of social media use on political attitudes. Although individuals self-select into social media use when it is available, limiting our ability to identify causal effects, we present and discuss these estimates because they highlight key characteristics of the social media user population in the context of SSA. These insights help explain how the availability of Free Basics could lead to shifts in the political prospects of female politicians.

We find a strong, significant, and robust positive association between social media use and more favorable attitudes toward women in politics. Specifically, the estimate in column (1) shows that, conditional on an individual's characteristics (including notably age, education, gender, and economic development in the constituency), using social media as a source of information is still associated with a 5.1 percentage point increase in favorable attitudes toward female political leadership (+10% of the sample mean). Exploring more recent data from Afrobarometer 8, we find that users significantly attribute a role to social media, both as a means of informing people about current events (column (2)) and as a tool that helps individuals impact political processes (column (3)). Further analysis of attitudes toward political representatives and voter turnout, as shown in column 6, reveals that social media users are significantly more likely to express negative views about corruption and the performance of MPs, exhibit lower trust in parliament, and demonstrate significantly lower voter turnout.

The estimation of the effect of Free Basics availability on the same set of dependent variables yields qualitatively similar results, albeit with smaller magnitudes (Panel B of Table 6). Notably, while $FreeBasics_{i,t}$ is an "intention to treat" variable, $SocialMedia_{i,t}$ measures actual usage, which may explain the larger effect observed for the latter. The difference in effect sizes can also be attributed to the endogeneity of $SocialMedia_{i,t}$, despite the inclusion of a comprehensive set of controls. Nonetheless, the results in column (1) show that, even in the short term, Free Basics significantly improved attitudes toward women in politics (+5% of the sample mean), whereas standard 2G and 3G/4G coverage had no significant impact.

Heterogeneities. As Free Basics connects a broader portion of the population, it is important to consider whether the average effect on political attitudes is driven by specific segments of so-

[37] This variable is the dependent variable in column 1 of Table 4.

[38] This question was available only in waves 6 and 7, so individuals were surveyed between 2014 and 2018, while the Free Basics roll-out occurred between 2014 and 2020 in our sample.

ciety. Social media consumption may shift attitudes toward women in politics through different mechanisms. On one hand, social media can expose individuals to diverse opinions, potentially broadening their perspectives. On the other hand, it may create "echo chambers," where individuals are insulated from differing views.[39] Moreover, variations in pre-existing attitudes toward women in politics across demographic groups add complexity when predicting heterogeneous effects of social media consumption.

We explore these potential differences by splitting our sample based on demographic and socio-economic characteristics, as reported in Table C1.[40] While the analysis of the social media effect in Panel A is influenced by compositional factors, we uncover significant heterogeneities in the impact of Free Basics in Panel B.[41] Specifically, we find that the population segments most responsive to Free Basics were those with generally less favorable attitudes toward women in politics: individuals without primary education, older individuals, men, rural residents, and those living in less developed constituencies (as proxied by nighttime light).[42]

Overall, these results suggest that Free Basics fostered more favorable attitudes toward women in politics among large, and potentially influential, segments of the population.

4.3 Free Basics, social media use and gender norms

Another pertinent question is whether Free Basics has triggered broader societal changes, particularly in attitudes toward gender norms. While Afrobarometer surveys offer valuable insights into respondents' views on gender norms, these questions were asked only in Afrobarometer 7, limiting us to a cross-sectional analysis. Additionally, since Afrobarometer 7 was conducted in 2016-2018 and Free Basics partnerships were rolled out between 2014 and 2020 in our sample, we can only capture short-term effects. This is a limitation, given the well-documented persistence of gender norms.[43] Nevertheless, identifying associations between social media use and attitudes toward gender norms is a valuable exercise that sheds light on how expanding internet access can influence women's political prospects. To explore this, we estimate Equation 2 on gender norms outcomes and uncover several interesting findings.[44]

Our results, reported in Panel A of Table 7, indicate that social media users in SSA are: less likely to agree that men should have more rights to a job than women when jobs are scarce (column (1)); more likely to agree that women should have the same rights as men to own and inherit land (column (2)); less likely to agree that women should be primarily responsible for household and childcare duties (column (3)); and more likely, though imprecisely estimated, to oppose the justification for men beating their wives (column (4)).[45] These findings suggest that

[39] See Zhuravskaya et al. (2020) and Campante et al. (2023) for reviews on the effects of social media on political attitudes.

[40] Note that we no longer use Afrobarometer sampling weights when splitting our sample.

[41] As mentioned earlier, the estimated effect of social media is not strictly causal, but offers valuable insights into the political attitudes of social media users. However, the issue of reverse causality and self-selection is amplified when examining specific sub-samples.

[42] In line with our analysis of compliers in subsection 4.1, we find no evidence of heterogeneity along religious lines, as reported in Table C2.

[43] For examples of the persistence of cultural norms, see Loper (2022), which explores the persistence of inheritance rules and associated gender norms in Sub-Saharan Africa, and Bargain et al. (2022), which examines the role of traditional norms in shaping long-term intra-household dynamics.

[44] In this analysis of gender norms, we systematically control for the gender of the interviewer to account for potential biases in responses.

[45] The specific questions used were: "*When jobs are scarce, men should have more rights to a job than women?*"

Table 6: Free Basics, social media consumption and political attitudes

Dependent variable	Equal chance for women in politics (1)	Social media informs people (2)	Social media impacts politics (3)	MPs are corrupt (4)	Trust in the parliament (5)	Voted in the last national election (6)
	Panel A: Gets news from social media					
Social media	0.051***	0.315***	0.274***	0.028***	-0.040***	-0.021**
	(0.010)	(0.019)	(0.021)	(0.009)	(0.008)	(0.008)
R^2	0.089	0.302	0.213	0.086	0.112	0.116
	Panel B: Free Basics, 3G/4G and 2G					
Free Basics	0.022**	0.051**	0.042**	0.034**	-0.021**	-0.012
	(0.011)	(0.018)	(0.017)	(0.014)	(0.009)	(0.010)
3G/4G	0.018	0.091***	0.077**	0.031**	-0.032**	-0.024
	(0.013)	(0.030)	(0.034)	(0.014)	(0.015)	(0.016)
2G	0.017	0.041*	0.028	0.028***	-0.024**	-0.002
	(0.011)	(0.023)	(0.022)	(0.010)	(0.011)	(0.012)
R^2	0.088	0.232	0.164	0.087	0.111	0.116
(*p-val.*) Free Basics = 3G/4G	0.812	0.282	0.372	0.871	0.486	0.556
(*p-val.*) Free Basics = 2G	0.725	0.675	0.581	0.755	0.819	0.515
All panels						
Individual controls	✓	✓	✓	✓	✓	✓
Constituency controls	✓	✓	✓	✓	✓	✓
Country-year fixed effects	✓	✓	✓	✓	✓	✓
Observations	41567	18528	18528	54911	54911	54911
Mean dep. var.	0.500	0.630	0.546	0.403	0.237	0.729

Notes: OLS estimations. *** p<0.01, ** p<0.05, * p<0.10. Two-way clustered standard errors at country-year level and enumeration area level in parentheses. The unit of observation is an individual surveyed in a given year between 2014 and 2021 (Afro. 6 to 8). Observations are weighted using Afrobarometers within country survey weights. "Equal chance for women in politics" = 1 if strongly agrees that women should have the same chance of being elected to political office as men (Afro. 6 and 7). "Social media informs people" = 1 if agrees that social media makes people more informed about current events (Afro. 8). "Social media impacts politics" = 1 if agrees that social media helps people have more impact on political processess (Afro. 8). "MPs are corrupt" = 1 if thinks most of MPs are corrupt. "Trust in the parliament" = 1 if trusts the parliament. "Voted in the last national election" = 1 if voted in the last national election. Main regressor in Panel A: "Social media" = 1 if an individual gets news from social media at least a few times a month. Main regressors in Panel B: "Free Basics", "3G/4G', "2G", defined in Table 4. Individual and constituency controls, as well as fixed effects are also defined in Table 4.

social media users tend to hold more progressive views on gender norms, indicating that such platforms could be powerful tools for driving societal change.

For transparency, we also report the results from estimating the effect of Free Basics (rather than social media use) on the same outcomes in Panel B. As expected, our data only allow us to detect small, non-significant short-term effects, although the signs are in the relevant direction. We leave the investigation of potential long-term effects to future research.

(`Q38D` in Afro. 7); "*Women should have the same rights as men to own and inherit land?*" (`Q38E` in Afro. 7); "*In general, is it better for a family if a woman has the main responsibility for taking care of the home and children rather than a man?*" (`Q38F` in Afro. 7); "*Can it ever be justified for a man to beat his wife?*" (`Q78B` in Afro. 7).

Table 7: Free Basics, social media consumption and gender norms

Dependent variable	Men should be prioritized in labor market (1)	Equal land rights for women (2)	Women should take care of HH (3)	Beating wife never justified (4)
	Panel A: Gets news from social media			
Social media	-0.086***	0.028***	-0.029**	0.019
	(0.013)	(0.009)	(0.012)	(0.015)
R^2	0.079	0.078	0.053	0.197
	Panel B: Free Basics, 3G/4G and 2G			
Free Basics	-0.002	0.006	-0.017	0.025
	(0.017)	(0.016)	(0.014)	(0.021)
3G/4G	0.003	0.028	-0.018	0.021
	(0.026)	(0.017)	(0.044)	(0.016)
2G	-0.012	0.039**	-0.011	0.019
	(0.020)	(0.014)	(0.023)	(0.015)
R^2	0.075	0.078	0.052	0.197
(*p-val.*) Free Basics = 3G/4G	0.885	0.110	0.984	0.890
(*p-val.*) Free Basics = 2G	0.703	0.126	0.837	0.821
All panels				
Individual controls	✓	✓	✓	✓
Constituency controls	✓	✓	✓	✓
Country-year fixed effects	✓	✓	✓	✓
Observations	16323	16323	16323	16323
Mean dep. var.	0.415	0.791	0.522	0.775

Notes: OLS estimations. *** p<0.01, ** p<0.05, * p<0.10. Two-way clustered standard errors at country-year level and enumeration area level in parentheses. The unit of observation is an individual surveyed in the Afrobarometer 7 (2016-2018, cross-sectional data). Observations are weighted using Afrobarometers within country survey weights. "Men should be prioritized on the labor market": dummy = 1 if agrees that men should have more right to a job than women when jobs are scarce. "Equal land rights for women": dummy = 1 if agrees that women should have the same rights as men to own and inherit land. "Women should take care of HH": dummy = 1 if agrees that it is better for a familly if a woman has the main responsibility for taking care of the home and children rather than a man. "Beating wife never justified": dummy = 1 if never finds justified for a man to beat his wife. The main regressor of interest in Panel A is"Social media", defined in Table 6. The main regressors of interest in Panel B are"Free Basics", "3G/4G', "2G", defined in Table 4. Individual and constituency controls, as well as fixed effects are also defined in Table 4. Note that for this specific analysis, we also control for the gender of interviewer.

5 Empirical Strategy

5.1 Facebook's Free Basics and Female MP Elections: Empirical Strategy

Does the connectivity boost, driven by Facebook through Free Basics, shape female representation in national parliaments within African developing democracies? To address this question, we compare electoral outcomes before and after the introduction of Free Basics in constituencies where it is available, to those in similar constituencies without Free Basics. A naive correlation

may suffer from severe endogeneity concerns, as constituencies gaining access to Free Basics could differ systematically from those without it in ways that are related to electoral politics. To mitigate this issue, we leverage the staggered rollout of Free Basics across countries and constituencies, and exploit two crucial variations: that of the timing of partnerships between Free Basics and individual mobile operators, and spatial variation in local coverage by each partner mobile operator. Given that our difference-in-differences framework involves staggered treatment adoption, two-way fixed-effects (TWFE) estimators may yield inconsistent estimates in the presence of heterogeneous dynamic treatment effects (Borusyak et al., 2024; Callaway and Sant'Anna, 2021; de Chaisemartin and D'Haultfoeuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2021).

To produce causal estimates, we employ the local projection approach to difference-in-differences (LP-DiD) developed by Dube et al. (2023). LP-DiD leverages local projections to estimate dynamic effects while incorporating a flexible clean control condition, in the spirit of the stacked difference-in-differences literature (Cengiz et al., 2019). This regression-based formulation allows for flexible adaptation to our unbalanced panel of constituencies. This flexibility is critical, as we observe electoral outcomes only in election years, and parliamentary elections are held in different years across countries. Moreover, LP-DiD enables the introduction of a rich set of controls and facilitates the empirical investigation of heterogeneous effects.

We estimate the effect of Facebook's Free Basics on the election outcomes, candidacy, and vote share of female politicians using the following equation:

$$Y_{j,t+k} - Y_{j,t-1} = \beta^k \, \Delta \, FreeBasics_{j,t} + \mathbf{X}_{j,t} \, . \, \delta^{\mathbf{k}} + \eta^k_{c,t} + \varepsilon^k_{j,t} \tag{3}$$

where $Y_{j,t+k} - Y_{j,t-1}$ represents the change in election outcomes, candidacy, or vote share of female politicians in constituency j of country c between two elections: election t+k and the reference election t-1. Our panel of races allows for estimating this equation for up to two elections after the introduction of Free Basics, hence $k \in \{0, 1\}$.

Δ $FreeBasics_{j,t}$ is an indicator variable denoting whether Free Basics became available in constituency j between the reference election t-1 and election t. Thus, we estimate the effect of a change in Free Basics status on the change in outcomes between the first election with Free Basics ($k = 0$) and the reference election, and separately, the second election with Free Basics ($k = 1$) and the reference election. All regressions include $\eta_{c,t}$, a set of country-election fixed effects, and $\mathbf{X}_{j,t}$, a vector of controls observed at the race level (i.e.constituency $\times$ election-year level). A crucial aspect of LP-DiD is the exclusion of unclean observations from the regression sample– those whose outcome dynamics may still be influenced by a prior change in treatment status. As a result, each regression includes only newly treated constituencies (Δ $FreeBasics_{j,t} = 1$) and the clean control (i.e. satisfying: $FreeBasics_{j,t+k} = 0$). We estimate Equation 3 using OLS and correct the standard errors for two-way clustering, accounting for the two key levels of treatment: election level (i.e. country $\times$ year) and constituency level.

The LP-DiD estimation framework presented in Equation 3 addresses several concerns that could otherwise compromise the causal interpretation of our results. First, the differencing process accounts for both observed and unobserved constituency characteristics, alleviating concerns that slow-moving factors–such as cultural norms, ethnic and religious composition, or long-term disparities in urbanization and economic development–might simultaneously influence the avail-

ability of Free Basics and the electoral prospects of female politicians. A within-constituency analysis of the staggered roll-out of Free Basics is particularly relevant in this context. Notably, the decomposition of the variance of the dummy variable indicating whether a female MP is elected reveals that within-constituency variation accounts for 53% of the total variance. Additionally, $\mathbf{X}_{j,t}$ includes time-varying controls to account for differences in constituencies' short-term dynamics, specifically log population density and average nighttime light intensity, weighted by cell-level population density.

The primary identification assumption underlying our analysis is that the timing of Free Basics' introduction is exogenous to local political dynamics. This assumption is supported by evidence that Free Basics partnerships are generally negotiated at the national or regional level with large telecommunications companies, such as Airtel, which operate across multiple countries.

To validate the parallel trends assumption, we also estimate a placebo version of Equation 3 for two earlier elections: t-2 and t-3. In this case, we estimate the potential effect of a future introduction of Free Basics on the election preceding the reference year (t-2) and the election before (t-3). These placebo estimations test whether a future introduction of Free Basics has any observable effect on outcomes in elections preceding the reference year (i.e in t-2 and t-3). The placebo estimations employ the same structure of fixed effects and controls as the main analysis. In the two specifications, the sample includes the treated constituencies (i.e. satisfying: $\Delta\, FreeBasics_{j,t} = 1$) for which we observe an election in the relative year of interest (respectively, elections t-2 and t-3), and the clean control group, defined as the constituencies that are not yet treated in year t (i.e. satisfying: $FreeBasics_{j,t} = 0$).

6 Results

This section presents our main findings on the impact of Facebook's Free Basics availability on parliamentary election outcomes for female candidates, analyzing 8,814 races conducted between 2001 and 2022 across 17 sub-Saharan African countries. We start by examining the influence of Free Basics on the election of female MPs. This analysis is then complemented by an exploration of the roles played by electoral competition and candidate selection. Additionally, we delve into the pivotal role of political parties in shaping these outcomes.

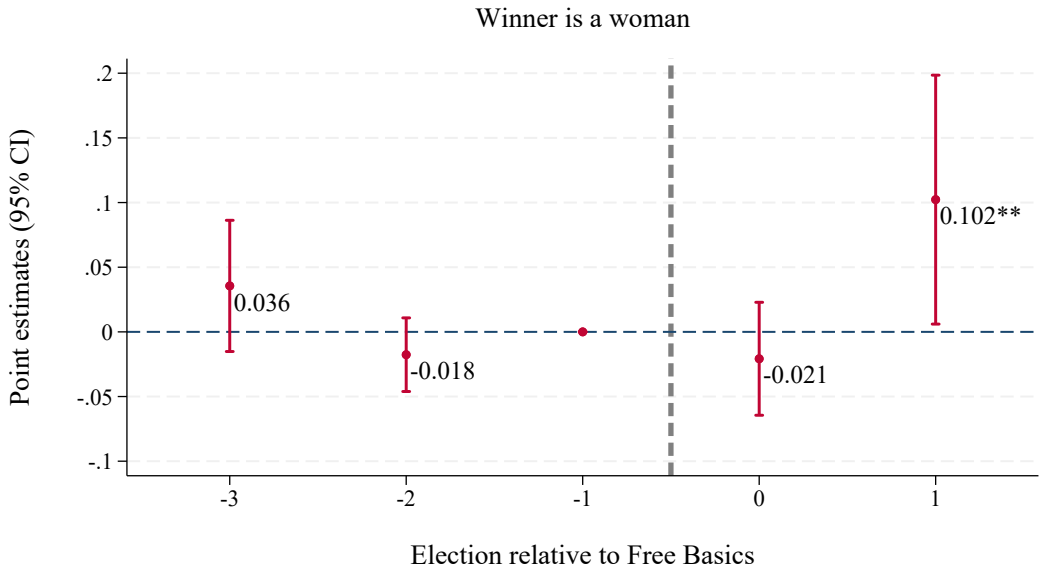
6.1 Free Basics and the election of female MPs

Baseline results. Figure 2 displays the estimates from Equation 3, with the dependent variable indicating whether election winner is a woman. Appendix Table D1 provides detailed features of each regression included in the analysis. All regressions incorporate the full set of controls described in section 5.1. This rich set of covariates allows us to isolate the effect of the connectivity shock induced by Facebook's Free Basics by comparing treated constituencies to similar constituencies with comparable levels of urbanization and local economic development.

We highlight three key findings. First, we observe a significant increase in the likelihood of electing a female MP in the second election following the introduction of Free Basics. The corresponding point estimate is both sizeable and statistically significant at the 5 percent level. Specifically, in this second election, constituencies exposed to Free Basics experience a 10.2 percentage point higher likelihood of electing a female MP, equivalent to one-third of a standard

deviation. Notably, this effect emerges only after an average of six years of exposure to Free Basics, with a range of five to eight years.[46] Second, and in contrast, Free Basics does not produce a significant effect on the first election following its introduction. The point estimate is -0.021, with a p-value of 0.36, indicating that the connectivity shock introduced by Free Basics does not immediately influence the electoral prospects of female candidates. Across treated constituencies, the first election after Free Basics' introduction occurs, on average, 2.7 years later, though this timing varies significantly–from less than one year to up to five years. Third, The LP-DiD framework allows us to test for the absence of diverging trends between treated and control constituencies by examining two placebo elections–those held two and three electoral cycles before Free Basics was introduced. The estimates for these placebo elections are close to zero, providing strong evidence for the parallel trends assumption and indicating no pre-existing differences in trends between treated and control groups.

Figure 2: Effects of Free Basics availability on female MP election



Notes: This figure presents the results of the LP-DiD estimates for the effect of Free Basics on the likelihood of electing a female MP (see Equation 3). The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses. All specifications include country × election-year fixed effects, and the following controls: logarithm of population density and nighttime light. *** p<0.01, ** p<0.05, * p<0.1.

The estimated impact of Free Basics on the election of female MPs is substantial in the second election following the implementation of this connectivity intervention. To better gauge the magnitude of this effect, one needs to take into account the fact that electing a female MP is infrequent in sub-Saharan Africa.

In the spirit of the persuasion rate commonly computed in the media literature (DellaVigna and Kaplan, 2007; DellaVigna and Gentzkow, 2010), we answer the following question: what is the share of constituencies covered by Free Basics that was *convinced* to elect a woman by the use of this digital technology? This calls for relating our point estimate (.102) to the share of constituencies "at risk of treatment", that is (i) the differential exposure to Free Basics in the

[46] In the regression presented in Figure 2 for the election +1 (the second election with Free Basics, with more details in column 4 of Appendix Table D1), a total of 4,640 races are exploited. This is due to the fact that the outcome is expressed in difference.

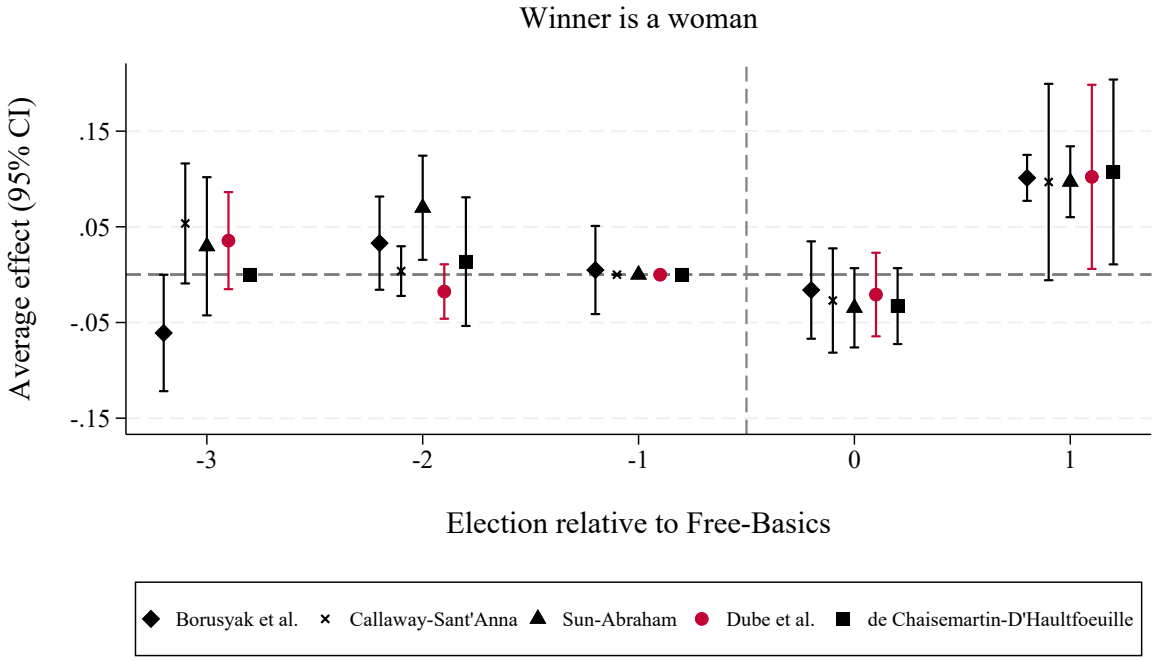
treated and control constituencies (we assume no spillover, and an exposure effect of 1.24 in baseline), weighted by the ratio between turnout (.657 in-sample) and the share of constituencies "left to be convinced". We approximate the latter with the share of constituencies electing a male MP in the clean control group of the regression presented (89.5%). We obtain a persuasion rate of $(.102/1.24) \times (0.657/.895) = 5.97\%$. This order of magnitude is in the usual range of persuasion rates measured in previous studies examining the impact of communication technologies on political attitudes and vote.

Composition effects and alternative estimators. One potential concern is that, as with any difference-in-differences analysis, composition effects might influence the observed differential effect between the first and subsequent elections following the introduction of Free Basics. To address this issue, we present the estimates in Panel B of Appendix Table F1, where we fix the set of countries across all four regressions. The results remain qualitatively consistent: we observe no differential trend in placebo elections between constituencies that will later adopt Free Basics and their unaffected counterparts. Moreover, we find that Free Basics increases the likelihood of a female MP being elected, but this effect emerges only in the second election after its introduction.

Another potential concern is that our findings may be influenced by the specific difference-in-differences estimator used (Dube et al., 2023) among the various methods recently proposed in the literature. Figure 3 addresses this concern by presenting estimates and 95% confidence intervals derived from alternative event-study estimators (Borusyak et al., 2024; Callaway and Sant'Anna, 2021; Sun and Abraham, 2021; de Chaisemartin and D'Haultfoeuille, 2020). The results are consistent across estimators and align with the parallel trends assumption. Regardless of the estimator employed, the connectivity shock initiated by Facebook is consistently associated with an increased probability of female MP elections in the second election following the introduction of Free Basics. Furthermore, the magnitude of the effect is remarkably similar across the different estimators, with point estimates ranging from 0.097 to 0.107.

Local internet infrastructure. Mechanically, a constituency can only be covered by Free Basics if at least one mobile operator is active locally. This raises two important questions. First, since Free Basics partnerships are established with mobile operators already serving the targeted country, it is possible that the observed effects reflect the broader impact of longstanding mobile network coverage and prolonged access to mobile internet, rather than the specific contribution of Free Basics. This distinction is particularly relevant, as the seminal work of Guriev et al. (2021) demonstrate significant effects of 3G exposure on political attitudes worlwide, although they do not specifically examine its impact on female political representation. To address this concern, we analyze the effects of the staggered roll-out of 3G infrastructure instead of Free Basics. The results of this analysis, presented in Appendix Figure D1, reveal no positive effect of 3G availability on the election of female MPs, even in constituencies exposed to 3G for a second or third election. In fact, the effect of 3G availability is negative in the second and third elections, though the estimates are imprecise. We interpret this absence of a positive effect of mobile internet, combined with our evidence of a stronger connectivity shock generated by Free Basics (discussed in section 4), as further evidence that in Sub-Saharan Africa, where the cost of internet data is prohibitively high, granting free access to Facebook plays a pivotal role in shaping political outcomes.

Figure 3: Effects of Free Basics availability on female MP election: alternative difference-in-differences strategies



Notes: This figure presents the event-study plots obtained from five different estimators: Borusyak et al. (2024) (with diamond markers), Callaway and Sant'Anna (2021) (with cross markers), Sun and Abraham (2021) (with triangle markers), Dube et al. (2023) (in red and with circle markers), and de Chaisemartin and D'Haultfoeuille (2020) (with square markers). The dependent variable is a dummy indicating whether the winner of the election is a woman. The time variable is the election year and the treatment group variable (i.e. election 0 relative to Free Basics) is given by the first election over which Free Basics became available in the constituency. All estimations incorporate controls for the logarithm of population and nightlight per capita, as well as country × election-year fixed-effects. In the Borusyak et al. (2024) and de Chaisemartin and D'Haultfoeuille (2020) specifications, we include also the difference in the logarithm of population and nightlight per capita, and standard errors are clustered at the constituency level (as two-way clustering is not allowed). In Callaway and Sant'Anna (2021), Dube et al. (2023) (our baseline), and Sun and Abraham (2021), standard errors are clustered two-way, at country-year level and constituency-level. The bars represent 95% confidence intervals.

Second, this analysis underscores the importance of investigating the robustness of the effect of Free Basics, to the inclusion of controls for local internet availability, particularly 3G coverage. In our sample, internet is available locally for 48% of the races, and Free Basics is available in only 51% of them. Controlling for the availability of mobile internet allows us to account for unobserved factors that might drive internet access, thus isolating the effect of the connectivity boost provided by Free Basics partnerships at the local level. We then estimate a version of Equation 3 that includes separate dummies for the presence of 2G and 3G. Our identifying variation comes from the fact that, within a given election, Free Basics becomes available only in constituencies served by a partner mobile operator, among those already covered by mobile broadband internet. As shown in Appendix Figure D2, our baseline result remains robust after this control. In the second election, the point estimate is 0.127, and it is significant at the 5% level.

Length of exposure to Free Basics. Our main results suggest that it takes time for the connectivity shock to impact the electoral prospects of female MP candidates. To explore whether the null effect observed in the first election after the introduction of Free Basics conceals heteroge-

neous effects based on the length of exposure to the treatment, we estimate an alternative version of Equation 3 that incorporates constituency-level treatment intensity. Specifically, we include a constituency-level component representing the number of years that voters in the constituency had access to Free Basics, determined by: (i) the set of mobile operators in the constituency and (ii) the dates of the partnerships these operators signed with Facebook. This leads to the following specification:

$$Y_{j,t+k} - Y_{j,t-1} = \sum_{l=L}^{x} [\Delta \ FreeBasics_{j,t} \times Years_{l(j,t+k)}] \ . \ \beta^{\mathbf{k,l}} + \mathbf{X}_{j,t} \ . \ \delta^{\mathbf{k}} + \eta_{c,t}^{k} + \varepsilon_{j,t}^{k} \tag{4}$$

where $Years_{l(j,t+k)}$ is a set of dummy variables indicating whether the earliest partnership affecting constituency j occurred l years prior to the election $t+k$.[47]

Figure 4 presents the estimates of $\beta^{\mathbf{k,l}}$ from Equation 4 for the first and second elections following the introduction of Free Basics. In the first election, we find that constituencies exposed to Free Basics, regardless of their length of exposure, do not differ in their likelihood of electing a female MP compared to their control counterparts. Similarly, in the second election after the introduction of Free Basics, the length of exposure does not have a significant effect. Specifically, for constituencies with six to eight years of exposure, the estimated coefficients are consistently positive and statistically significant at the 5% level, with no significant differences between them. The only notable exception occurs in constituencies where Free Basics was available for the second election after only five years of coverage. Interestingly, these constituencies also experienced the first election with Free Basics shortly after the policy's implementation, which may have drastically reduced the opportunity for voters and political actors to learn about the political effects of Free Basics in the first election.

Overall, these findings support the view that the heterogeneity in the impact of Free Basics over time is largely contained within the electoral cycle. We interpret this result as indicating that political actors primarily acquire knowledge about changing voter attitudes and preferences through the electoral process.

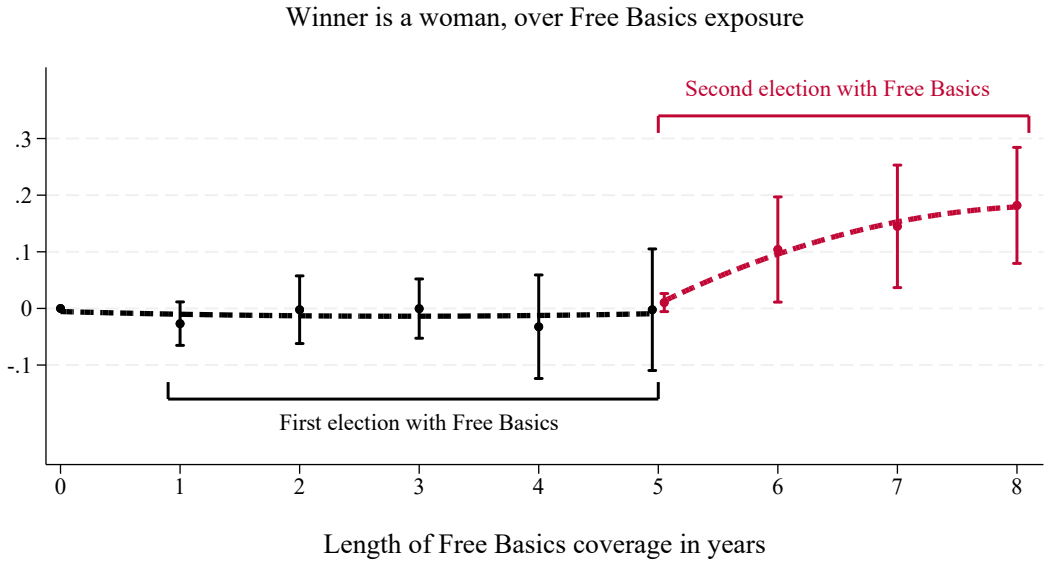
6.2 Effects of Free Basics on electoral competition and candidate selection

As discussed in subsection 6.1, Facebook's Free Basics positively influenced the election of female MPs, but only after the first election conducted with the technology, suggesting that candidates underwent a learning process. In this subsection, we examine the role of competition and candidate selection in shaping the two stages of electoral outcomes triggered by this connectivity shock.

Our analysis begins with the effects of Free Basics on the competitiveness of elections. We estimate the impact of its availability in the first and second elections following its introduction, focusing on the total number of candidates and the distribution of votes among them. To capture relevant features of the vote share distribution, we employ two measures: vote share fragmentation and fractionalization. The fragmentation index, based on Laakso and Taagepera (1979), calculates the effective number of candidates as: $\frac{1}{\sum_1^N v_i^2}$, where v_i is the vote share obtained by

[47] In other words, when a constituency is covered by more than one mobile operator partnering with Free Basics at the time of election, we retain the earliest partnership to calculate the length of exposure.

Figure 4: Female MP election in first election with Free Basics over years of exposure



Notes: This figure presents the results of the LP-DiD estimates for the effect of Free Basics on the likelihood of electing a female MP, over exposure to Free Basics in years (see Equation 4). The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses. All specifications include country × election-year fixed effects, and the following controls: logarithm of population density and nighttime light.

candidate i. The fractionalization index, following Montalvo and Reynal-Querol (2005), is defined as: $\sum_1^N v_i(1-v_i)$.

Table 8 presents the results. We do not observe any significant effect of Free Basics' availability on electoral competitiveness in either of the two elections following its introduction. The magnitudes of observed effects are small, and the estimates lack precision (columns 1 to 6). This absence of significant effects on aggregated measures of competition might obscure heterogeneous effects, particularly as social media often exerts differential influences on mainstream versus marginalized candidates (Campante et al., 2018; Guriev et al., 2021; Tabellini et al., 2023). To explore this possibility, we examine whether Free Basics affects the number of candidates from parliamentary parties (defined as parties represented in the previous parliament), less established (non-parliamentary) parties, and independent candidates separately. Again, our findings reveal no economically or statistically significant effects (see Appendix Table D2).

Additionally, we analyze the impact of Free Basics on voter turnout and find a negative and statistically significant effect in the second election. This result aligns with prior research indicating that the internet and social media can distract or discourage citizens from voting. It is also consistent with the findings discussed in subsection 4.2, which document increased disillusionment among citizens regarding their representatives, as well as shifts in voting behavior reported in survey data. Here again, it is important to note that the effect appears in the second election with Free Basics only.

Table 8: Effect of Free Basics on electoral competition and turnout

Dependent variable	Number of candidates		Vote share fragmentation		Vote share fractionalization		Turnout	
Election after Free Basics entry	First election	Second election	First election	Second election	First election	Second election	First election	Second election
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Free Basics	0.247	–0.559	0.327	0.258	0.003	–0.005	0.011	–0.061***
	(0.401)	(0.533)	(0.347)	(0.200)	(0.014)	(0.012)	(0.014)	(0.009)
Mean dep. var.	6.649	6.363	2.572	2.540	0.550	0.551	0.642	0.657
Observations	5547	2592	4867	1964	4867	1964	2210	926
Country × election-year FEs	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses. LP-DiD estimations of Equation 3. Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include country × election-year fixed effects, and the following controls: logarithm of population density and nighttime light. The mean dependent variable is computed in the reference election-year.

6.3 Effects on candidate selection and the role of political parties

The positive effects of Free Basics on the election of female MPs may stem both from voters being more inclined to support female candidates when they participate in the race and from candidates themselves adjusting their decision to run. Some female candidates might choose to enter the race because they anticipate advantages such as the ability to outspend competitors, aided by Free Basics, the evolving positive attitudes towards female leaders, and their own capacity to campaign effectively online. Conversely, the same dynamics could reduce male politicians' incentives to run.

To test these hypotheses, we examine the factors influencing female candidacies and assess the performance of female politicians, not only through their probability of winning but also in terms of their vote shares. Columns 1 and 2 of Table 9 present estimates for the first and second elections with Free Basics, where the dependent variable is a dummy indicating whether at least one female candidate appears on the ballot. The results indicate a 10-percentage-point reduction in the probability of a female candidate being on the ballot in the first election. However, in the second election, there is a positive, though imprecisely estimated, effect of 16 percentage points.

Columns 5 and 6 provide insights into the vote share of the top-performing female candidates, reflecting similar patterns to those observed for their winning probabilities (as reported in columns 3 and 4). The vote share of the highest-ranked female candidate remains unaffected in the first election (a small and statistically insignificant +0.3 percentage points). However, in the second election, it increases significantly by 7.8 percentage points, with statistical significance at the 5% level.

Decomposition of the effects on candidate selection by party affiliation. We further explore which types of candidates adjust their decisions to appear on the ballot by examining the likelihood of observing at least one candidate of a given gender and political party affiliation.

Table 9: Free Basics and female candidacy, election and vote share

Dependent variable	Woman					
	Run		Win		Vote share	
Election after Free Basics entry	First election	Second election	First election	Second election	First election	Second election
	(1)	(2)	(3)	(4)	(5)	(6)
Free Basics	–0.101*	0.162	–0.021	0.102**	0.001	0.078***
	(0.059)	(0.128)	(0.022)	(0.049)	(0.014)	(0.028)
Mean dep. var.	0.492	0.492	0.104	0.110	0.105	0.107
Observations	5547	2592	5547	2592	4867	1964
Country × election-year FEs	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses. LP-DiD estimations of Equation 3. Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include country × election-year fixed effects, and the following controls: logarithm of population density and nighttime light. The mean dependent variable is computed in the reference election-year.

We also analyze the number of candidates to investigate effects along the intensive margin. The results, displayed in Figure 5, reveal intriguing patterns for both candidate presence (Panel A) and candidate numbers (Panel B).

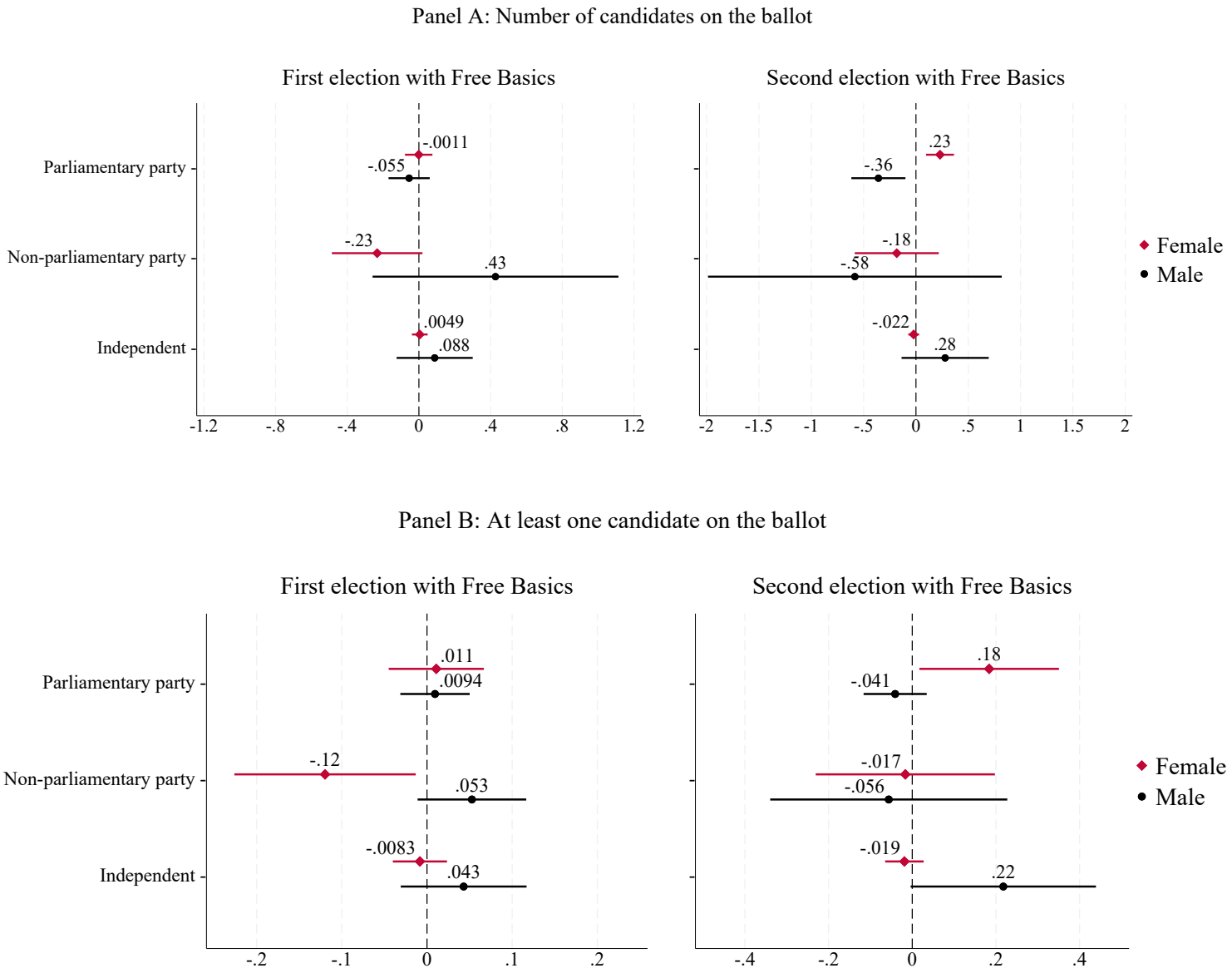
Specifically, the negative effect on female candidate entry in the first election with Free Basics is driven by candidates affiliated with non-parliamentary parties. This result is clearly observed in both the presence and the number of female candidates from these parties. By contrast, the presence and number of female candidates from parliamentary parties or running as independents remain unaffected, with coefficients close to zero and statistically insignificant.

In the second election with Free Basics, the positive (albeit imprecise) effect on the entry of female politicians is confirmed for one specific group: women running with a parliamentary party. The effect is substantial, with an estimated coefficient of .23 on the number of candidates, translating into an increase of 153% of the mean number of female candidates in-sample (which is very low: .15) and a 18 percentage points increase on the presence of at least one female candidate from one of these major parties. The effects are both statistically significant at the 1% and 5% levels, respectively (see columns 2 of Panels A and C in Appendix Table D3).

Interestingly, the effects of Free Basics on the presence and number of male candidates on the ballot mirror roughly the patterns observed for their female counterpart. In the second election, the number of male candidates from a parliamentary party is reduced by 31% of the mean number of male candidates in-sample (which amounts to 1.16). This effect is significant at the 1% level (see columns 2 of Panel B in Appendix Table D3).

Decomposition of the effects on electoral performance by party affiliation. The findings presented so far emphasize the pivotal role of established parties in driving both the entry of female politicians and the exit of male politicians in national elections. We now extend this analysis to examine the electoral performance of these different types of candidates. Table 10

Figure 5: Effects of Free Basics on candidate selection



Notes: This figure displays the results of separate regressions, where the dependent variable is either the presence of a candidate on the ballot (Panel A) or the total number of candidates of a given type (Panel B). Candidates are categorized based on their gender and political party affiliation. The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses. LP-DiD estimations of Equation 3. Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include country × election-year fixed effects, and the following controls: logarithm of population density and nighttime light. The mean dependent variable is computed in the reference election-year.

provides estimates of the effect of Free Basics availability on the winning probability and vote share of the top-performing candidates, categorized by gender and party affiliation.

Panel A reveals that, in the second election, Free Basics significantly increases the winning probability of female politicians running with a parliamentary party by 11 percentage points (a 163% increase relative to the mean). This effect is statistically significant at the 5% level. Simultaneously, the winning probability of male politicians from these established parties decreases by 8 percentage points (a 15% decline relative to the mean), as shown in Panel B.

Table 10: Effects of Free Basics on electoral gender representation and vote shares

	Electoral outcome of candidates					
	endorsed by:					
	a parliamentary party		a non-parliamentary party		running as independent	
Election after Free Basics entry	First election	Second election	First election	Second election	First election	Second election
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Winner is a woman					
Free Basics	–0.008	0.119**	–0.009	–0.017	–0.003	0.001
	(0.030)	(0.053)	(0.011)	(0.010)	(0.005)	(0.001)
Mean dep. var.	0.069	0.073	0.030	0.032	0.007	0.004
Observations	5547	2592	5547	2592	5547	2592
	Panel B: Winner is a man					
Free Basics	–0.081*	–0.170	0.084***	0.008	0.017	0.024
	(0.044)	(0.148)	(0.029)	(0.095)	(0.019)	(0.022)
Mean dep. var.	0.555	0.542	0.262	0.282	0.043	0.026
Observations	5547	2592	5547	2592	5547	2592
	Panel C: Vote share of the first-ranked female candidate					
Free Basics	0.008	0.107***	–0.008	–0.016	–0.004	–0.013
	(0.015)	(0.014)	(0.008)	(0.011)	(0.005)	(0.012)
Mean dep. var.	0.060	0.065	0.034	0.041	0.011	0.008
Observations	4867	1964	4867	1964	4867	1964
	Panel D: Vote share of the first-ranked male candidate					
Free Basics	–0.041*	–0.125*	0.024	0.008	–0.001	0.026**
	(0.023)	(0.063)	(0.025)	(0.029)	(0.009)	(0.011)
Mean dep. var.	0.400	0.383	0.227	0.265	0.063	0.049
Observations	4867	1964	4867	1964	4867	1964
Country × election-year FEs	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses. LP-DiD estimations of Equation 3. Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include country × election-year fixed effects, and the following controls: logarithm of population density and nighttime light. The mean dependent variable is computed in the reference election-year.

Similar patterns are observed in the vote shares of the top-ranked female and male candidates affiliated with parliamentary parties. In the first election, the vote share of the highest-ranked male candidate from a parliamentary party decreases by 4 percentage points (a 10% decline relative to the mean), with this effect intensifying in the second election to a reduction of 13 percentage points (a 33% decline relative to the mean). Conversely, the vote share of the top-ranked

female candidate from a parliamentary party increased significantly in the second election by 11 percentage points (a 164% increase relative to the mean).

Effects on win margins in the first election with Free Basics. We further trace the effect of Free Basics on the dynamics of constituencies which elected a male from a parliamentary party in the first election, with the aim of better understanding the learning process in the first election, and its subsequent effect in the second election. Table 11 presents the estimates for an alternative version of Equation 3 specified on the subsample of constituencies that elect a male from a parliamentary party, and where the dependent variable is alternatively the win margin of this male winner over the runner-up (columns 1 and 2), the second best male candidate (columns 3 and 4) and the best female candidate (columns 5 and 6). In the first election, the win margin of elected males running with a parliamentary party decreases significantly with Free Basics, by 5.2 percentage points (a 19% reduction relative to the mean). This reduction is found also when we zoom-in on the win margin over the best female candidate (-3.5 percentage points, a 7% decrease relative to the mean) and is significant at the 5% level. In the second election, this negative effect on the win margin over the best female candidate persists. In the case of the win margin over the second best male, the point estimates are negative as well in the two elections, but is imprecisely estimated.

Table 11: Free Basics and MP elections: gender and political parties

Sample restriction	Races with victories of male candidates running with a parliamentary party					
Dependent variable	Win margin over					
	runner-up		second best male		best female	
Election after Free Basics entry	First election	Second election	First election	Second election	First election	Second election
	(1)	(2)	(3)	(4)	(5)	(6)
Free Basics	–0.052*	–0.045	–0.015	–0.015	–0.035**	–0.096***
	(0.030)	(0.049)	(0.035)	(0.075)	(0.014)	(0.023)
Mean dep. var.	0.275	0.258	0.284	0.266	0.493	0.473
Observations	3273	1401	3273	1401	3273	1401
Country × election-year FEs	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses. LP-DiD estimations of Equation 3. Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include country × election-year fixed effects, and the following controls: logarithm of population density and nighttime light. The mean dependent variable is computed in the reference election-year.

Bounds on the effects of Free Basics, conditional on running. We now examine whether Free Basics influences the chances of winning and the vote share of candidates, conditional on their participation in the race. Our focus is on the two groups where significant effects on candidacy

were detected: male candidates affiliated with a parliamentary party in the first election with Free Basics, and female candidates from parliamentary parties in the second election with Free Basics.

A direct comparison of electoral outcomes for these candidates in constituencies with and without Free Basics, where they are present, is not feasible. Our earlier analysis of Free Basics' impact on candidate selection indicates that the composition of candidates differs systematically between constituencies with and without Free Basics, invalidating a simple comparison.

To address this issue, we employ the bounding methodology developed by Lee (2009) in the context of this electoral setting. The computation of bounds for the probability of winning for female candidates from parliamentary parties, conditional on running, is detailed in Appendix. The same method is applied to derive bounds for male candidates' winning probabilities. Additionally, we use observed effects on unconditional vote shares to estimate bounds on the vote shares of both male and female candidates, conditional on running. Standard errors for these bounds are computed using a bootstrapping procedure. Specifically, we repeatedly draw a sample of races with replacement, calculate the lower and upper bounds as described in Appendix, and repeat this process 10,000 times.

Table 12 summarizes the results. Conditional on running, Free Basics reduces the probability of male candidates being elected and their vote share in the first election. Their probability of winning decreases by 7.1 to 8.2 percentage points, with both the lower and upper bounds of these estimates being statistically significant. In the second election, Free Basics increases the probability of female candidates winning by 15.1 to 42.2 percentage points, conditional on running. While the upper bounds of these estimates are statistically significant, the lower bounds are not.

Overall, these findings suggest that the negative impact of Free Basics on the electoral prospects of male candidates from major parties in the first election stems from both a reduced likelihood of entering the race and a diminished voter propensity to support them, conditional on running. Similarly, the positive impact on their female counterparts in the second election is driven by both an increase in entry rates and a higher vote share, conditional on running.

6.4 Heterogeneities across institutional and economic environment

In this subsection, we complement the baseline estimates presented in Figure 2 by studying heterogeneities across the institutional setting, measured at the election level, and across the economic environment, measured at the constituency level. In addition, we present a series of robustness checks for our results.

Quality of democracy. At the core of how the introduction of Free Basics impacts the political prospects of women lies the effectiveness of democratic and political institutions. Using data from the *Varieties of Democracy* (V-DEM) project,[48] we investigate potential heterogeneities along two dimensions: fairness of elections and freedom of the press. We do so firstly by interacting the *Free Basics* coefficient in Equation 3 with dummies indicating whether an election was considered as fair or unfair. As such, we thus split the Free Basics coefficient between these two

[48]The data is accessible at: v-dem.net

Table 12: Bounds on the impact of Free Basics on electoral success, conditional on running

Dependent variable	Man		Woman	
	Win	Vote share	Win	Vote share
Election after Free Basics entry	First election	First election	Second election	Second election
	(1)	(2)	(3)	(4)
Lower bound	-0.082**	-0.056***	0.151	0.109
	(0.038)	(0.018)	(0.217)	(0.110)
Upper bound	-0.071*	-0.044**	0.422*	0.380*
	(0.040)	(0.019)	(0.251)	(0.210)
Bootstrap replications	1000	1000	1000	1000
Mean dep. var., absence of Free Basics	.69	.48	.40	.32

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses. LP-DiD estimations of Equation 3. Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include country × election-year fixed effects, and the following controls: logarithm of population density and nighttime light. The mean dependent variable is computed in the reference election-year.

groups of election. We show in Figure 6 that Free Basics' impact on the election of all women to parliament is particularly concentrated in fair elections. This finding is consistent with our finding that the Facebook-centered connectivity shock had a positive of gender norms and comforts us in the fact that this is driving its the electoral consequences. There are two reasons for this. On a demand side, only under fair elections can individuals express in the polls their true opinion. On a supply side, under unfair elections, political parties (and in particular the party in power imposing the unfairness) have lower incentives to adapt their supply of candidates to the demands of voters. We can note that, while of much smaller magnitude, we still do observe a positive and precisely estimated impact of Free Basics on the election of women under unfair elections.

Secondly, we perform a similar exercise by splitting our effect across levels of freedom of the press. Using V-Dem's press freedom index, measured in the year prior to the election, we identify elections above and below the sample median and interact these indicators with our treatment variable. As show in Figure 6, we find the overall estimated coefficient associated with *Free Basics* to be almost entirely driven by elections with low press freedom. This results is highly consistent with the fact that social media can act as a substitute for traditional media when the latter is censored by maintaining media pluralism. It further highlights it's importance and potential as a catalyst for change in contexts of low agency of traditional news media.

Electoral rules. While we focus only on first-past-the-post races in single member constituencies, countries in our sample have in parallel mixed allocation systems for the parliamentary seats, which is likely to create sorting of politicians and possibly voters into different segments of the system. In particular, the presence of reserved seats for women in some countries may affect female candidacy and election in the traditional races held in the same countries.[49] The

[49]In our sample, Kenya, Tanzania, Uganda and Zimbabwe have reserved seats for women. In Tanzania and Zimbabwe, reserved seats are allocated to parties using a proportional representation system based on the votes obtained nationally in Tanzania and district-wide in Zimbabwe. In such system, citizens vote once for their local

predicted sign of the effect is unclear, as both crowding-out and ripple effects can be generated by reservation (Dahlerup and Freidenvall, 2011; Esteve-Volart and Bagues, 2012). By splitting the *Free Basics* coefficient between countries with reserved seats and countries without, we show in Figure 6 that the point estimate associated with Free Basics is very similar under both electoral system. Therefore we argue that the impact of Free Basics is not driven by possible manipulation or specificities of electoral reservation rules.

Correlates of urbanization. Due to the fact that a potential effect of Free Basics requires technological adoption, one can expect urbanization and overall economic development to play a role in enabling it. To investigate this, we estimate separately two version of Equation 3 in which we interact our treatment variable *Free Basics* with constituency-level indicators for being above or below the sample median in terms of nighttime light and population density, respectively. Estimated coefficients are reported in Figure 6. Unsurprisingly, we find that our results are larger in areas above both the nighttime light and population density medians. Nonetheless, while of smaller magnitude, we still observe a positive impact of Free Basics in places of lower urbanization. This finding is particularly true when focusing on the election of women from parliamentary parties.

7 Mechanism: diffusion through social networks

Our results show that Free Basics is strongly associated with more favorable individual attitudes towards women in politics and that this translates into a sharp increase in the number of women elected to parliament starting in the second election following Free Basics' introduction. We have seen that one mechanism at play is the increased endorsing of women by political parties, providing an larger number of women with the political network and platform often needed to win. While other mechanisms can be at play, we focus now on the role of social networks in shaping one's opinion. By drastically reducing communication costs and speed, social media has the potential to significantly expand one's social network and connect users in different areas of the world. As such, social media can thus contribute to exposing individuals to different social and gender norms, in turn impacting voting behavior.

Throughout this section, we measure online social networks using Facebook's *Social Connectedness Index* (SCI) (Bailey et al., 2018). As described in section 3, it captures for each ADM1 region i, the share of online friends of it's average user which are located in ADM1 region j. As such, the SCI provides a measure of bilateral online connections between almost every ADM1 region worldwide, allowing a detailed analysis of online social networks.

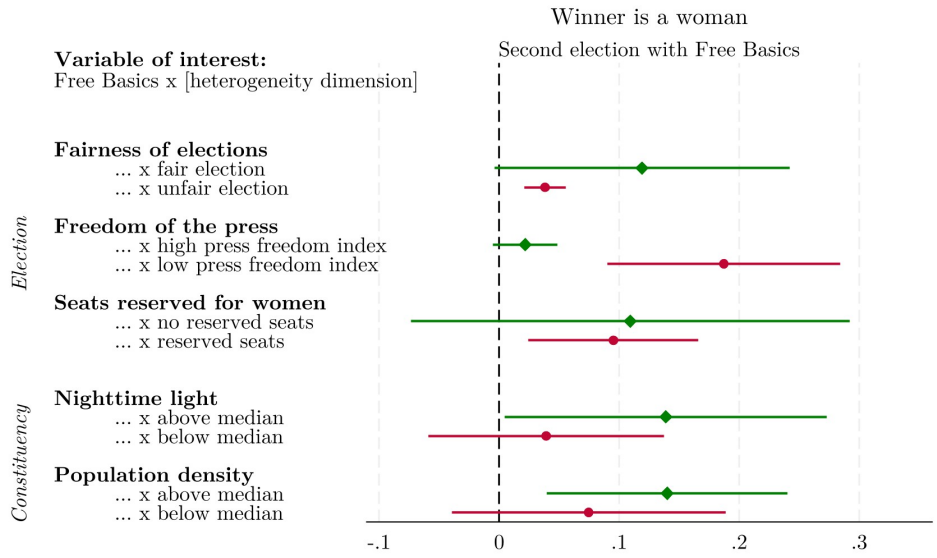
7.1 Local concentration of network

A necessary condition for social media to foster norm change is for it to allow to be exposed to an increased diversity of views. As such, we first we provide evidence of the role of network

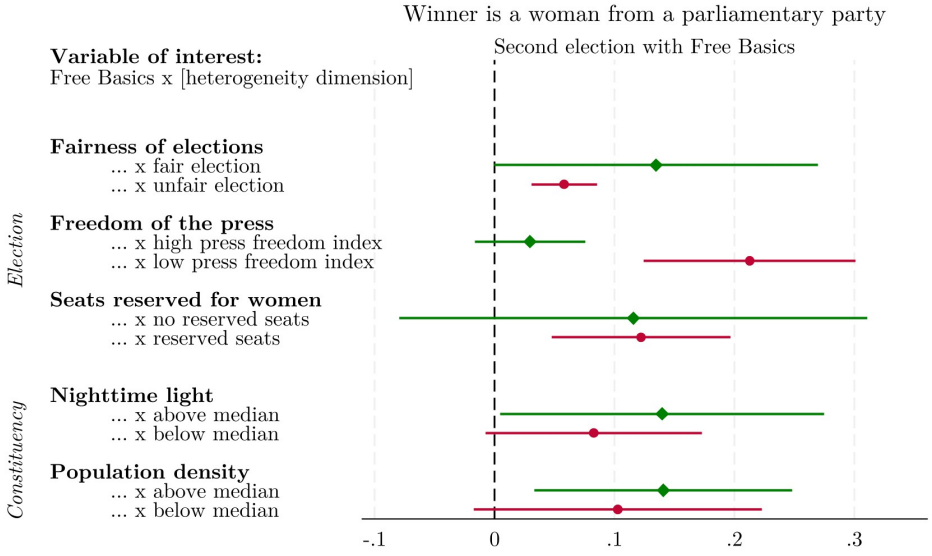
MP and this vote is also used to compute the allocation of reserved seats. Reserved seats in Kenya and Uganda are allocated trough FPTP single-member constituencies, wider then the "regular" constituency. In such system, citizens therefore cast two votes.

Figure 6: Heterogeneities of Free Basics effect on Female MP election

Panel A: Winner is a woman



Panel B: Winner is a woman from a parliamentary party



Notes: The figure presents the results of the LP-DiD estimates for the effect of Free Basics on the likelihood of electing a female MP in the second election after the introduction of Free Basics. 95% confidence intervals are reported. Each pair of coefficients is estimated separately. The unit of observation is a race, i.e. a constituency × election year. The dependent variable is a dummy indicating whether the winner of the election is either a woman (panel A) or a women endorsed by a parliamentary party (panel B). Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include region (admin1) and election-year fixed effects, and have the following controls: logarithm of total population, population density and nighttime light.

concentration in dampening Free Basics' impact. We use the *Facebook Social Connectedness Index* to measure the share of a typical region i Facebook user's online *friends* which are located in the same ADM1 region i. To document how network structure affects the impact of Free Basics, we

first estimate a version of Equation 3 in which we interact our treatment variable *Free Basics* with this measure of local network concentration. In a second step, we split consitutencies into local concentration quartiles, and interact our treatment variable with indicators for such quartiles. Figure D3 presents the distribution of network concentration across constituencies. Results are presented in Table 13.

We find that increased local network concentration, measured as the share of friends in the same region, significantly reduces the positive impact of Free Basics on the election of a woman as MP (column 1). On average, an additional percentage point of online friends in one's own region is associated with a reduced Free Basics effect on the likelihood of electing a woman as MP by 0.24pp. When pooling constituencies by quartiles, we find that, compared to constituencies in the first quartile of network concentration,[50] the effect of Free Basics in constituencies with higher network concentration is reduced by 44 to 77% (column 3). When focusing on the election of a woman endorsed by a parliamentary party, we find that this sharp reduction of the effect of Free Basics is concentrated at the higher end of concentration distribution. In constituencies where more then 54% of online connections are located in the same region, the association between Free Basics and the election of a woman from a parliamentary party is reduced by 2/3 (column 7). Since population density and economic development are likely to correlate with social network structure, we show that these results are robust to interacting our control variables with Free Basics.

These results highlight the importance of social network structure when appreciating the consequences of a connectivity shock. We show that the impact of Free Basics on female MP election is very limited in places in which people are mostly connected to people living nearby. That is, Free Basics matters less where online networks resemble most "real-life" social circles. Conversely, our effect is driven by constituencies whose inhabitants are mostly connected to people living further away, and through which they are exposed to potentially a variety of social norms.

7.2 Exposure to female politicians

In a second step, we turn to studying how the content individuals are exposed to online affects the potential impact of Free Basics. In particular, we ask whether Free Basics has greater positive impact in places which are more connected to countries with higher female political representation.

We measure female political representation using the *Women Power Index*, a time-invariant country-level index aggregating a wide range of female political representation measures.[51] We can thus compute for each ADM1 regions in our sample the share of Facebook friends of it's average Facebook user which are located in countries with higher female political representation. The formal computation of this measure is detailed in section 3. We then estimate a version of Equation 3 in which we interact our treatment variable *Free Basics* with the share of Facebook Friends in countries with large representation of women in politics. Estimated coefficients are reported in table Table 14.

We find that the effect of Free Basics is larger in places whose inhabitants are more connected to countries with higher female representation. On average, a 10pp point increase in the share

[50] This first quartile of network concentration corresponds to constituencies where less then 26% of the average Facebook user's friend are present in the same ADM1 region. See Figure D3 for the full distribution

[51] The Women Power Index is computed using the share of women in national cabinets, in national and local legislatures, among candidates to national legislatures, as well as the number of female head of states or government.

Table 13: Free Basics and female MP elections: role of local network concentration

Dependent variable	Winner is a woman				Winner is a woman from a parliamentary party			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Free Basics	0.117**	0.089*	0.208***	0.193***	0.133**	0.118***	0.197***	0.202***
	(0.053)	(0.044)	(0.058)	(0.060)	(0.056)	(0.040)	(0.065)	(0.055)
... × share of Facebook friends in same region	–0.241***	–0.207**			–0.168*	–0.168*		
	(0.080)	(0.098)			(0.089)	(0.090)		
... × $\mathbb{1}(2^{nd}$ quartile of network local concentration)			–0.090**	–0.090**			–0.059	–0.064
			(0.038)	(0.043)			(0.048)	(0.046)
... × $\mathbb{1}(3^{rd}$ quartile of network local concentration)			–0.110***	–0.112***			–0.055	–0.066*
			(0.035)	(0.038)			(0.043)	(0.036)
... × $\mathbb{1}(4^{th}$ quartile of network local concentration)			–0.160***	–0.162***			–0.130***	–0.143***
			(0.035)	(0.044)			(0.041)	(0.037)
Controls: nighttime light, population density	✓	✓	✓	✓	✓	✓	✓	✓
Country-year FEs	✓	✓	✓	✓	✓	✓	✓	✓
Interaction terms: nighttime light, pop. density		✓		✓		✓		✓
Observations	2471	2471	2471	2471	2471	2471	2471	2471
Mean: female MP elected	0.11	0.11	0.11	0.11	0.09	0.09	0.09	0.09

Notes: LP-DiD estimations. *** p<0.01, ** p<0.05, * p<0.1. Two-way clustered standard errors at country-year level and constituency-level in parentheses. The unit of observation is a constituency and an election-year. The dependent variable is a dummy indicating whether the winner of the election is a woman (column 1 to 4) or a women endorsed by a political party (5-8). Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include region (admin1) and election-year fixed effects, and have the following controls: logarithm of total population, population density and nighttime light. Specifications reported in columns 2, 4, 6, 8 also include as control the interaction between *Free Basics* and the population density and nighttime light variables.

of Facebook friends located in countries with higher presence of women in politics is associated with a 7.1pp larger effect of Free Basics on the election of a woman. Similarly, it is associated with a 6.4pp larger impact on the election of a woman from a parliamentary party, although this coefficient is imprecisely estimated. Going further, we split the share of friends in countries with higher representation between those in countries with a the representation measure of more then one standard deviation above one's own country and those below. We find that the positive impact of connections to places with higher representation is driven entirely by connections to countries with a representation measure at least one standard deviation higher. These result are robust to controlling for the interaction between Free Basics and both nighttime light and population density.

Through these results, we document how the positive impact of Free Basics on the political prospects of women is heightened when it allows people to be exposed to higher levels of women representation. While we are agnostic on whether this goes though the exposure to norms which in turn foster more gender equal representation or through direct exposure to women in politics, these results shed important light on how exposure to online content can translate locally.

8 Conclusion

Throughout this paper, we studied the impact of the staggered connectivity shock induced by Facebook's Free Basics initiative on the electoral prospects of women in parliamentary elections in 17 sub-Saharan countries. We find that it induced a sharp increase in the winning likelihood and vote share of female candidates in the second election after the introduction of Free Basics.

Table 14: Free Basics and female MP elections: role of exposure to women in politics

Dependent variable	Winner is a woman				Winner is a woman from a parliamentary party			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Free Basics	0.129*	0.085	0.127*	0.081	0.144**	0.117**	0.142**	0.116**
	(0.063)	(0.052)	(0.063)	(0.052)	(0.064)	(0.048)	(0.064)	(0.045)
... × share of Facebook friends in countries								
... with higher women representation	0.714*	0.569			0.644	0.583		
	(0.360)	(0.372)			(0.389)	(0.353)		
... with higher women representation: ≤ –1SD			0.585	–0.030			0.431	0.186
			(0.824)	(1.031)			(0.794)	(0.852)
... with higher women representation: > +1SD			0.779**	0.826***			0.747***	0.766***
			(0.280)	(0.269)			(0.247)	(0.262)
Country × election-year FEs	✓	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Interaction terms: nighttime light, population density		✓		✓		✓		✓
Observations	2471	2471	2471	2471	2471	2471	2471	2471
Mean dep. var.	0.11	0.11	0.11	0.11	0.09	0.09	0.09	0.09

Notes: LP-DiD estimations. *** p<0.01, ** p<0.05, * p<0.1. Two-way clustered standard errors at country-year level and constituency-level in parentheses. The unit of observation is a constituency and an election-year. The dependent variable is a dummy indicating whether the winner of the election is a woman (column 1 to 4) or a women endorsed by a political party (5-8). Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include region (admin1) and election-year fixed effects, and have the following controls: logarithm of total population, population density and nighttime light. Specifications reported in columns 2, 4, 6, 8 also include as control the interaction between *Free Basics* and the population density and nighttime light variables.

This result is driven primarily by women running for the first time and endorsed by established political parties. We find mirror effects on male candidates' electoral outcomes, starting in the first election post Free Basics. Specifically, we show that starting in the first election after Free Basics' introduction, men's winning margin over women is significantly reduced. Interestingly, we do not find that the length of exposure prior to the first election matters, indicating that the impact of Free Basics is encapsulated in the electoral cycle. We interpret these results as evidence of learning by political parties, who in turn endorse more women in the second election.

We interpret this reduction of the winning margin of male candidates facing women, and the further increased endorsement and election likelihood of women, as the consequence of a shift in gender norms triggered by increased social media access. Indeed, we document that Free Basics generated sharp changes in attitudes, with covered population expressing significantly more progressive views and higher support for women in politics. Furthermore, we show that the effect of Free Basics is greater in areas where Facebook users are exposed online to a diverse set of views and to higher levels of female political representation.

Finally, we show that the political consequences of Free Basics are enabled by the holding of fair elections and are magnified when the traditional press is captured.

Overall, our findings are consistent by the hypothesis that the Free Basics connectivity shock has had a positive impact on gender norms and that political parties update their beliefs through the political cycle, learning of the increased demand for female politicians in the first election following the introduction of Free Basics and endorsing more women in the second.

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Appendix

A Background information and data sources

Table A1: **Free Basics roll-out in our sample**

Country	Free Basics	Operators	Partnership Date
Botswana	Yes	BTC	End 2017-Early 2018
Gambia	Never covered		
Ghana	Yes	Airtel	01/2015
		Tigo	10/2014
		MTN	02/2015
		Vodafone	2017
Guinea	Yes	Cellcom	11/2015
Ivory Coast	Yes	MTN	08/2017
		Moov	2019
Kenya	Yes	Airtel	11/2014
		Safaricom	2016
Lesotho	Never covered		
Liberia	Yes	Cellcom[1]	10/2015
		Lonestar cell	06/2020
		Orange	04/2016
Madagascar	Yes	BIP (Blueline)[2]	06/2016
		Orange	08/2016
Malawi	Yes	TNM	05/2015
		Airtel	05/2015
Nigeria	Yes	Airtel	05/2016
		Etisalat[3]	02/2017
		Tizeti[4]	11/2017
		Coollink[4]	08/2016
		9Mobil	07/2017
Seychelles	Yes	Airtel	11/2015
Sierra Leone	Considered but nerver launched		
Tanzania	Yes	Tigo	10/2014
		Airtel	06/2016
		Vodacom	2016 - 2019
Uganda	Considered but never launched		
Zambia	Yes	Airtel	07/2014
		MTN	07/2017
Zimbabwe	Considered but never launched		

Countries with electoral data in our sample. [1]Cellcom becomes Orange in 2016 in Liberia and is therefore not separately identified in Open Cell ID. [2]BIP (Blueline) does not have tower recorded in Open Cell ID. [3] Etisalat becomes 9Mobile in 2017 in Nigeria and is therefore not separately identified. [4] Tizeti and Coolink have no mobile phone tower network and provide WiFi hotspots instead

Table A2: **Elections and Data Sources by Country**

Country	Data Description
Botswana	*Election Years:* 2004, 2009, 2014, 2019 *Election Data Sources:* 2009-2014: CLEA; 2004: http://psephos.adam-carr.net/countries/b/botswana/botswana20042.txt; 2019: http://psephos.adam-carr.net/countries/b/botswana/botswana20192.txt *Shapefile Sources:* Bowles and Marx (2022)
Gambia	*Election Years:* 2007, 2012, 2017, 2022 *Election Data Sources:* 2007-2017: CLEA; 2022: https://iec.gm/download/national-assembly-final-results-9th-april-2022 *Shapefile Sources:* GADM: https://gadm.org/download_country.html
Ghana	*Election Years:* 2004, 2008, 2012, 2016, 2020 *Election Data Sources:* 2004-2016: CLEA; 2020: https://ghanaelections.peacefmonline.com/pages/2020/parliament *Shapefile Sources:* Amodio et al. (2022)
Guinea	*Election Years:* 2013, 2020 *Election Data Sources:* 2013: CLEA; 2020: http://psephos.adam-carr.net/countries/g/guinea/guinea2020.txt *Shapefile Sources:* GADM: https://gadm.org/download_country.html
Ivory Coast	*Election Years:* 2011, 2016, 2021 *Election Data Sources:* 2011: http://psephos.adam-carr.net/countries/c/cotedivoire/cotedivoire20111.txt; 2016: CLEA; 2021: https://www.cei.ci/wp-content/uploads/2021/03/EDAN-021_Ensemble-Resultats-avec-Nom-Prenoms-des-candidats.xlsx *Shapefile Sources:* Humdata: https://data.humdata.org/dataset/cod-ab-civ
Kenya	*Election Years:* 2002, 2007, 2013, 2017 *Election Data Sources:* 2002-2013: CLEA; 2017: https://www.iebc.or.ke/uploads/resources/siEABKREDq.pdf *Shapefile Sources:* Bowles and Marx (2022)
Lesotho	*Election Years:* 2002, 2007, 2012, 2015, 2017, 2022 *Election Data Sources:* 2002-2017: CLEA; 2022: https://www.iec.org.ls/2022-results *Shapefile Sources:* IPUMS: https://international.ipums.org/international-action/variables/GEO2_LS2006#codes_section
Liberia	*Election Years:* 2005, 2011, 2017 *Election Data Sources:* 2005-2017: CLEA *Shapefile Sources:* Amodio et al. (2022)

Madagascar
Election Years: 2013, 2019
Election Data Sources: 2013: CLEA;
2019: https://www.ceni-madagascar.mg/wp-content/uploads/2021/12/R%C3%A9sultats-l%C3%A9gislatifs-2019-par-district.pdf
Shapefile Sources: Humdata: https://data.humdata.org/dataset/cod-ab-mdg

Malawi
Election Years: 2004, 2009, 2014, 2019
Election Data Sources: 2004-2014: CLEA; 2019: https://www.eisa.org/pdf/mal2019results.pdf
Shapefile Sources: Amodio et al. (2022)

Nigeria
Election Years: 2007, 2011, 2015, 2019
Election Data Sources: 2007: http://psephos.adam-carr.net/countries/n/nigeria/nigeria20072.txt;
2011: https://inecnigeria.org/wp-content/uploads/2019/02/HOUSE-OF-REPS-2011.pdf;
2015: https://inecnigeria.org/news-all/final-list-of-presidential-and-national-assembly-candidates-for-2015-general-elections;
2019: https://www.inecnigeria.org/2019-house-of-representative-elections-result/
Shapefile Sources: Humdata: https://data.humdata.org/dataset/cod-ab-nga

Seychelles
Election Years: 2011, 2016, 2020
Election Data Sources: 2011-2016: CLEA; 2020: http://www.ecs.sc/index.php/election/2020-elections/category/21-national-assembly
Shapefile Sources: GADM: https://gadm.org/download_country.html

Sierra Leone
Election Years: 2007, 2012, 2018
Election Data Sources: 2007-2012: CLEA; 2018: http://psephos.adam-carr.net/countries/s/sierraleone/sierraleone20182.txt
Shapefile Sources: Amodio et al. (2022)

Tanzania
Election Years: 2005, 2010, 2015, 2020
Election Data Sources: 2005 & 2015: CLEA; 2010: http://psephos.adam-carr.net/countries/t/tanzania/tanzania20103.txt;
2020: https://www.nec.go.tz/uploads/documents/en/1624892417-matokeo%20final%205%20january%202021%20special%20gazzete.pdf
Shapefile Sources: GADM: https://gadm.org/download_country.html

Uganda
Election Years: 2011, 2016, 2021
Election Data Sources: 2011-2016: CLEA; 2021: https://www.ec.or.ug/ecresults/2021/MPS_RESULTS_2021.pdf
Shapefile Sources: Amodio et al. (2022)

Zambia
Election Years: 2001, 2006, 2011, 2016, 2021
Election Data Sources: 2001-2016: CLEA; 2021: http://psephos.adam-carr.net/countries/z/zambia/zambia20214.txt
Shapefile Sources: CLEA: https://electiondataarchive.org/data-and-documentation/georeferenced-electoral-districts-datasets/

Zimbabwe
Election Years: 2005, 2008, 2013, 2018
Election Data Sources: 2005 & 2018: CLEA; 2008: http://psephos.adam-carr.net/countries/z/zimbabwe/zimbabwe20083.txt;
2013: http://psephos.adam-carr.net/countries/z/zimbabwe/zimbabwe20132.txt
Shapefile Sources: Reeder and Seeberg (2018)

B Additional results and robustness checks on the effects of Free Basics on social media consumption

Table B1: Free Basics fuels connectivity - Robustness with larger buffers

Dependent variable	Gets news from social media	Gets news from internet	Uses internet frequently	Owns mobile phone	Heard about social media
	(1)	(2)	(3)	(4)	(5)
	Panel A: Buffers + 2 km				
Free Basics	0.040***	0.041***	0.035***	0.024*	0.053***
	(0.010)	(0.011)	(0.010)	(0.013)	(0.017)
3G/4G	0.009	0.015	0.013	0.017	0.070*
	(0.016)	(0.012)	(0.016)	(0.011)	(0.035)
2G	0.001	0.003	-0.003	0.019**	0.036
	(0.007)	(0.006)	(0.008)	(0.009)	(0.024)
R^2	0.273	0.251	0.257	0.260	0.236
(*p-val.*) Free Basics = 3G/4G	0.129	0.147	0.219	0.699	0.656
(*p-val.*) Free Basics = 2G	0.001	0.002	0.001	0.763	0.456
	Panel B: Buffers + 4 km				
Free Basics	0.040***	0.041***	0.036***	0.026*	0.046**
	(0.011)	(0.012)	(0.012)	(0.014)	(0.018)
3G/4G	0.008	0.013	0.007	0.017	0.061*
	(0.014)	(0.011)	(0.015)	(0.012)	(0.032)
2G	0.000	-0.000	-0.008	0.014	0.041*
	(0.007)	(0.006)	(0.007)	(0.009)	(0.020)
R^2	0.273	0.251	0.257	0.260	0.236
(*p-val.*) Free Basics = 3G/4G	0.101	0.120	0.108	0.641	0.681
(*p-val.*) Free Basics = 2G	0.002	0.002	0.001	0.441	0.826
	Panel C: Buffers + 8 km				
Free Basics	0.026***	0.027***	0.026**	0.013	0.038*
	(0.009)	(0.010)	(0.010)	(0.015)	(0.020)
3G/4G	-0.002	0.001	-0.007	0.013	0.045
	(0.012)	(0.010)	(0.012)	(0.011)	(0.035)
2G	-0.003	-0.002	-0.014**	0.007	0.025
	(0.007)	(0.006)	(0.007)	(0.009)	(0.026)
R^2	0.273	0.250	0.257	0.260	0.235
(*p-val.*) Free Basics = 3G/4G	0.092	0.085	0.034	0.998	0.863
(*p-val.*) Free Basics = 2G	0.008	0.007	0.000	0.755	0.654
All panels					
Individual controls	✓	✓	✓	✓	✓
Constituency controls	✓	✓	✓	✓	✓
Country-year fixed effects	✓	✓	✓	✓	✓
Observations	61675	61675	61675	61675	19177
Mean dep. var.	0.260	0.245	0.244	0.773	0.698

Notes: OLS estimations. *** p<0.01, ** p<0.05, * p<0.10. Two-way clustered standard errors at country-year level and enumeration area level in parentheses. The unit of observation is an individual surveyed in a given year between 2014 and 2021 (Afrobarometer data, rounds 6 to 8). Observations are weighted using Afrobarometers within country survey weights. Oucomes, "Free Basics", "3G/4G', "2G" are defined in Table 4. Individual and constituency controls, as well as fixed effects are also defined in Table 4. In this table, we explore the robustness of the connectivity effect of Free Basics, for alternative measures of coverage computed using larger mobile phone buffers sizes. In Panel A, buffers are expanded by 2km. In panel B, buffers are expanded by 4km. In panel C, buffers are expanded by 8 km.

Table B2: Free Basics fuels connectivity: Arbitrary (spatial) correlation regressions

Dependent variable	Gets news from social media	Gets news from internet	Uses internet frequently	Owns mobile phone	Heard about social media
	(1)	(2)	(3)	(4)	(5)
Free Basics	0.048	0.046	0.039	0.033	0.057
	(0.009)***	(0.008)***	(0.008)***	(0.009)***	(0.015)***
	[0.009]***	[0.008]***	[0.009]***	[0.009]***	[0.015]***
	{0.010}***	{0.009}***	{0.008}***	{0.007}***	{0.015}***
3G/4G	0.021	0.024	0.020	0.022	0.078
	(0.012)*	(0.011)**	(0.013)	(0.011)**	(0.025)***
	[0.016]	[0.013]*	[0.015]	[0.012]*	[0.026]***
	{0.019}	{0.015}	{0.017}	{0.016}	{0.029}***
2G	0.000	0.003	-0.007	0.021	0.043
	(0.007)	(0.007)	(0.008)	(0.010)**	(0.021)**
	[0.007]	[0.007]	[0.007]	[0.011]**	[0.022]*
	{0.007}	{0.007}	{0.008}	{0.009}**	{0.017}**
Individual controls	✓	✓	✓	✓	✓
Constituency controls	✓	✓	✓	✓	✓
Country-year fixed effects	✓	✓	✓	✓	✓
Observations	61675	61675	61675	61675	19177
Mean dep. var.	0.260	0.245	0.244	0.773	0.698
R^2	0.274	0.251	0.257	0.260	0.237

Notes: OLS estimations. *** p<0.01, ** p<0.05, * p<0.10. Standard errors corrected for arbitrary spatial correlation with a cutoff of 50 km are reported in parentheses. Standard errors corrected for arbitrary spatial correlation with a cutoff of 100 km are reported in square brackets. Standard errors corrected for arbitrary spatial correlation with a cutoff of 250 km are reported in curly brackets. The unit of observation is an individual surveyed in a given year between 2014 and 2021 (Afrobarometer data, rounds 6 to 8). Observations are weighted using Afrobarometers within country survey weights. "Get news from Social Media" = 1 if an individual gets news from social media at least a few times a month. "Get news from Internet" = 1 if an individual gets news from internet at least a few times a month. "Frequent use of Internet" = 1 if an individual uses internet at least a few times a week. "Owns mobile phone" = 1 if an individual personally owns a mobile phone. "Heard about social media" = 1 if an individual has heard about social media, for example, Facebook, Twitter, and WhatsApp. This last question is asked in Afrobarometer 8 (2019-2021) only. "Free Basics" = 1 if an individual is covered by a mobile phone operator providing access to Free Basics. "3G/4G" = 1 if an individual is covered by a mobile phone operator providing access to 3G/4G (without Free Basics). "2G" = 1 if an individual is covered by a mobile phone operator providing access to 2G (without Free Basics). We report the p-values of t-tests of equality of Free Basics and 3G/4G coefficients as well as Free Basics and 2G coefficients in the penultimate and the last row of the table, respectively. Individual controls include age, gender of the respondent, primary education, religion dummies, a dummy indicating rural location, as well as several enumaration area level dummy variables indicating the presence of facilities (post office, police station, health clinic, market stalls, bank or money services, and any kind of paid transport, such as a bus, taxi, moped, or other form). Constituency controls consist of the log transformation (i.e. log 1+x) of the constituency-year-level population-density-weighted mean nighttime light. Estimations also include country-year fixed effects.

Table B3: Free Basics fuels connectivity - Compliers (Heterogeneities by religion)

Dependent variable	Gets news from social media			
	Christian Catholic	Christian Non-catholic	Muslim	Agnostic / Atheist
	(1)	(2)	(3)	(4)
Free Basics	0.043***	0.042***	0.043***	0.036
	(0.014)	(0.015)	(0.015)	(0.027)
3G/4G	0.026	0.003	0.030	0.024
	(0.020)	(0.016)	(0.028)	(0.039)
2G	0.005	0.003	0.005	0.003
	(0.012)	(0.009)	(0.015)	(0.026)
Individual controls	✓	✓	✓	✓
Constituency controls	✓	✓	✓	✓
Country-year fixed effects	✓	✓	✓	✓
Observations	21420	20848	15749	3652
Mean dep. var.	0.298	0.239	0.253	0.182
R^2	0.296	0.255	0.286	0.283
(*p-val.*) Free Basics = 3G/4G	0.494	0.070	0.704	0.791
(*p-val.*) Free Basics = 2G	0.029	0.018	0.011	0.348

Notes: OLS estimations. *** p<0.01, ** p<0.05, * p<0.10. Two-way clustered standard errors at country-year level and enumeration area level in parentheses. The unit of observation is an individual surveyed in a given year between 2014 and 2021 (Afrobarometer data, rounds 6 to 8). "Social Media" = 1 if an individual gets news from social media at least a few times a month. "Free Basics" = 1 if an individual is covered by a mobile phone operator providing access to Free Basics. "3G/4G" = 1 if an individual is covered by a mobile phone operator providing access to 3G/4G (without Free Basics). "2G" = 1 if an individual is covered by a mobile phone operator providing access to 2G (without Free Basics). We report the p-values of t-tests of equality of Free Basics and 3G/4G coefficients as well as Free Basics and 2G coefficients in the penultimate and the last row of the table, respectively. Individual and constituency controls, as well as fixed effects are defined in Table 4. In this table, we regress our baseline specification (i.e. column 1 in Table 4) on several subsamples: christian catholic individuals in column (1); christian non-catholic individuals in column (2); muslim individuals in column (3); individuals self-declaring no religion, agnostic or atheist in column (4).

C Additional results and robustness checks on the effects of Free Basics on political attitudes

Table C1: Free Basics, social media consumption and attitudes towards women in politics - Heterogeneities

Dependent variable	Equal chance for women in politics									
	Education		Age		Gender		Residence		Nightlight	
	None (1)	Primary (2)	≤ med. (3)	> med. (4)	Male (5)	Female (6)	Urban (7)	Rural (8)	> 2^{nd} ter. (9)	≤ 2^{nd} ter. (10)
	Panel A: Gets news from social media									
Social media	0.007	0.057***	0.041***	0.055***	0.057***	0.049***	0.060***	0.036***	0.059***	0.047***
	(0.024)	(0.010)	(0.013)	(0.012)	(0.010)	(0.012)	(0.012)	(0.009)	(0.013)	(0.010)
R^2	0.070	0.099	0.083	0.096	0.077	0.081	0.089	0.089	0.091	0.090
	Panel B: Free Basics, 3G/4G and 2G									
Free Basics	0.042**	0.011	0.015	0.030***	0.029**	0.016	0.040	0.026*	0.007	0.029***
	(0.019)	(0.014)	(0.012)	(0.011)	(0.012)	(0.016)	(0.041)	(0.014)	(0.029)	(0.010)
3G/4G	0.041*	0.012	0.019	0.023*	0.029*	0.013	0.007	0.026	0.074**	0.003
	(0.021)	(0.015)	(0.020)	(0.012)	(0.015)	(0.019)	(0.019)	(0.022)	(0.033)	(0.019)
2G	0.026*	0.012	0.004	0.032**	0.025**	0.012	0.012	0.011	0.087**	0.002
	(0.014)	(0.014)	(0.014)	(0.013)	(0.011)	(0.016)	(0.018)	(0.013)	(0.038)	(0.010)
R^2	0.071	0.097	0.082	0.094	0.075	0.080	0.087	0.089	0.089	0.089
(*p-val.*) Free Basics = 3G/4G	0.942	0.948	0.846	0.652	0.991	0.894	0.432	1.000	0.072	0.222
(*p-val.*) Free Basics = 2G	0.488	0.964	0.533	0.916	0.791	0.874	0.516	0.351	0.060	0.054
All panels										
Individual controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Constituency controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Country-year fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	13793	27322	19949	21166	20580	20535	15913	25202	12621	28494
Mean dep. var.	0.465	0.520	0.499	0.503	0.440	0.562	0.527	0.485	0.521	0.492

Notes: OLS estimations. *** p<0.01, ** p<0.05, * p<0.10. Two-way clustered standard errors at country-year level and enumeration area level in parentheses. The unit of observation is an individual surveyed in a given year between 2014 and 2018 (Afrobarometer data, rounds 6 and 7). "Equal chance for women in politics" = 1 if strongly agrees that women should have the same chance of being elected to political office as men (Afrobarometer 6 and 7). In this table, we explore heterogeneities in the effect of social media consumption (Panel A), as well as in the effect of Free Basics coverage (Panel B) on attitudes towards women in politics. We regress specifications from column (1) in Table 6 on subsamples defined in Table 5. "Social media" is defined in Table 6. "Free Basics", "3G/4G', "2G" are defined in Table 4. Individual and constituency controls, as well as fixed effects are also defined in Table 4.

Table C2: Free Basics, social media consumption and attitudes towards women in politics - Heterogeneities by religion

Dependent variable	Equal chance for women in politics			
	Christian Catholic	Christian Non-catholic	Muslim	Agnostic / Atheist
	(1)	(2)	(3)	(4)
	Panel A: Gets news from social media			
Social media	0.052***	0.049***	0.057***	0.035
	(0.012)	(0.012)	(0.009)	(0.041)
R^2	0.088	0.090	0.094	0.101
	Panel B: Free Basics, 3G/4G and 2G			
Free Basics	0.040*	0.001	0.003	-0.005
	(0.020)	(0.012)	(0.024)	(0.022)
3G/4G	0.029	0.027	0.006	0.044
	(0.021)	(0.020)	(0.018)	(0.040)
2G	0.022	0.026	-0.010	0.025
	(0.014)	(0.018)	(0.012)	(0.038)
R^2	0.087	0.089	0.092	0.101
(*p-val.*) Free Basics = 3G/4G	0.718	0.151	0.900	0.226
(*p-val.*) Free Basics = 2G	0.433	0.160	0.656	0.482
All panels				
Individual controls	✓	✓	✓	✓
Constituency controls	✓	✓	✓	✓
Country-year fixed effects	✓	✓	✓	✓
Observations	14016	14504	9960	2632
Mean dep. var.	0.505	0.533	0.457	0.472

Notes: OLS estimations. *** p<0.01, ** p<0.05, * p<0.10. Two-way clustered standard errors at country-year level and enumeration area level in parentheses. The unit of observation is an individual surveyed in a given year between 2014 and 2018 (Afrobarometer data, rounds 6 and 7). "Equal chance for women in politics" = 1 if strongly agrees that women should have the same chance of being elected to political office as men (Afrobarometer 6 and 7). In this table, we explore heterogeneities between individuals of different religions in the effect of social media consumption (Panel A), as well as in the effect of Free Basics coverage (Panel B) on attitudes towards women in politics. We regress specifications from column (1) in Table 6 on subsamples defined in Table B3, namely christian catholics in column (1), christian non-catholics in column (2), muslims in column (3) and agnotics/atheists in column (4). "Social media" is defined in Table 6. "Free Basics", "3G/4G', "2G" are defined in Table 4. Individual and constituency controls, as well as fixed effects are also defined in Table 4.

D Additional results on the electoral effects of Free Basics

D.1 Effects of Free Basics on female MP eletion: main event-study table

Table D1: Effects of Free Basics availability on Female MP Election – event-study table

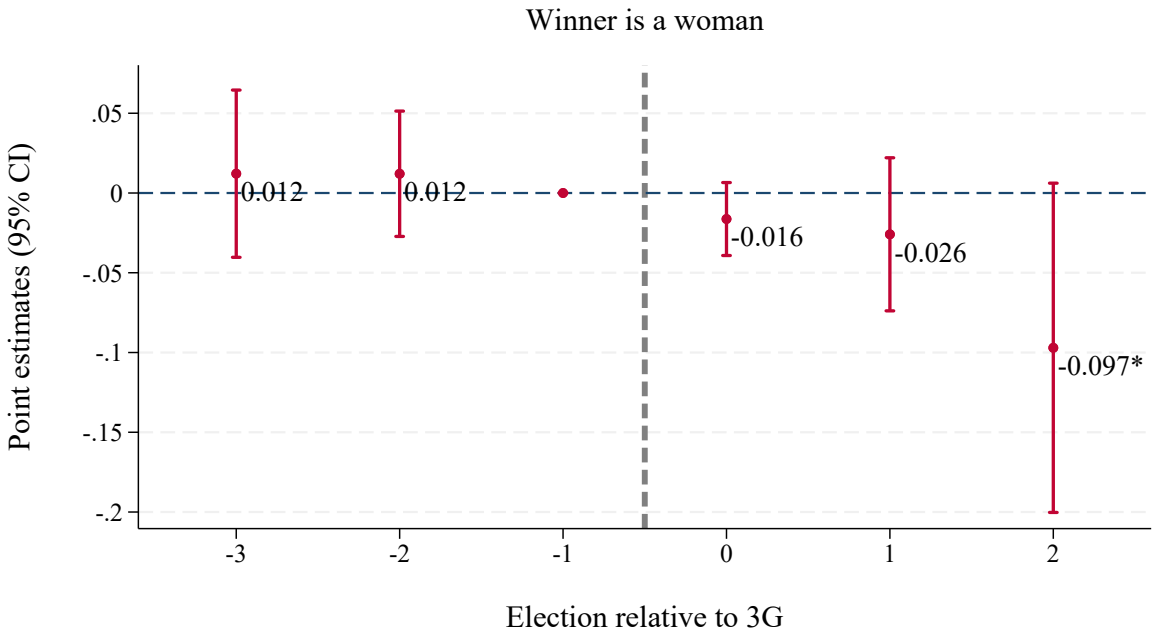
Dependent variable	Election of female MPs			
	Elections before Free Basics entry		Elections after Free Basics entry	
	Third-prior election	Second-prior election	First election	Second election
	(1)	(2)	(3)	(4)
	Panel A: Baseline sample			
Free Basics	0.036	–0.018	–0.021	0.102**
	(0.026)	(0.015)	(0.022)	(0.049)
Mean dep. var.	0.092	0.104	0.104	0.110
Observations	1359	3159	5547	2592
National-election pairs	24	52	86	48
Countries	10	14	16	15
	Panel B: Constant sample of countries			
Free Basics	0.036	–0.025	–0.034	0.103**
	(0.026)	(0.015)	(0.028)	(0.049)
Mean dep. var.	0.092	0.106	0.105	0.113
Observations	1359	2804	4518	2334
National-election pairs	24	44	66	38
Countries	10	10	10	10
Country × election-year FEs	✓	✓	✓	✓
Controls	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses.

D.2 Validity: Effects of 3G on electoral outcomes

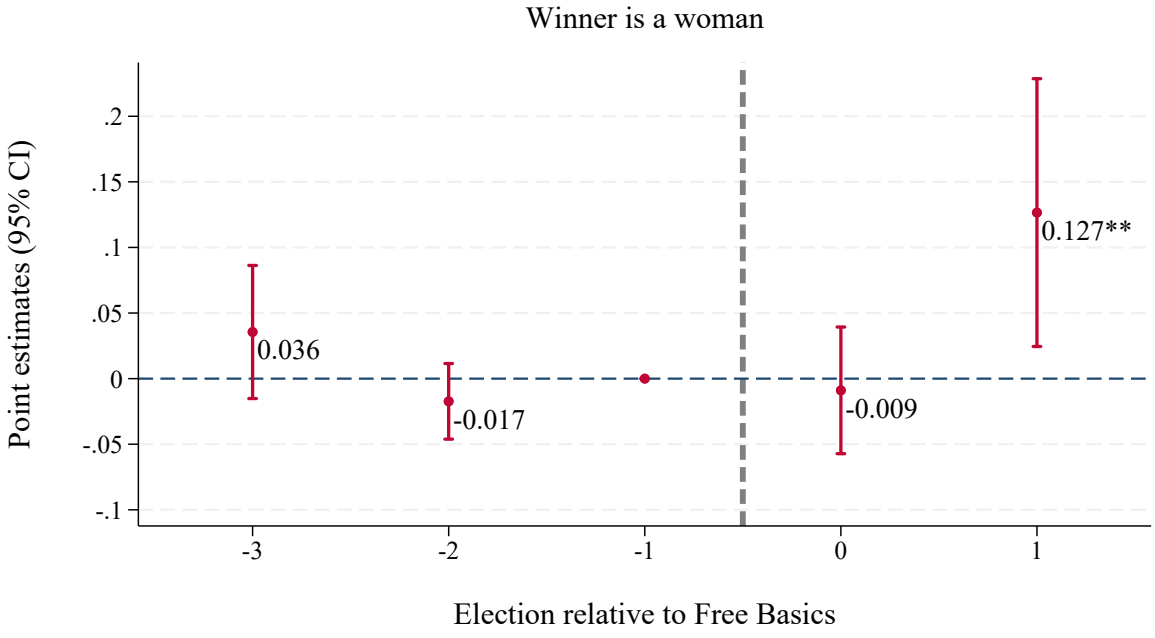
D.3 Additional results on the effects of Free Basics on competition and candidate selection

Figure D1: Effects of 3G availability on Female MP Election (yes/no)



Notes: TBA

Figure D2: Effects of Free Basics availability on Female MP Election, with control for local 2G and 3G/4G availability



Notes: TBA

Table D2: Effect of Free Basics on candidates on the ballot, by party type

Dependent variable	Number of candidates					
	Endorsed by					
	a parliamentary party		a non-parliamentary party		Running as independent	
Election after Free Basics entry	First election	Second election	First election	Second election	First election	Second election
	(1)	(2)	(3)	(4)	(5)	(6)
Free Basics	–0.018	–0.067	0.201	–0.789	0.064	0.296
	(0.034)	(0.144)	(0.376)	(0.567)	(0.129)	(0.216)
Mean dep. var.	2.040	2.016	3.643	3.407	0.965	0.941
Observations	5547	2592	5547	2592	5547	2592
Country × election-year FEs	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses. LP-DiD estimations of Equation 3. Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include country × election-year fixed effects, and the following controls: logarithm of population density and nighttime light. The mean dependent variable is computed in the reference election-year.

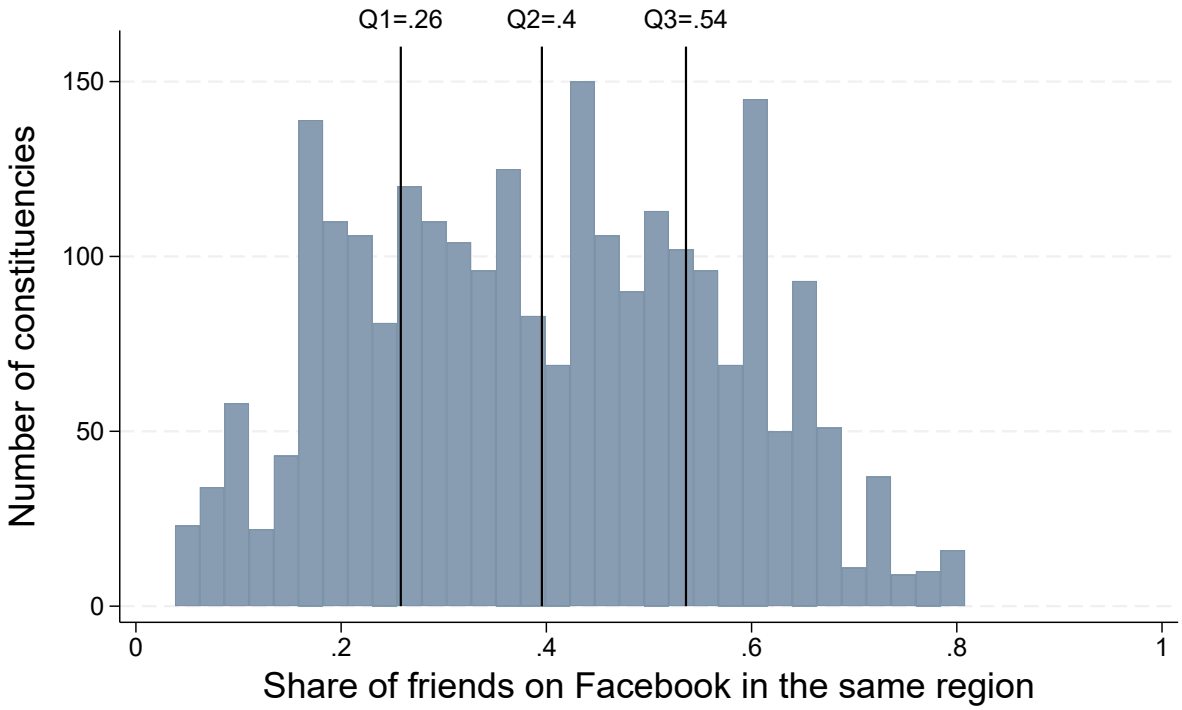
Table D3: Effect of Free Basics on candidacies, by gender and political party status

	Candidates on the ballot					
	endorsed by:					
	a parliamentary party		a non-parliamentary party		running as independent	
Election after Free Basics entry	First election	Second election	First election	Second election	First election	Second election
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Number of female candidates					
Free Basics	–0.001	0.230***	–0.233*	–0.183	0.005	–0.022
	(0.038)	(0.065)	(0.125)	(0.196)	(0.022)	(0.025)
Mean dep. var.	0.180	0.151	0.439	0.427	0.094	0.062
	Panel B: Number of male candidates					
Free Basics	–0.055	–0.359***	0.427	–0.583	0.088	0.279
	(0.057)	(0.126)	(0.341)	(0.684)	(0.105)	(0.203)
Mean dep. var.	1.362	1.158	2.644	2.739	0.611	0.453
	Panel C: At least one female candidate					
Free Basics	0.011	0.184**	–0.120**	–0.017	–0.008	–0.019
	(0.028)	(0.081)	(0.053)	(0.104)	(0.016)	(0.022)
Mean dep. var.	0.165	0.142	0.292	0.289	0.083	0.059
	Panel D: At least one male candidate					
Free Basics	0.009	–0.041	0.053	–0.056	0.043	0.218*
	(0.020)	(0.037)	(0.032)	(0.138)	(0.037)	(0.108)
Mean dep. var.	0.872	0.842	0.893	0.945	0.330	0.287
Observations	5547	2592	5547	2592	5547	2592
Country × election-year FEs	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is a race, i.e. a constituency × election year. Standard errors clustered two-way at constituency and country-year level in parentheses. LP-DiD estimations of Equation 3. Free Basics is equal to 1 if it became available in the constituency after the reference election and before the first election. All specifications include country × election-year fixed effects, and the following controls: logarithm of population density and nighttime light. The mean dependent variable is computed in the reference election-year.

D.4 Free Basics and online network structure

Figure D3: Distribution of online network concentration



Notes: