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HEALTH POLICIES FOR WOMEN'S EMPOWERMENT: EVIDENCES FROM MALAWI'S ANTIRETROVIRAL THERAPY FOR HIV CAMPAIGN

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Health Policies for women's empowerment:

Evidences from Malawi's Antiretroviral Therapy for HIV campaign

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Abstract

Can major health interventions promote women's empowerment? Focusing on rural Malawi, I study the effect of Antiretroviral Therapy (ART) to combat the HIV/AIDS epidemic on women's empowerment. To identify the effect, I use the ART roll-out campaign launched by the Malawian government in 2004. I calculate an index based on the scope and accessibility of treatment to measure the benefit of ART to rural communities. Women in communities that benefited the most from the treatment, in terms of the number of beneficiaries and access, experienced increased decision-making indicators and decreased justification and experience of physical violence. The rise in women's empowerment can be explained by the positive effects of health improvement on economic empowerment and human capital formation. This paper advocates for the central role of health interventions in future women's empowerment campaigns.

Keywords: HIV, women's empowerment, Health Interventions, ART expansion, Africa, Malawi

JEL Codes: I15, I18, I38, J16, O10

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1 Introduction

Promoting women's empowerment is crucial for sustainable development (UN (2000); UN Assembly (2015); Page and Pande (2018); Duflo (2012)). All over the world, cultural norms, stereotypes, and gender-based violence still prevent women from accessing proper education, economic resource, and health. The 2020 COVID-19 pandemic has dramatically shown that some health shocks may affect women more than men in terms of their impact on well-being (Etheridge and Spantig (2020)), occupation (Adams-Prassl et al. (2020)), and workload in the household (Farré et al. (2020)). A similar negative relation between a health shock on women's empowerment has been observed in the context of the HIV/AIDS epidemic in Sub-Saharan Africa (SSA).[1] Over 25 million people still live with HIV in SSA, and HIV/AIDS continues to cause 600,000 deaths per year. Cultural and biological factors make women in the African continent more exposed to HIV, and today a young woman is twice as likely to become HIV positive than a young man (Anderson (2018)). International organizations have argued that there is a relationship between HIV/AIDS and women's empowerment. Gender-based violence, lack of education, and poverty may make women more exposed to the virus, while the spread of the HIV/AIDS epidemic negatively affected women's economic empowerment, reducing women's work productivity, and women's human capital, especially through a negative effect on women's education. This negative relationship appears to extend beyond the direct impact of illness on empowerment and affects the general population at large, as documented by the literature. Conroy et al. (2013) show how the AIDS epidemic in Malawi contributed to shaping social norms and beliefs across rural areas in the general population. Baranov et al. (2015) explore the effect of AIDS treatment on savings and investment. The reduced perception of mortality risk after the Antiretroviral Therapy (ART) availability led to an increase in savings and human capital investments even among HIV-negative people. At the same time, while being more exposed to the virus, the female population has also a higher chance of receiving proper care for HIV. Since the early 2000s, the UN has implemented policies to reduce the Mother-to-Child

[1] https://www.unaids.org/sites/default/files/media_asset/2019_women-and-hiv_en.pdf

transmission of HIV. As a result of these programs, women are more likely than men to know about their HIV status and being on treatment.[2] Both the COVID-19 and HIV/AIDS epidemics suggest an important and strong relationship between health and women's empowerment. However, whether major health interventions may play a role in empowering women still remains unexplored.

The HIV pandemic and its management in Malawi provide a unique natural experiment to answer this question. HIV virus started spreading in Africa during the 70s, and, by 2000, over 36 million in the world were living with the virus (UNAIDS (2000)). Although the first ART was approved in the US in 1987, ART was not available in the African continent until 2001 because of its prohibitive cost. In 2001, thanks to international organizations and public opinion campaigns, generic drugs for HIV were introduced in the market, leading to a massive drop in the price and cost of ART. The drop in drug prices allowed countries, often with the support of international organizations, to start ART rollout campaigns. In 2004, the Malawian government, with the support of the Global Fund, started a program aiming to provide free ART in the health facilities of the country. In the early 2000s Malawi was one of the poorest countries in the world and one of the most plagued by the HIV epidemic, with a prevalence of 14.9% among the adult population (World Bank, 2000). The impact of this campaign on the country's health has been significant. Due to the HIV pandemic, life expectancy in Malawi dropped to 45 years in 2000. However, it began to increase towards the end of the decade, reaching 55 years in 2010 and over 64 years by 2019 (World Bank). Beyond the direct effect of ART on life expectancy, we observe a positive impact on work productivity and supply, mental health, saving, and investment in human capital on both HIV-positive and negative people (Baranov et al. (2015); Baranov and Kohler (2018); Dickerson et al. (2020)). Recent literature has shown how ART roll-out has promoted economic growth (Tompsett (2020)) and reduced social violence in the African continent (Berlanda et al. (2024)). Despite evidence of spillover effects of major health policies,

[2] https://www.unaids.org/sites/default/files/media_asset/live-life-positively-know-your-hiv-status_en.pdf

there is still no evidence of any effect of this campaign on women's empowerment.

In this paper, I will show how major health interventions, such as ART roll-out, have a positive impact on women's empowerment, defined as *power to achieve goals and ends*.[3] I perform my analysis using a repeated cross-section of rural clusters of Demographic Health Surveys (DHS), from 4 waves conducted in Malawi between 2000 and 2016[4]. Since information on the number of people receiving ART is not available at the sub-national level, I rely on a proxy to identify the communities that benefited the most from ART availability. To do so, I exploit the geographical variation of the scope of the treatment and the access to it. I measure the scope of treatment using HIV prevalence in 2000 for each cluster. In this way, I capture the number of potential beneficiaries of the treatment in each community at the peak of the HIV pandemic. The second source of information I use is effective access to the treatment. Using data on health facilities' location, road network, and geography, I construct a measure of access to health for each cluster in my sample. Proximity to facilities is a crucial determinant of access to health services in rural SSA Guenther et al. (2012); Koole et al. (2014). Then, I construct a measure of benefit from ART using the interaction of these two terms.

In this work, I perform an intention-to-treat (ITT) analysis to study the effect of proxies for benefits from ART before and after 2004 in rural Malawi. Because of data availability, I do not have information about the timing of treatment provision for each clinic, so I assume that each health facility started providing ART in 2004. This approach can be viewed as a conservative one, since considering all clinics treated at the same time would eventually imply an attenuation bias. In my baseline analysis, I include all the health facilities of the country in 2013, but results are robust if I restrict the clinics only to the ones actually providing ART in 2013 or to the public ones. I find that higher exposure to treatment, both in terms of the number of beneficiaries and access, has led to an increase in women's empowerment after 2004. In particular, higher exposure to ART is associated with more decision-making by women, a bigger share of women

[3]Following Demographic Health Surveys guidelines (https://dhsprogram.com/pubs/pdf/CR20/CR20.pdf), I define empowerment as *power to achieve goals and ends* and not as power *over* others.

[4]DHS collected 4 waves in Malawi over the period 2000-2016: 2000, 2004, 2010, 2015-16

never justifying intimate partner violence, and a lower likelihood of experiencing physical violence. One possible concern with my empirical approach is that, despite the set of fixed effects included in the analysis, I might be capturing the effects of some contemporaneous policies. However, in my analysis, I rule out the possibility that my results are driven by confounders such as education campaigns, shifts in cultural norms, and measures to support women's employment. The main channels through which ART expansion affected women's empowerment are economic empowerment, through a positive effect on women's participation in the labor market, and human capital channel, through a positive effect on young women's education.

This paper contributes to the literature in several ways. The first contribution concerns the understanding of the relationship between HIV/AIDS epidemic and women's empowerment. Previous literature has studied how lack of empowerment and poverty expose women to HIV/AIDS epidemic in Africa (Türmen (2003); Mufune (2015); Ramjee and Daniels (2013)), showing a relationship between lack of empowerment and poor health (Bashemera et al. (2013)). This work first provides an example of how health interventions are viable instruments for policymakers to promote women's empowerment. A second contribution is providing new insight into the spillover effects of major health interventions in the context of HIV/AIDS epidemic. This paper complements previous research on the effects of ART availability. Earlier studies have demonstrated ART's impact on fostering productivity and time devoted to work (Baranov et al. (2015)), on investment choices (Baranov and Kohler (2018)), on economic growth (Tompsett (2020)), and on social stability (Berlanda et al. (2024)). This paper complements this literature by providing evidence about the effect of ART on the extensive margin of female labor supply and investment in education. Finally, this work contributes to the literature by studying the relationship between health and human capital. Becker (2007) provides a theoretical framework explicitly introducing health in a human capital model. The following literature showed that, according to Becker's prediction, improving health conditions has a positive effect on productivity (Hokayem and Ziliak (2014)), and promotes investment and human capital accumulation (Goodman-Bacon (2021); Papageorge et al.

(2021)).

The remainder of the paper is organized as follows. Section 2 provides background on Malawi and its ART roll-out campaign. Section 3 describes the data used for the analysis. Section 4 describes the empirical approach used in the paper, and Section 5 discusses the main findings. Section 6 investigates the channels through which health policies affect women's empowerment. Section 7 summarises the results and discusses their implications.

2 Historical Background

Management of the HIV pandemic in Malawi provides a unique setting to study the effect of the introduction of ART on women's empowerment. Malawi is a landlocked, low-income country in Eastern Africa with an estimated population of 18.6 million people as of 2019 (World Bank). With a GDP per capita of $583 (World Bank, 2019), Malawi is one of the poorest countries in the world. Over 80% of the population lives in rural areas, and the country's economy heavily relies on agriculture. The HIV/AIDS pandemic is the main public health issue in Malawi, where 10.6% of the adult population (15-64) was living with HIV in 2016.[5] This epidemic disproportionately affects women: in the adult population HIV prevalence among them is 12.8%, compared with 8.2% among men. Women and girls in Malawi experience worse living conditions and opportunities than their male counterparts, as shown by socio-economic indicators about education and labor outcomes (WEF (2021); World Bank (2021)). In 2021, the secondary education gender parity ratio in the country was still 84%, with a proportion of over 60 men for 40 women in universities. Due to a lack of resources, women-managed plots in the agricultural sector, the most important for the economy, are 25% less productive than the ones managed by men. The most significant barrier to gender equality and women's empowerment in the country is frequently identified as the disparity in access to economic resources.[6] Lack of access to education and resources, makes women more

[5] Malawi Population-Based HIV Impact Assessment (MPHIA), 2015-16

[6] https://www.usaid.gov/gender-equality-and-womens-empowerment

exposed to poverty and consequently increases their exposure to HIV (Mufune (2015); Anderson (2018)). At the same time, as shown by Baranov et al. (2015), exposure to HIV in Malawi has reduced people's labor provision. This reduction especially affects women because of their traditional role as caregivers within the household. The HIV pandemic creates a vicious cycle where the disease leads to poverty, and poverty increases exposure to the disease due to behavior and deteriorating health conditions. This cycle disproportionately affects women, resulting in reduced access to economic resources and further hindering women's empowerment.

ART roll-out campaign. Despite the first ART being discovered in the US in 1987, the treatment was not available in the African continent because of its prohibitive price. Only in the early 2000s, thanks to public opinion and international institutions' support, the price dropped dramatically and the treatment became available worldwide.[7] Before 2004 ART in Malawi was de facto not available, and only 3000 people out of approximately 930,000 HIV-positive people were on ART. In 2003 Malawian government announced that it would have provided free ART to all individuals living with HIV eligible for treatment.[8] One important feature of the ART rollout in Malawi was that it happened mainly through already existing clinics and hospitals. Because of very rigorous requirements for clinics, the expansion of the program was slow and by the end of 2005, only 60 health facilities were providing ART. Starting in 2006, in order to maximize ART coverage in the country, the Malawian government relaxed the standards for health facilities to access the program, making eligible all clinics with at least one data clerk (Baranov and Kohler (2018)). As a result of this change in the policy, by the end of 2010, the number of clinics providing ART was over 300, reaching a total of 716 ART clinics in the country by 2015 (Jahn et al. (2016)).

[7] In 2001 ART drugs price dropped from over 10000 $ to less than 1000$ per person/year (Tompsett (2020)).

[8] ART eligibility depended, according to WHO guidelines of the time, on the lymphocyte count of a patient. In 2004 were eligible all the patients in clinical stages 3 and 4 of the disease or patients with lymphocyte counts below 200 cells/μL

As enrollment, geographical coverage has been crucial for the success of the program since enrollment and adherence to the program are very costly for patients. ART recipients are required to visit a health facility every two weeks in the first month after the treatment begins. They should then visit once per month in the following semester and after that once every 3 months. For this reason, distance from a health facility has been crucial for access and adherence to treatment in Malawi (Koole et al. (2014)).

3 Data

To study the effect of ART availability on women's empowerment in Malawi, I use survey data collected by the Demographic and Health Surveys Program (DHS). The surveys were conducted in the years 2000, 2004, 2010, and 2015. As units of observation for the analysis, I use clusters, i.e. groupings of households that participated in the surveys, located in rural areas of the country. For each cluster DHS reports the GPS coordinates, however, to ensure respondent confidentiality, latitude and longitude are randomly displaced by a few kilometers.[9] The resulting dataset is a repeated cross-section containing a total of 2210 rural clusters over the 4 waves of the DHS survey.[10] I match each DHS cluster with the respective administrative unit, assigning each to the respective Region, Province, and Traditional Authority Area, the most granular administrative unit in the country (*admin3*).[11] In the analysis, I exploit variation across DHS clusters within waves and Traditional Authority Areas. For each unit of observation, I compute the indicators of women's empowerment according to DHS guidelines and I create a measure of exposure to ART in the country. Table A1 reports summary statistics of the variables

[9] Clusters are divided between urban clusters, which contain an error ranging between 0 and 2 km, and rural clusters, which contain an error ranging between 0 and 5 km. Moreover, there is a 1% of rural clusters displaced between 0 and 10 kilometers. The displacement is restricted so that the points stay within the country and the DHS survey region.

[10] More specifically, I have 435 rural clusters for the 2000 wave, 445 for the 2004 wave, 669 for the 2010 wave, and 661 for the 2015 wave.

[11] To do so, I construct a 5 km buffer around each rural cluster, and then I assign it to the most likely administrative unit.

described in Section 3.

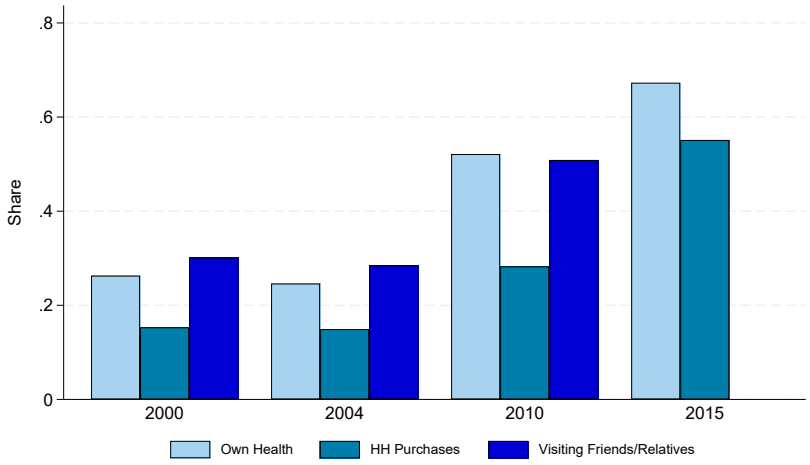
3.1 Women's empowerment Indicators

Decision Making. Following DHS guidelines[12], I define empowerment as *power to achieve goals and ends* and not as power *over* others. DHS measures women's empowerment in terms of control over various aspects of life and the surrounding environment. The main indicator of women's empowerment in the Malawi surveys is participation in decision-making. The relevant questions about women's decision-making are contained in Individual Recode (IR), the DHS dataset containing one record for every eligible woman as defined by the household schedule. DHS questionnaires aim to investigate decisional power in different spheres of a woman's life: i) the personal sphere, asking about decisions on respondents' health; ii) the family sphere, asking about big purchase decisions in the household; iii) the public sphere, asking about decisions on visiting friends or relatives.[13] Following DHS guidelines, I create an indicator variable for each of the three questions, assigning a value of 1 if the decision-maker is the respondent or the respondent along with her husband/partner. For each cluster and wave, I compute the share of married women participating in decision-making. The data are presented in Figure 1. Figure 1 displays an increase in women participating in each of the decisions over time, dramatically increasing after 2004. Following DHS guidelines, I define as *empowered* the women participating in all the decisions discussed above. I create two outcome variables that capture the decision-making process. The first variable, labeled as *All Decisions*, is the share of women participating in all the decisions available in each year. The second variable, labeled as *Own Health & HH Purchases*, restricts the analysis only to the decisions i) and ii), for which I have information in all 4 waves.

[12] https://dhsprogram.com/pubs/pdf/CR20/CR20.pdf

[13] More specifically, women are asked who usually makes decisions about each aspect of their lives. Possible answers include "respondent alone," "respondent and husband/partner," "respondent and another person," "husband/partner alone," or "someone else."

Figure 1: Women's empowerment Indicators: Decision Making



Notes: The figure shows the evolution of decision-making indicators over time. Light blue bars (*Own Health*) show the time evolution of the share of currently married women participating in decision-making about their own health. Bright blue bars (*HH Purchases*) show the time evolution of the share of currently married women participating in decision-making about big purchases in the household. Blue bars (*Visiting Friends/Relatives*) show the time evolution of the share of currently married women participating in decision-making about visits to friends and relatives. Data are from DHS collected in Malawi over the period 2000-2016.

Attitude Towards Intimate Partner Violence (IPV). As a measure of women's empowerment, I use data on women's and men's attitudes toward intimate partner violence (IPV). Since 2000, DHS surveys have asked women and men under which circumstances they find it justifiable for a husband to exert physical violence on his spouse. The questionnaire covers a broad range of answers regarding various aspects of women's lives, including their roles in the household, community, and sexual life. This variable takes a value of 1 for individuals who never justify violence. I then use this information to compute the share of women and men who never justify IPV in each cluster.

Domestic Violence. As an alternative proxy for women's empowerment, following UN directive (Walby (2007)), I use data on women experiencing physical violence. DHS surveys from 2004 ask women if they have experienced physical violence in the 12 months before the interview. I then use this information to compute the share of women and men who never justify IPV in each cluster.

3.2 Benefit from ART provision program

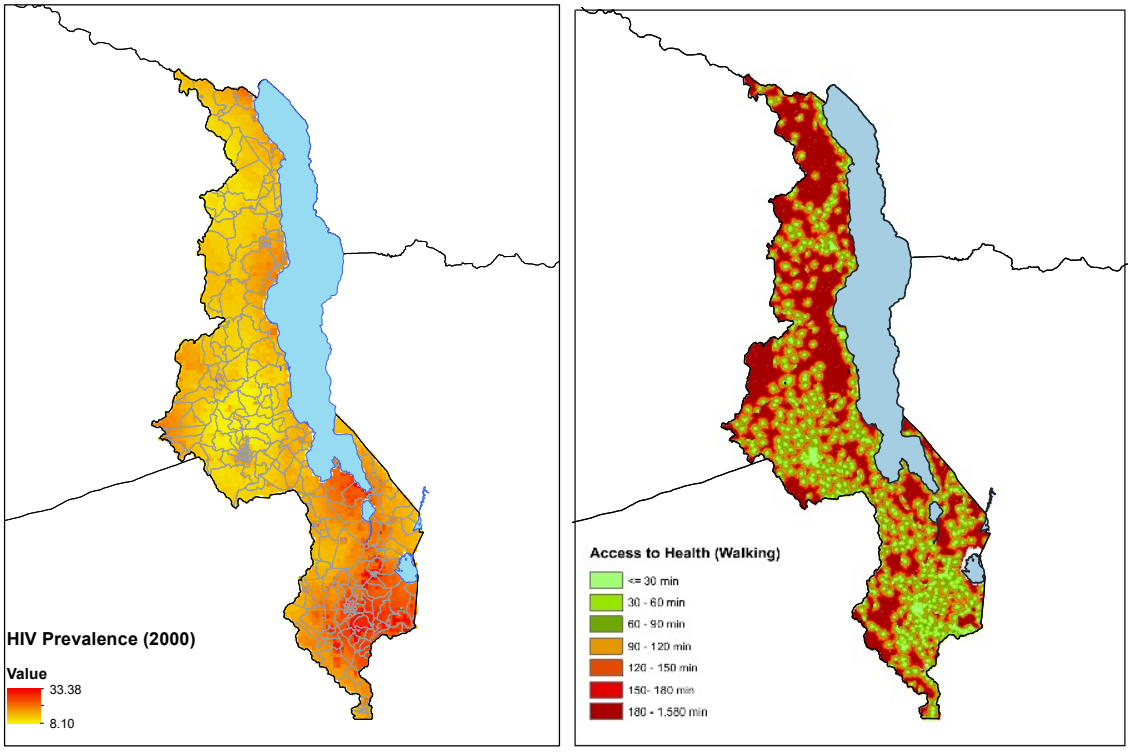
As mentioned in Section 2, in 2004 the Malawian government started a program to provide free ART to HIV-infected people in 9 hospitals situated in urban areas of the country. In the following years, the program expanded to other clinics in the country, both in urban and rural areas. Since detailed data on the program provision are not available, I use two time-invariant measures to evaluate the beneficial effect of ART availability at the cluster level. The first one is the share of adult population (15-49) living with HIV in 2000. This variable is meant to capture the scope of the treatment, i.e. the beneficiaries from ART in a cluster. Considering the random displacement of the clusters, I assigned to each cluster the average HIV prevalence in 2000 within a radius of 5 km from the GPS coordinates in the survey. Panel (a) of Figure 2, shows the spatial distribution of HIV prevalence in the country. In the sample HIV prevalence in 2000 ranges between around 9% and 32% with an average value of around 17%.

The second measure is an interaction between the number of beneficiaries, given by the number of HIV-positive people in 2000, and the effective access to treatment, given by proximity to the closest health facility. I measure proximity as the walking distance of each cluster from the closest health facility (panel (b) of Figure 2). Using the software AccessMod (Ray and Ebener (2008)) I construct a Friction Surface Raster combining raster images of roads (Google Street View), rivers, land cover (Figure A1), and data on topography (Figure A2). Following Palk et al. (2020), I define the walking speed for each cell of the Friction Surface Raster, and I compute the distance in minutes from the closest health facility for each cell of the grid (Table A4). The final result is a map of access to health by walking at a resolution of 30 meters $\times$ 30 meters. Taking into account the coordinates randomization made by DHS, I then assign to each cluster the average value within a 5 km radius. In the rural clusters sample, the average walking time of each cluster from the closest health facility is 98 minutes, ranging between 28.9 and over 470 minutes.

Distance from health structures is a reliable proxy for access to health care in Africa (Guenther et al. (2012)), and, in particular, is a significant predictor for access and

adherence to ART in rural areas (Koole et al. (2014)). The combination of these two elements, i.e. HIV prevalence and proximity, captures the potential benefit in a DHS cluster from ART provision after 2004: the greater the number of recipients, the greater the benefit of ART availability. At the same time, the closer a health facility is, the higher is the probability of actually receiving the treatment.

Figure 2: Exposure to Treatment



(a) HIV Prevalence (b) Distance from Health Facilities

Notes: Panel (a) shows the spatial distribution of HIV prevalence in Malawi in 2000; data source: IHME, Sartorius et al. (2021). Panel (b) shows the distance in minutes of each location in Malawi from the closest health facility; data source: author's computations.

Data on HIV prevalence are from the Institute for Health Metrics and Evaluation (IHME)(Sartorius et al. (2021)). Using data on HIV and geographical location from surveys and sentinel surveillance of antenatal care clinics, IHME produced estimates for HIV prevalence among the adult population. The estimates are produced at a 5×5 km grid level and cover 47 countries in Africa for a period between 2000 and 2017. In the analysis, I use HIV prevalence in 2000 in Malawi, to capture the HIV epidemic in the

country right before ART became available in the African continent.

Data on health facilities come from the Malawi DHS Service Provision Assessment (SPA) 2013-2014. This survey covers health facilities active in Malawi between 2013 and 2014, providing information about location, type of facility, and the services provided for 997 health facilities. In the analysis, I exploit for robustness exercises information about the owner of the clinic, namely if it is public or private, and if in 2013 the clinic was part of the ART program provision. Figure A3, shows the spatial distribution of health facilities in Malawi, and it reports information about who manages each facility.

3.3 Additional Data

In my analysis, I exploit information on women's employment status, educational attainment, and living in a polygynous household[14]. All those variables are constructed using DHS surveys over the period 2000 and 2015-16. The women employment indicator measures the share of married women who have been employed in the 12 months before the interview.[15] As educational attainment measure I use the share of women who completed primary education, and I compute this measure both for the married women in my baseline analysis and for all the young women (15-24) in DHS surveys.[16] Finally, I use the number of co-wives reported by each woman to determine the share of polygynous households.[17] In some robustness exercises, I also use educational and labor market outcomes for the male population in the same age group within the cluster.

[14] Polygyny is defined as the marriage of a man with several women.

[15] https://dhsprogram.com/data/Guide-to-DHS-Statistics/Employment_and_Occupation.htm

[16] https://dhsprogram.com/data/Guide-to-DHS-Statistics/Educational_Attainment_of_Women_and_Men.htm

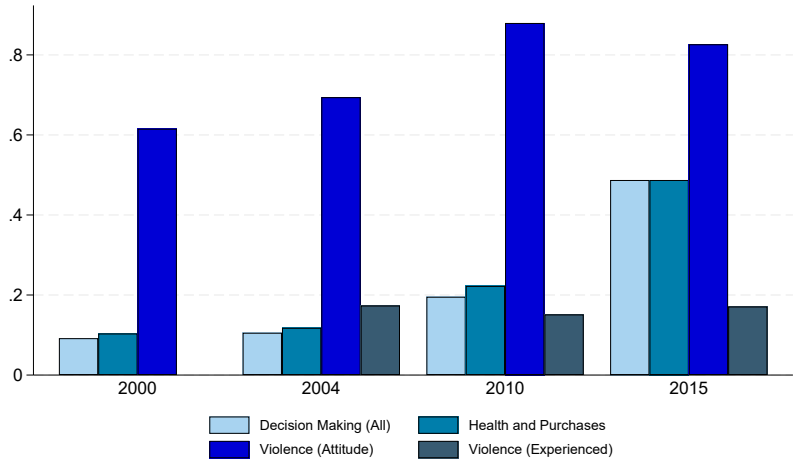
[17] https://dhsprogram.com/data/Guide-to-DHS-Statistics/Number_of_Co-Wives_and_Number_of_Wives.htm

4 Empirical Strategy

4.1 A Graphical Illustration

As discussed in section 2, the HIV pandemic disproportionately affects women in the African continent. Lack of women's empowerment, cultural norms, and biology are crucial factors in explaining why women in Africa are more affected by HIV (Anderson (2018); Türmen (2003); Kim et al. (2008); Ramjee and Daniels (2013)). Figure 3 shows the time evolution of the raw mean of the main outcome variables discussed in Section 3. The summary statistics show a large improvement in women's empowerment after 2004, which coincided with the ART rollout campaign to combat the HIV epidemic. Despite it being a simple correlation, these first pieces of graphical evidence suggest a potential relationship between ART provision and an improvement in women's empowerment in the country.

Figure 3: Outcome variables



Notes: The figure shows the time evolution of women's empowerment indicators over time. Light blue bars (*Decision Making (All)*) show the time evolution of the share of currently married women participating in all the decisions available in each specific year. Bright blue bars (*Own Health & HH Purchases*) show the time evolution of the share of currently married women participating in decision-making about their own health and big purchases in the household. Blue bars (*Violence (Attitude)*) show the time evolution of the share of currently married women who never justify IPV. Grey bars (*Violence (Experienced)*) show the time evolution of the share of currently married women who have experienced physical violence in the 12 months before the interview. Data are from DHS collected in Malawi over the period 2000-2016.

4.2 Baseline Analysis

I study the impact of ART availability on women's empowerment indicators in Malawi using a repeated cross-section of (2210) DHS clusters, from four DHS rounds conducted between 2000 and 2016. I exploit the Malawian government's campaign started in 2004 to provide ART free of charge in health facilities described in Section 2. The implementation of this policy has been staggered over time across the country. It is then crucial that the timing of the policy has been exogenous to women's condition in the country. According to Baranov and Kohler (2018), the Malawian government's aim has been reaching the maximum geographical coverage for ART provision, so the timing of policy implementation should be a concern. In this work, because of data limitation, I adopt a more conservative approach and I assume that every clinic in the country started to provide the treatment after the year 2004. This approach allows me to rule out any potential endogeneity due to the timing of the campaign.

My analysis consists of an intention-to-treat (ITT) analysis, focusing on a proxy for ART coverage as the main variable of interest. Similarly to a difference-in-differences approach (DID), I evaluate its effects before and after 2004. The first difference with a standard DID is that my sample is composed of a repeated cross-section and then it is not possible to include the unit of observation fixed effects. The second difference is that my treatment is continuous and that every unit is treated after 2004. The main analysis equation takes the following form:

$$WomEmp_{c,t,a} = \beta \cdot Post_{2004} \cdot Exposure_c + \gamma \cdot Exposure_c + \theta_{r,t} + \eta_a + \epsilon_{c,t,a} \qquad (1)$$

$WomEmp_{c,t}$ represents different women's empowerment indicators, measured as the share of women in a cluster participating in decision-making about their life, the share of women who never justify IPV, and the share of women who experienced domestic violence in the 12 months preceding the surveys t. $Exposure_c$ is a time-invariant measure of exposure to treatment once it becomes available. As discussed in Section 3, I compute this measure at the cluster level exploiting geographical variation in the access and scope of the treatment. The first and simplest measure relies on geographical

variation in the scope of the treatment, which is proxied by the HIV prevalence in the year 2000 and reflects the number of people benefiting from it. This measure ($HIV_{2000,c}$) allows a simple interpretation of results, but it doesn't take into account effective access to the treatment. Therefore, I build a variable capturing the effective exposure to the treatment, which is a crucial factor in explaining access to health in rural areas of SSA. The second measure of $Exposure_c$ relies on the interaction between the scope of treatment and effective access to health measured as proximity to the closest health facility ($\cdot HIV_{2000,c} \cdot Proximity_c$). The rationale for this measure is as follows. First, HIV prevalence in 2000 in a cluster captures the share of the adult population that will benefit from ART once it becomes available. Second, following Koole et al. (2014), distance from health facilities captures how easy, and then likely, it is to access and adhere to the treatment once it's available. The proximity-based exposure indicator monotonically increases with the number of beneficiaries and access to treatment. I use as a measure of proximity to health facilities the inverse of the walking distance from the closest health facility as discussed in Section 3. I interact then the $Exposure_c$ variable with a binary indicator, $Post_{2004}$, taking value 1 for DHS conducted after 2004: coefficient β captures the potential benefit from access to ART once it becomes available.

I include then an exhaustive set of fixed effects: $\theta_{r,t}$ captures fixed effects at region-year[18] level, while η_a captures fixed effects at Traditional Authority area level (admin 3). In my analysis, I include 204 admin3 areas, allowing me to relax the concerns about the cross-sectional structure of my data, and exploit variation within each unit. Standard errors are clustered at the Traditional Authority area level.

Identification. The identification of the effect of exposure to ART on women's empowerment in equation 1, β, relies on the assumption that the measure of exposure to treatment is uncorrelated with unobserved or omitted factors in the error term $\epsilon_{c,t}$. Conditional to the set of controls and fixed effects included in the main analysis, the two elements of the measures of exposure to treatment, HIV prevalence and proximity to the

[18] With region I refer to the three Administrative 1 units of Malawi: Northern Region, Central Region, and Southern Region

closest health facility, are exogenous to women's empowerment indicators. Before 2001, ART was not available in the African continent so policymakers didn't have any valid instrument to contrast effectively the epidemic. For this reason, it is safe to assume HIV prevalence in a cluster is related to specific historical, cultural, and social factors. Those factors are taken into account by the vast set of fixed effects included in the regression. In particular, Traditional Authority Areas[19] fixed effects take into account differences in cultural, social, and gender norms that have played a role in the spread of HIV. A second crucial aspect is that the clinics' location, and then their distance, is not related to policies affecting women's empowerment or ART provision. This could be the case if the government has built new health facilities trying to boost the provision of ART or if health facilities have been used for other policies that could have an impact on women's empowerment. Baranov et al. (2015), Baranov and Kohler (2018), Dickerson et al. (2020), have shown how the Malawian government did not target specific areas for the ART roll-out and that it used health facilities already existing in 2004 for policy implementation. The inclusion of Traditional Authority area fixed effects helps again in taking into account any systematic difference in clinic availability due to ethnic and cultural factors. Finally, the inclusion of region-wave fixed effects takes into account any shock change in policy at the national and regional level that may have had an impact on both access to treatment and women's empowerment.

Pre-trend analysis. Given that my identification strategy mirrors a DID approach, I assess if the treatment had any impact during the pre-treatment period. This verification ensures that the policy was not intentionally implemented in regions with lower levels of women's empowerment. Initially, I define a binary treatment variable based on HIV prevalence, where clusters with HIV prevalence above the median in 2000 are considered treated. This new variable is then used to test whether clusters with high or low HIV prevalence in the reference year exhibit different characteristics. Table A2 presents the summary statistics for both groups before and after 2004. Before the treatment period,

[19] According to UN, Traditional Authorities act as custodians of the cultural and traditional values of community link [Accessed: 09/12/2021]

we do not observe any systematic differences between the two groups regarding women's empowerment indicators, educational outcomes, and labor force participation. However, areas with lower HIV prevalence tend to be located further away (half standard error difference). Subsequently, I regress the HIV binary indicator on dummy variables for each wave of the DHS surveys, using the 2004 wave as the reference. Since my dataset includes only 4 time periods, to test the absence of pre-trends, I run the baseline analysis limiting the time horizon to the pre-treatment period. Table A5 reports the results of the analysis described in Equation 1 for the 2000 and 2004 waves. The results suggest that none of our variables of interest are correlated with women's empowerment indicators before the treatment became available. Combined with the evidence provided in Section 4.1, these exercises suggest that the results are not driven by trends in the pre-treatment period.

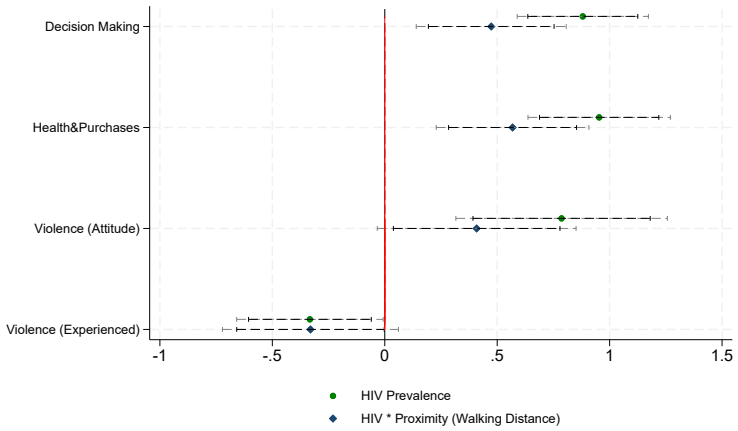
5 Results

Baseline Analysis. Figure 4 and Table A6 report the results for the impact of exposure to ART on women's empowerment using the estimation strategies discussed in Section 4. The figure shows the results for the share of women participating in decision-making, the share of women who never justify IPV, and the share of women who experienced domestic violence in the 12 months prior to the interview.

The first panel shows the results of ART availability on the share of women who report participating in decision-making. The second panel shows results for the decision-making indicator constructed using the sub-sample of decisions, on women's own health and major purchases in the household, covered over the entire period by DHS surveys. Estimates show a positive and statistically significant relationship between both the decision-making variables and the measures of exposure to treatment after the year 2004.

The last two panels focus on IPV. The third panel of the figure explores the relationship between ART introduction and the attitude toward IPV. The final panel of the

Figure 4: Baseline Analysis



Notes: OLS Estimates for effect of ART availability on women's empowerment, using specification described in equation 1. I use two proxies to measure exposure to ART. The first one, the HIV prevalence in 2000 (green squares), is meant to capture the number of potential recipients of the treatment. The second one is the interaction between HIV prevalence and access to the clinic ($HIVxProximity$), which combines the prevalence of HIV with access to ART (blue dots). $Proximity$ is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). This variable is meant to capture the exposure to ART combining the number of recipients and effective access to the treatment.

Dependent variables: first panel (*Decision Making (All)*), the share of currently married women participating in all the decisions available in each specific year; second panel (*Health & HH Purchases*), the share of currently married women participating in decision making about their own health and big purchases in the household; third panel (*Violence (Attitude*), the share of women who never justify intimate partner violence; fourth panel (*Violence (Experienced)*), the share of currently married women who have experienced physical violence in the 12 months before the interview. More details on the outcomes variables are provided in Section 3. Black lines show the 95% confidence interval, grey lines show the 90% one.

figure reports the effect of ART availability on the share of women experiencing physical violence in the 12 months before the interview. Estimates show an increase in women who never justify IPV and a decrease in the ones experiencing it after 2004.

While the OLS analysis shows a strong significant effect of ART on promoting women's empowerment, it is not straightforward how to quantify the effect of exposure to ART. To provide an example of that, we can interpret the results for the analysis using only HIV prevalence as a proxy for the benefit of ART. The total effect of a 1 p.p. increase in HIV prevalence in the post period, summing up the effect before and after 2004, is an increase of around 0.74 p.p. on all decision-making variables, a 0.42 p.p. increase in the share of women never justifying IPV, and a decrease of 0.18 p.p. on the

share of women experiencing physical violence. This means that for the average cluster in terms of HIV prevalence, the introduction of ART implied an increase in decision-making indicators of over 12 p.p., an increase in the share of women never justifying IPV of 7.5 p.p., and a decrease in physical violence of around 3 p.p. This effect explains around 30% of the total increase in average decision-making indicators observed in the data. Regarding attitudes toward IPV, our results explain a 50% increase in the average share of women who never justify IPV.[20]

Table A7 reports results for baseline analysis analyzing the effect of ART expansion on the single components of the decision-making indicators. Column (1) presents the results of the baseline analysis. Column (2) shows results for the share of women participating in decision-making about their own health. Column (3) presents results for the share of women taking part in decision-making on big purchases for the household. Finally, column (4) shows results for the share of women who participate in decision-making about visiting friends or relatives. All the ART availability proxies show a positive and robust correlation with all the components of the women's empowerment indicators.

Robustness. Despite the extensive set of fixed effects included in the regression, concerns about the validity of the results may still arise. The primary concern is that my analysis might be capturing variations influenced by other factors, such as the implementation of the Millennium Development Goals or cultural elements that may have impacted women's empowerment after 2004. To address this, I incorporate additional controls in my baseline analysis. Although these controls may present endogeneity issues, they help account for these factors. First, I control if the results are driven by improvement in women's education. More educated women tend to be more empowered, and during the period of my analysis, the percentage of women completing primary school rose from 11% in 2000 to over 25% in 2015. Second, I examine whether the results are influenced by an increase in women's employment in the country. Women's economic

[20] In the estimation sample the share of women participating in all decisions increases from 10.4% to 34.4%. The share of women never justifying IPV rises from 69.4% to 85.4%. The share of women experiencing domestic violence is reduced from 17.4% to 16%.

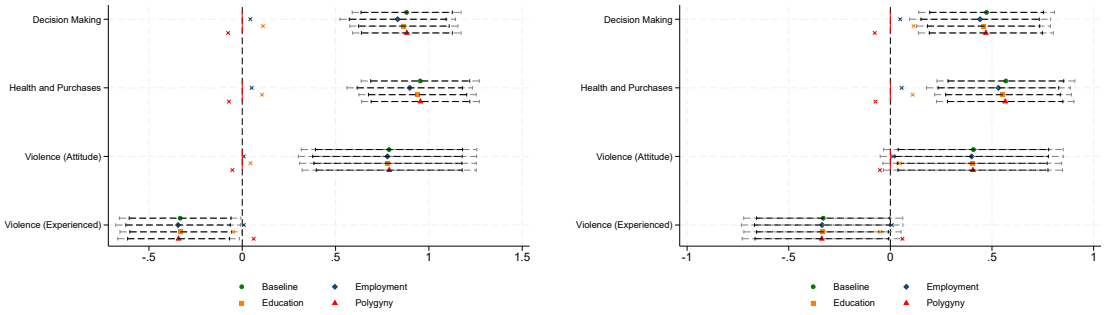
conditions are crucial determinants of empowerment, and during this period, the country's economic situation improved significantly, with GDP per capita increasing from $156 in 2000 to $380 in 2015. Lastly, I assess whether the results are affected by changes in cultural norms, such as polygyny[21], that limit women's empowerment. Despite polygyny is not legal in Malawi, in the year 2000 over 18% of women in my sample were living in a polygynous household. Despite government efforts to combat this practice, nearly 15% of women in the sample were still in such households in 2015.

Tables A8, A9 and A10 show the results for baseline analysis including each of the controls discussed above. Results from the previous tables are summarized in Figure 5, where I plot the main coefficient for each of the regressions and the single coefficient for the added control variable. The inclusion of each of the controls does not affect baseline results either in terms of the magnitude of the effect or the significance. However, it is interesting to notice how each of these controls affects women's empowerment indicators. As expected, both higher education and employment lead to an increase in women's empowerment, by affecting decision-making. To what concerns physical violence, education is related to an improvement in the attitude toward IPV and a reduction in the experienced one, while employment does not seem to have any effect on it. On the other hand, living in polygynous households leads to a reduction in women's empowerment: polygyny is associated with lower decision-making and a higher chance of justifying and experiencing physical violence. In Table A11 I include all three exogenous controls at the same time, and results are still robust both in terms of significance and magnitude. As a further robustness in this direction, I control if my results are driven by a general improvement in men's condition. Then, I control for men's education (Table A12) and for men's employment (Table A13). Results of the coefficient of interest are qualitatively and quantitatively unaffected, however, while male education seems to be associated with more empowerment, their employment rate seems to be uncorrelated to it.

A second potential threat to my analysis is the fact that areas with high or low HIV prevalence present some systematic characteristics affecting my main findings. To test

[21] Polygyny is defined as the marriage of a man with several women

Figure 5: Robustness: control for confounds



(a) HIV Prevalence (b) $HIV \times Proximity$

Notes: OLS Estimates for the effect of ART availability on women's empowerment, controlling for potential confounds. I use two proxies to measure exposure to ART. In sub-figure (a) is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In sub-figure (b) I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. $Proximity$ is measured as the inverse walking distance from the closest clinic, in 15-minute units. Potential confounds: women's employment (diamonds), women's education (squares), and share of women living in polygynous households (triangles). The marker "X" represents the point estimates for the extra control variable.

Dependent variables: first panel (*Decision Making (All)*), the share of currently married women participating in all the decisions available in each specific year; second panel (*Health & HH Purchases*), the share of currently married women participating in decision making about their own health and big purchases in the household; third panel (*Violence (Attitude)*), the share of women who never justify intimate partner violence; fourth panel (*Violence (Experienced)*), the share of currently married women who have experienced physical violence in the 12 months before the interview. More details on the outcomes variables are provided in Section 3. Black lines show the 95% confidence interval, grey lines show the 90% one.

it I construct balance tables for cluster characteristics (Table A2) and for Traditional Authority Areas characteristics (Table A3).

Regarding the clusters, I observe that those with a higher prevalence of HIV tend to have higher population density and greater access to health facilities. To ensure that my results are not simply identifying more developed areas of the country, which could bias the findings, I perform additional analysis to rule out this possibility. Table A14 shows the results after including as controls population density and distance from the closest health facilities at the cluster level. Results are qualitatively and quantitatively unaffected.

As a further robustness test, I include in my analysis the unbalanced characteristic at cluster and TA as flexible controls. The variables considered for this analysis are

population density and access to healthcare at the cluster level, as well as the 1998 Census employment rate and primary education at the Traditional Authorities (TAs) level. I interact each of these variables with specific year fixed effects. Results are shown in Table A15. From this analysis, we can observe that the baseline results are qualitatively unaffected. However, the introduction of such a large number of controls, often statistically insignificant, adds extra noise to the regression, reducing the precision of the point estimates for the share of women who experienced domestic violence.

Another possible concern for my identification strategy is that I am capturing a general improvement in health conditions in the country and that my findings are unrelated to the ART roll-out. To exclude this hypothesis, I perform the same analysis using malaria instead of HIV. Malaria was chosen for this exercise because Malawi has one of the highest prevalence rates of this disease in the world, and it is one of the most serious health issues in the country. I compute malaria prevalence[22] in each cluster in the year 2000, and I construct my exposure measure interacting malaria prevalence with proximity to the closest health facility. Table A16 reports results of the baseline analysis showing no effect of malaria on women's empowerment indicators, besides a small effect, in terms of magnitude, on the combination of the three indicators. Results are then not driven by a general improvement in health conditions in the country but by improvements in the living conditions of HIV-positive people.

Finally, I conduct the baseline analysis using alternative measures of proximity to health facilities. Specifically, I use information from the 2013 DHS Service Provision Assessment (SPA) on clinic characteristics in the country. I then compute the proximity of each cluster to the nearest public health facility or the nearest facility providing ART in 2013, and use these measures to replace the ones in the baseline analysis. Table A17 reports the results of this analysis, showing that the baseline results are robust to different specifications of proximity. Finally, it is important to note that when the analysis focuses on clinics actually providing ART in 2013, the results increase in both

[22] Using data from Malaria Atlas Project, I define malaria prevalence as parasite rate for Plasmodium falciparum malaria for children two to ten years of age for the year 2000.

magnitude and precision, confirming that the baseline estimates can be considered a lower bound of the true effect.

6 Channels

Promoting women's empowerment and gender equality around the world has been one of the main objectives of international policymakers since the start of the millennium. In 2000, the United Nations included the promotion of empowerment and gender equality among the 8 Millennium Development Goals (MDGs)(UN (2000)). More specifically, the UN aimed to reduce the gender gap in education, increase the number of women working in the non-agricultural sector, and enhance women's political representation. Despite the progress made between 2000 and 2015, women's empowerment and gender equality have also been included as a cross-cutting issue among the 17 Sustainable Development Goals (SDGs) set by the UN in 2015, intended to be achieved by 2030 (UN Assembly (2015)). The SDGs do not explicitly refer to women's issues because the promotion of women's empowerment is considered a *conditio sine qua non* for achieving all the other goals (OECD (2013)). International organizations' strategies to promote women's empowerment rely on two main channels: promotion of women's economic empowerment[23] and education[24]. Through economic empowerment women can gain more power in terms of decision making, both in personal and public life, and more independence. Through education, especially of younger cohorts, women can acquire more human capital that can allow them to improve their economic conditions, improve their health, and give them more instruments to increase their decision-making.

How can health policies affect economic empowerment and education outcomes? Concerning labor market outcomes, previous literature has shown that the HIV pandemic reduced workers' productivity and labor participation among both HIV-positive and HIV-negative individuals. This effect is especially pronounced for women, as they have

[23] https://africa.unwomen.org/en/what-we-do/economic-empowerment_africa

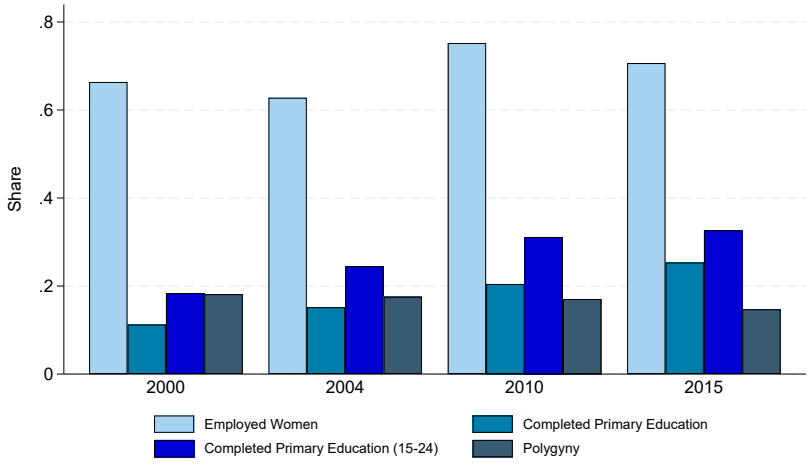
[24] https://www.un.org/en/chronicle/article/importance-educating-girls-and-women-fight-against-poverty-african-rural-communities

traditionally borne the burden of caring for ill family members. Availability of ART led to a recovery of labor productivity in the continent (Habyarimana et al. (2010); Bor et al. (2012)). Baranov et al. (2015) show that ART availability in Malawi led to an increase in labor market outcomes and that this effect is more pronounced for women, because of their traditional role as caregivers. Concerning education, the main references are Chicoine et al. (2021), for empirical evidence, and Becker (2007), for the theoretical framework. Chicoine et al. (2021) show how the HIV pandemic had a detrimental effect on human capital accumulation, and in particular on education outcomes. Becker (2007) introduces explicitly health as a component of the human capital model, predicting that better health improves educational outcomes. Another prediction of Becker's model is a reduction in the individual discount rate. In the context of the HIV epidemic, this comes through a dramatic increase in HIV-positive people's life expectancy. This improvement in health conditions both makes viable investments in education and gives the incentive to break social norms and personal situations harming women's empowerment (Papageorge et al. (2021)).

To investigate potential channels through which ART provision in Malawi has improved women's empowerment, I focus on changes in three main outcomes from DHS surveys: women's labor outcomes, women's education, and social norms. As a measure of labor market outcome, I use the share of women employed in the 12 months before the interview. As a measure of educational attainment, I use the share of women who completed primary school[25], among all women in my sample and among young women (15-24 yo). As a proxy for change in social norms, I use the share of women living in polygynous households. Figure 6 summarizes the time evolution of the potential channels over time. Women's employment rate follows a pattern similar to the one of women indicator variables used in the main analysis. The average share of employed women in the country is relatively constant until 2004 and, after that, shows a consistent increase. The share of women and young women who completed primary school is very low, espe-

[25]Malawian educational system defines as primary education the first 8 grade of schooling and, according to the 1994 Constitution, primary education is mandatory in the country.

Figure 6: Channels

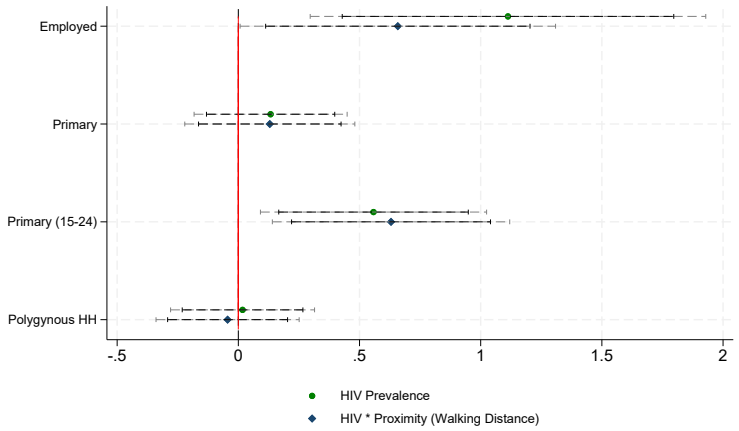


Notes: The figure shows the time evolution of the variables used in the channel analysis. Light blue bars (*Employed Women*) shows the time evolution of the share of currently married women who worked in the 12 months before the interview. Bright blue bars (*Completed Primary Education*) show the time evolution of the share of currently married women who have completed primary education (8 years of schooling). Blue bars (*Completed Primary Education (15-24)*) shows the time evolution of the share of young women (15-24) who have completed primary education (8 years of schooling). Dark grey bars (*Polygyny*) show the time evolution of the share of currently married women who are currently living in polygynous households. Data are from DHS collected in Malawi over the period 2000-2016.

cially considering that primary education in the country has been mandatory since 1994, but it shows an increase over time ranging from around 18% in 2000 to over 32% in the year 2015. The share of women living in polygynous households is relatively constant over time, with an average always higher than 15% of women in my sample.

Figure 7 and Table A18 show the results for the analysis of the channel using the same specification described in section 4. All the specifications of the exposure measures have a positive effect on women's employment, even if for the one using geodesic distance the effect is slightly not statistically different from zero (p-value = .16). The effect on education works only through the education of young women, where it's positive and statistically different from zero for all the specifications. The social norms channel, proxied by the share of women living in polygynous households, shows zero effect on health policies. This analysis suggests that economic empowerment, via increased employment, and human capital accumulation, via more education, are the main mechanisms through which ART expansion has promoted women's empowerment.

Figure 7: Channels Analysis



Notes: OLS Estimates for the effect of ART availability on women's empowerment, using specification described in equation 1. I use two proxies to measure exposure to ART. HIV prevalence in 2000 (HIV) mean to capture the number of potential recipients of the treatment (green dots). An interaction between HIV prevalence and access to the clinic ($HIVxProximity$ (Walking Distance)) that combines the prevalence of HIV with access to ART, measured as the inverse walking distance from the closest clinic (blue diamonds). This variable is meant to capture the exposure to ART combining the number of recipients and effective access to the treatment.
Dependent variables: first panel (*Employed*) share of currently married women who worked in the 12 months before the interview; second panel (*Primary*) share of currently married women who have completed primary education (8 years of schooling); third panel (*Primary (15-24)*) share of young women (15-24) who have completed primary education (8 years of schooling); fourth panel (*Polygynous HH*) share of currently married women who are currently living in polygynous households. More details on the outcomes variables are provided in Section 3. Black lines show the 95% confidence interval, grey lines show the 90% one.

I try to investigate then if ART expansion had a similar effect on men as on women. Figure A4 shows the time evolution for employment and education among the male population in my sample. Table A19 reports the results of the previous analysis on male outcomes. In this analysis, I replaced polygyny as a cultural norm proxy with the share of men who never justify IPV. ART expansion appears to not have any effect on men's outcomes. Concerning employment outcomes, this could be explained by the fact that the male employment rate in rural areas of the country has been constant and over 90% throughout the sample. Concerning primary education, the small increase observed in the data is likely to be explained by other education campaigns and then captured by the region-year fixed effects. Finally, we do not observe any effect on men's attitude towards IPV.

7 Conclusions

Showing the positive relationship between ART roll-out in Malawi and women's empowerment, this paper provides a first example of how major health interventions are viable instruments to promote women's empowerment.

The connection between the HIV/AIDS epidemic in Africa and women's empowerment is deeply intertwined. On one hand, cultural norms and gender-based violence limit women's empowerment and increase their vulnerability to the virus. On the other hand, the spread of HIV negatively impacts women's empowerment, particularly in terms of economic opportunities and education, due to their caregiving roles in many African societies. This creates a vicious cycle: lower empowerment leads to a higher spread of the virus, and as HIV spreads further, women's empowerment diminishes even more.

The introduction of ART (antiretroviral therapy) has provided a crucial tool for breaking this cycle. The availability of treatment has significantly reduced new infections and improved the health of people living with HIV, thereby reducing the burden on women both in terms of their risk of exposure to the virus and their caregiving responsibilities. In the context of the HIV/AIDS epidemic in Malawi, the ART roll-out campaign has positively impacted women's empowerment, particularly in decision-making and reducing instances of violence. This impact stems from the beneficial effects of ART on women's economic empowerment and human capital development.

The validity of these results extends beyond the HIV/AIDS epidemic in Malawi in Africa. The 2020 COVID-19 epidemic showed a similar negative effect of epidemics on women's empowerment. My results suggest that policymakers should take into account health interventions as instruments to promote empowerment.

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A Appendix

The appendix section is organized as follows:

- Data:
  - Table A1 reports the summary statistics of the main variables used in the paper.
  - Table A2 reports the summary statistics of the main characteristics of clusters used in the analysis splitting them by high and low HIV prevalence in 2000.
  - Table A3 reports the summary statistics of selected variables from the 1998 Census splitting the sample between Traditional Authority Areas with high and low HIV prevalence in 2000.
  - Figure A1 shows the Land Use Map of Malawi.
  - Figure A2 shows the Digital Elevation Model of Malawi.
  - Figure A3 shows health facility locations in the country, classifying them according to the type of facility.
  - Table A4 shows the travel speed by different landscape characteristics used to calculate access to health.
- Baseline analysis and robustness:
  - Table A5 reports the results of the baseline analysis for the pre-treatment period.
  - Table A6 reports the results of the baseline analysis.
  - Table A7 reports the results of the baseline analysis showing the effect of ART expansion on each component of the decision-making indicator.
  - Tables A8, A9, A10, A11, A12. and A13 report the results of the baseline analysis introducing potential (endogenous) confounders in the analysis.
  - Tables A14 and A15 report the results once controlling for clusters', or Traditional Authority Areas', characteristics which are unbalanced in the sample.
  - Table A16 reports the results of the placebo analysis where I replace HIV prevalence with Malaria prevalence.

  - Table A17 reports the results of the baseline analysis using a sub-sample of clinics in the country, namely clinics providing ART in 2013 and public clinics.

- Channels analysis and robustness:

  - Table A18 reports the results of the channels analysis.
  - Table A19 reports the results of the channels analysis on men's outcomes.

Table A1: Summary Statistics

	Full Sample				
Outcome Variable	N	Mean	SD	Min	Max
Own Health Decision	2210	0.460	0.248	0.000	1.000
HH Purchase Decision	2210	0.310	0.227	0.000	1.000
Visiting Relatives Decision	1549	0.385	0.201	0.000	0.917
All Decisions	2210	0.244	0.218	0.000	1.000
Health & HH Purchases Decisions	2210	0.257	0.215	0.000	1.000
Experiencing physical violence (12 months)	1775	0.164	0.138	0.000	0.833
Never justify wife-beating (Wom)	2210	0.775	0.183	0.125	1.000
Never justify wife-beating (Men)	2177	0.877	0.201	0.000	1.000
Cluster Characteristics	N	Mean	SD	Min	Max
Geodesic distance from health facility (km)	2210	4.411	2.676	0.056	23.979
Population Density (2000)	2210	171.653	125.959	0.695	1633.243
HIV prevalence (2000)	2210	0.174	0.054	0.090	0.326
Malaria (2000)	2210	0.406	0.105	0.155	0.694
Employment rate (Wom)	2210	0.696	0.219	0.000	1.000
Employment rate (Men)	2177	0.950	0.155	0.000	1.000
Completed primary (Wom)	2210	0.190	0.156	0.000	0.833
Completed primary (Men)	2177	0.320	0.277	0.000	1.000
Completed primary (Wom) 15-24	2210	0.277	0.212	0.000	1.000
Completed primary (Men) 15-24	2006	0.333	0.330	0.000	1.000
Polygyny	2210	0.166	0.124	0.000	0.750

Notes: Summary Statistics for the main variable included in the paper.

Table A2: Summary Statistics - High vs Low HIV prevalence

PANEL A	Balance Tables - Pre-2004							
	HIV 2000 ≥ Median			HIV 2000 < Median			Difference	
Cluster Characteristics	N	Mean	SD	N	Mean	SD	Diff.	p (2-tailed)
Geodesic distance from health facility (km)	449	3.812	2.152	431	5.139	2.885	-1.327	0
Population Density (2000)	449	237.335	157.815	431	122.440	64.782	114.895	0
HIV prevalence (2000)	449	0.223	0.042	431	0.130	0.019	.092	0
Malaria (2000)	449	0.447	0.103	431	0.365	0.084	.082	0
Employment rate (Wom)	449	0.650	0.251	431	0.639	0.214	.011	.482
Employment rate (Men)	434	0.905	0.227	417	0.935	0.178	-.029	.035
Completed primary (Wom)	449	0.125	0.134	431	0.137	0.141	-.011	.229
Completed primary (Men)	434	0.257	0.281	417	0.263	0.290	-.006	.757
Completed primary (Wom) 15-24	449	0.210	0.205	431	0.218	0.213	-.008	.594
Completed primary (Men) 15-24	367	0.342	0.373	361	0.290	0.346	.052	.049
Polygyny	449	0.148	0.125	431	0.210	0.139	-.061	0
PANEL B	Balance Tables - Post-2004							
	HIV 2000 ≥ Median			HIV 2000 < Median			Difference	
Cluster Characteristics	N	Mean	SD	N	Mean	SD	Diff.	p (2-tailed)
Geodesic distance from health facility (km)	656	3.750	2.203	674	4.988	3.008	-1.238	0
Population Density (2000)	656	217.171	140.439	674	115.065	62.961	102.106	0
HIV prevalence (2000)	656	0.214	0.040	674	0.130	0.020	.085	0
Malaria (2000)	656	0.442	0.110	674	0.369	0.091	.073	0
Employment rate (Wom)	656	0.722	0.198	674	0.737	0.205	-.015	.186
Employment rate (Men)	654	0.977	0.091	672	0.962	0.122	.015	.014
Completed primary (Wom)	656	0.221	0.147	674	0.236	0.162	-.015	.076
Completed primary (Men)	654	0.355	0.266	672	0.364	0.261	-.009	.527
Completed primary (Wom) 15-24	656	0.324	0.202	674	0.314	0.205	.01	.359
Completed primary (Men) 15-24	632	0.366	0.313	646	0.321	0.308	.045	.01
Polygyny	656	0.129	0.103	674	0.188	0.118	-.059	0

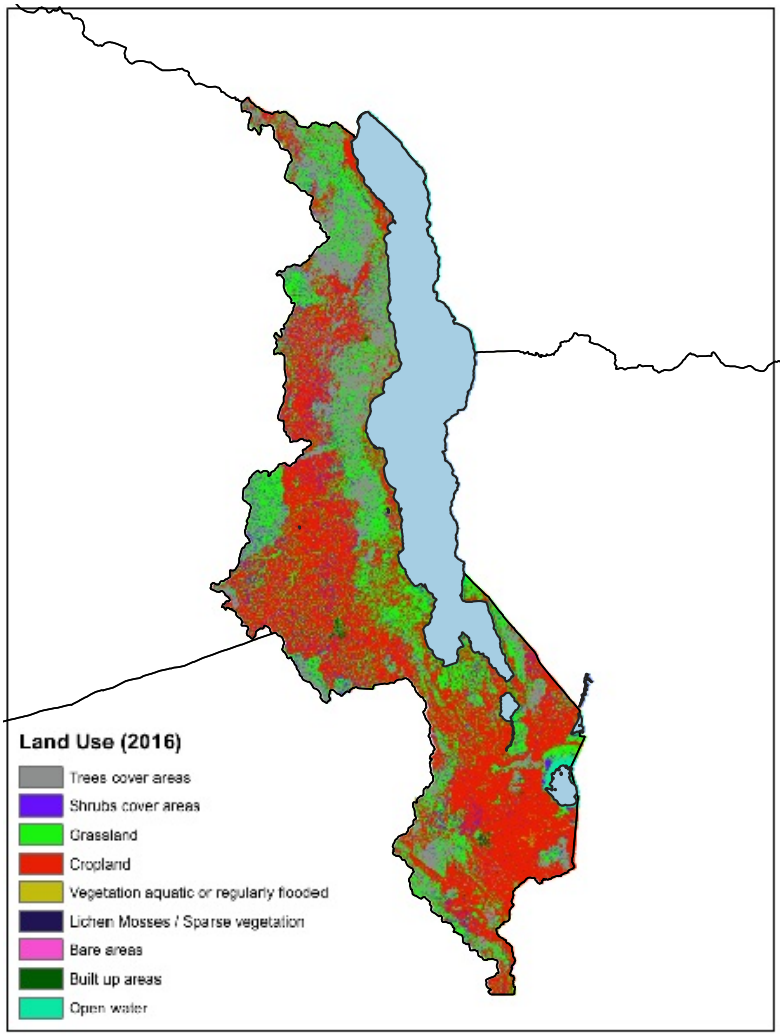
Notes: Summary Statistics for the main variable included in the paper, splitting the sample by clusters above or below the median HIV prevalence in 2000. Panel (a) reports the summary statistics for the clusters in the sample in the pre-treatment period; Panel (B) reports summary statistics for the clusters in sample after the year 2004.

Table A3: Summary Statistics - High vs Low HIV prevalence using 1998 Census data

PANEL A	Output Variables - Census 1998											
	HIV 2000 ≥ Median					HIV 2000 < Median					Difference	
Variable	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	Diff.	p (2-tailed)
Share of Women (1998)	94	0.494	0.106	0.000	0.551	93	0.508	0.016	0.467	0.541	-.014	.219
Employment rate	94	0.592	0.160	0.000	0.828	93	0.654	0.084	0.380	0.812	-.062	.001
Employment rate (Men)	94	0.589	0.139	0.000	0.795	93	0.644	0.078	0.419	0.792	-.055	.001
Employment rate (Women)	94	0.592	0.198	0.000	0.858	93	0.663	0.106	0.240	0.831	-.071	.003
Literacy rate	94	0.556	0.177	0.000	0.876	93	0.532	0.119	0.258	0.792	.023	.288
Literacy rate (Men)	94	0.626	0.171	0.000	0.896	93	0.597	0.102	0.352	0.811	.03	.153
Literacy rate (Women)	94	0.491	0.187	0.000	0.857	93	0.470	0.136	0.178	0.794	.02	.4
No Primary	94	0.804	0.195	0.000	0.961	93	0.867	0.072	0.645	0.965	-.063	.004
No Primary (Men)	94	0.756	0.192	0.000	0.941	93	0.824	0.083	0.584	0.950	-.068	.002
No Primary (Women)	94	0.849	0.199	0.000	0.978	93	0.909	0.063	0.702	0.987	-.06	.006
Years of School	94	3.211	1.331	0.000	6.659	93	3.055	0.999	1.271	5.609	.156	.366
Years of School (Men)	94	3.798	1.384	0.000	7.174	93	3.558	0.994	1.753	6.125	.24	.174
Years of School (Women)	94	2.664	1.290	0.000	6.118	93	2.571	1.005	0.803	5.042	.093	.581
HIV prevalence (2000)	93	0.211	0.040	0.157	0.318	93	0.128	0.017	0.093	0.156	.083	0
Population Density	94	317.169	425.598	3.966	2376.187	93	122.744	96.722	14.126	764.084	194.425	0

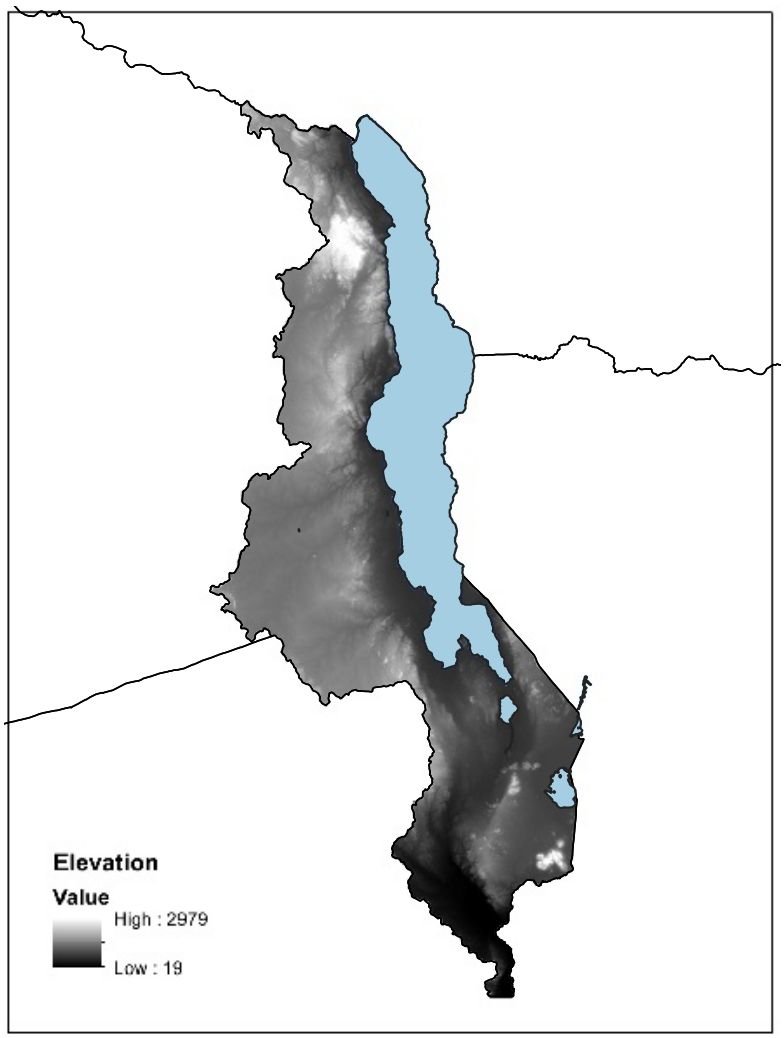
Notes: Summary Statistics for selected variables from the 1998 Census computed at Traditional Authority Area (admin 3), splitting the sample by TAs above or below the median HIV prevalence in 2000.

Figure A1: Land Use



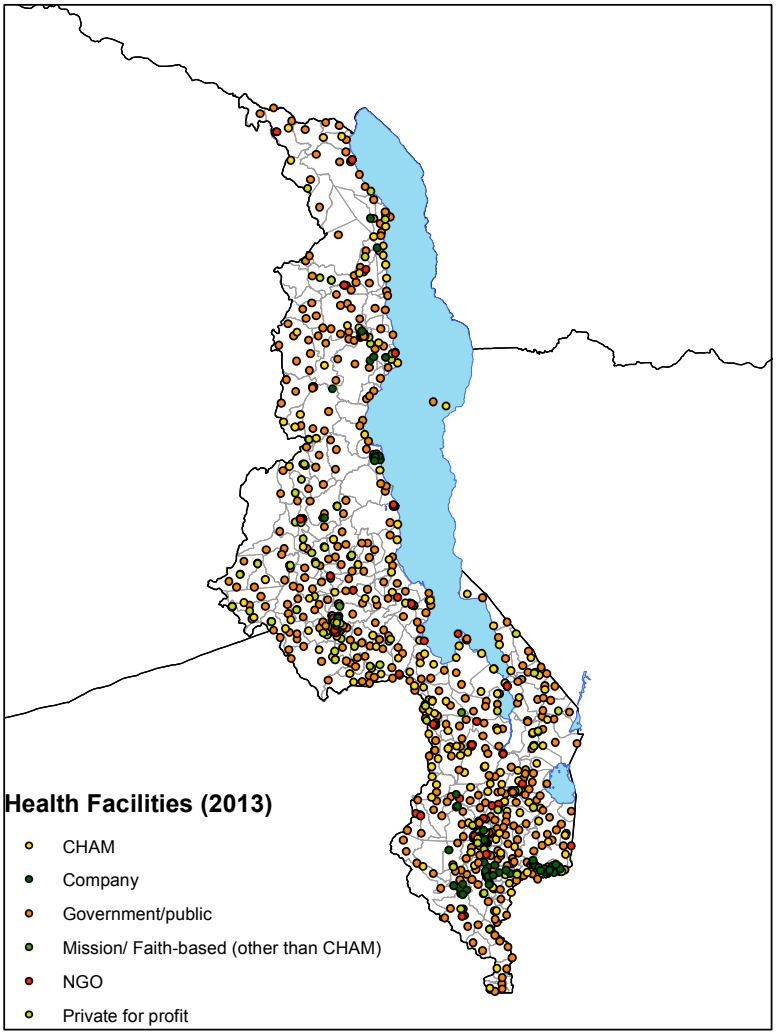
Notes: This figure shows the Land Use Map of Malawi; source: Sentinel-2 global land cover data

Figure A2: Topography



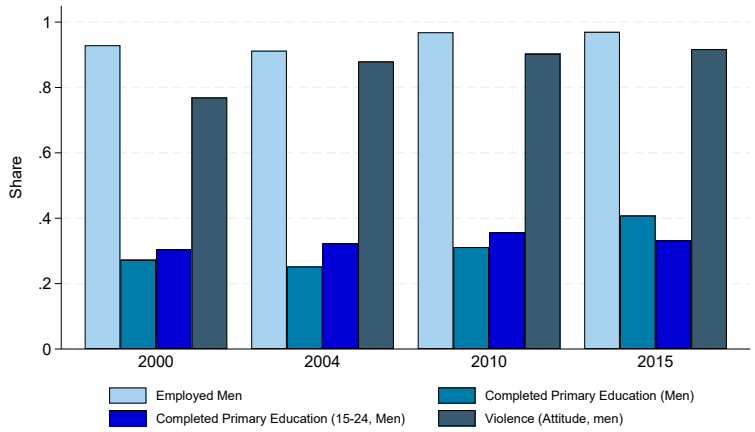
Notes: This figure shows the Digital Elevation Model of Malawi; source: Shuttle Radar Topography Mission (SRTM)

Figure A3: Health facilities



Notes: This figure shows health facility locations in the country, classifying them according to the type of facility; data source: Malawi DHS Service Provision Assessment (SPA) 2013-2014.

Figure A4: Men's Outcomes



Notes: The figure shows the time evolution of the variables used in the channel analysis but computed for the male population. Light blue bars (*Employed Men*) show the time evolution of the share of currently married men who worked in the 12 months before the interview. Bright blue bars (*Completed Primary Education*) show the time evolution of the share of currently married men who have completed primary education (8 years of schooling). Blue bars (*Completed Primary Education (15-24)*) shows the time evolution of the share of young men (15-24) who have completed primary education (8 years of schooling). Data are from DHS collected in Malawi over the period 2000-2016.

Table A4: Travel Speed

Label	Speed	Mode
Trees cover areas	2	WALKING
Shrubs cover areas	2	WALKING
Grassland	3	WALKING
Cropland	3	WALKING
Vegetation aquatic or regularly flooded	2	WALKING
Lichen Mosses Sparse vegetation	3	WALKING
Bare areas	3	WALKING
Built up areas	5	WALKING
Open water	0	WALKING
Trunk roads	5	WALKING
Secondary roads	5	WALKING
Tertiary roads	5	WALKING
Track roads	5	WALKING

Notes: Travel speed by different landscape characteristics.

Table A5: Baseline Analysis: pre 2004

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
HIV	0.035	0.071	-0.372	0.046
	(0.190)	(0.193)	(0.291)	(0.375)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	845	845	845	383
Clusters	155	155	155	109
Adj-R2	0.10	0.10	0.39	0.17
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
HIV × Proximity	0.213	0.188	-0.269	0.030
	(0.134)	(0.135)	(0.241)	(0.233)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	845	845	845	383
Clusters	155	155	155	109
Adj-R2	0.11	0.10	0.39	0.17
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment before 2004. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. $Proximity$ is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B).
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A6: Baseline Analysis

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV	0.881***	0.953***	0.786***	-0.333**
	(0.148)	(0.161)	(0.239)	(0.165)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,210	2,210	2,210	1,771
Clusters	204	204	204	200
Adj-R2	0.65	0.62	0.51	0.09
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.474***	0.568***	0.409*	-0.330*
	(0.169)	(0.172)	(0.224)	(0.198)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,208	2,208	2,208	1,771
Clusters	203	203	203	200
Adj-R2	0.64	0.61	0.51	0.09
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A7: Baseline Analysis: Single Decisions

Dependent Variable	Share of Women Making Decisions on			
Panel A	All Indicators	Own Health	HH Purchases	Visit Friends/Relatives
	(1)	(2)	(3)	(4)
Post × HIV	0.881***	1.080***	0.926***	0.915***
	(0.148)	(0.224)	(0.172)	(0.267)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,210	2,210	2,210	1,538
Clusters	204	204	204	193
Adj-R2	0.65	0.60	0.62	0.47
Panel B	All Indicators	Own Health	HH Purchases	Visit Friends/Relatives
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.474***	0.619**	0.506***	0.519**
	(0.169)	(0.240)	(0.187)	(0.232)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,208	2,208	2,208	1,538
Clusters	203	203	203	193
Adj-R2	0.64	0.60	0.62	0.47
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their own health; Column (3) share of currently married women participating in decision making about big purchases in the household; Column (4) share of currently married women participating in decision making about visiting friends or relatives. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A8: Robustness: Baseline controlling for Education

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV	0.866***	0.939***	0.781***	-0.330**
	(0.147)	(0.159)	(0.240)	(0.165)
Primary Education (Women)	0.111***	0.106***	0.044**	-0.050*
	(0.022)	(0.023)	(0.022)	(0.026)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,210	2,210	2,210	1,771
Clusters	204	204	204	200
Adj-R2	0.65	0.62	0.51	0.09
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.459***	0.554***	0.403*	-0.334*
	(0.167)	(0.171)	(0.223)	(0.196)
Primary Education (Women)	0.114***	0.110***	0.047**	-0.049*
	(0.022)	(0.023)	(0.023)	(0.027)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,208	2,208	2,208	1,771
Clusters	203	203	203	200
Adj-R2	0.65	0.62	0.51	0.09
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment controlling for women's education. *Primary Education* is the share of currently married women who have completed primary education (8 years of schooling). I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A9: Robustness: Baseline controlling for Employment

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV	0.833***	0.897***	0.778***	-0.344**
	(0.157)	(0.171)	(0.242)	(0.169)
Employment Rate (Women)	0.043**	0.050**	0.008	0.008
	(0.021)	(0.021)	(0.020)	(0.017)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,210	2,210	2,210	1,771
Clusters	204	204	204	200
Adj-R2	0.65	0.62	0.51	0.09
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.442**	0.532***	0.400*	-0.336*
	(0.176)	(0.180)	(0.228)	(0.202)
Employment Rate (Women)	0.049**	0.056***	0.013	0.007
	(0.021)	(0.021)	(0.021)	(0.018)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,208	2,208	2,208	1,771
Clusters	203	203	203	200
Adj-R2	0.64	0.61	0.51	0.09
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment controlling for women employment rate. *Employment rate (Women)* is the share of currently married women who worked in the 12 months before the interview. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A10: Robustness: Baseline controlling for Polygyny

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV	0.882***	0.955***	0.787***	-0.341**
	(0.147)	(0.160)	(0.237)	(0.165)
Polygyny	-0.075***	-0.071**	-0.053*	0.061*
	(0.026)	(0.028)	(0.027)	(0.033)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,210	2,210	2,210	1,771
Clusters	204	204	204	200
Adj-R2	0.65	0.62	0.51	0.09
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.470***	0.565***	0.406*	-0.337*
	(0.168)	(0.172)	(0.223)	(0.199)
Polygyny	-0.077***	-0.073**	-0.051*	0.060*
	(0.027)	(0.028)	(0.027)	(0.034)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,208	2,208	2,208	1,771
Clusters	203	203	203	200
Adj-R2	0.64	0.61	0.51	0.09
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment controlling for polygyny. *Polygyny* is the share of currently married women who are currently living in polygynous households. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A11: Robustness: Baseline controlling for Education, Employment, and Polygyny

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV	0.820***	0.885***	0.774***	-0.348**
	(0.154)	(0.168)	(0.242)	(0.169)
Primary Education (Women)	0.106***	0.101***	0.040*	-0.044*
	(0.022)	(0.022)	(0.023)	(0.025)
Employment Rate (Women)	0.043**	0.050**	0.007	0.008
	(0.021)	(0.021)	(0.020)	(0.017)
Polygyny	-0.061**	-0.058**	-0.048*	0.054
	(0.026)	(0.028)	(0.027)	(0.033)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,210	2,210	2,210	1,771
Clusters	204	204	204	200
Adj-R2	0.65	0.62	0.51	0.09
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.425**	0.516***	0.393*	-0.345*
	(0.173)	(0.177)	(0.226)	(0.200)
Primary Education (Women)	0.109***	0.104***	0.043*	-0.044
	(0.022)	(0.023)	(0.024)	(0.027)
Employment Rate (Women)	0.048**	0.055***	0.013	0.007
	(0.021)	(0.021)	(0.021)	(0.017)
Polygyny	-0.063**	-0.059**	-0.046*	0.053
	(0.027)	(0.028)	(0.027)	(0.033)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,208	2,208	2,208	1,771
Clusters	203	203	203	200
Adj-R2	0.65	0.62	0.51	0.09
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment controlling for women's education, employment rate, and polygyny. *Employment rate (Women)* is the share of currently married women who worked in the 12 months before the interview. *Primary Education* is the share of currently married women who have completed primary education (8 years of schooling). *Polygyny* is the share of currently married women who are currently living in polygynous households. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A12: Robustness: Baseline controlling for Male Education

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV	0.897***	0.970***	0.755***	-0.282*
	(0.147)	(0.160)	(0.237)	(0.170)
Primary Education (Men)	0.028**	0.031**	0.009	0.005
	(0.012)	(0.012)	(0.012)	(0.016)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,176	2,176	2,176	1,756
Clusters	203	203	203	200
Adj-R2	0.64	0.62	0.51	0.09
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.479***	0.576***	0.381*	-0.301
	(0.167)	(0.170)	(0.222)	(0.200)
Primary Education (Men)	0.027**	0.030**	0.008	0.006
	(0.012)	(0.012)	(0.012)	(0.016)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,174	2,174	2,174	1,756
Clusters	202	202	202	200
Adj-R2	0.64	0.61	0.51	0.09
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment controlling for men education. *Primary Education* is the share of currently married men who have completed primary education (8 years of schooling). I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A13: Robustness: Baseline controlling for Male Employment

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV	0.899***	0.971***	0.747***	-0.279
	(0.146)	(0.160)	(0.235)	(0.172)
Employment Rate (Men)	-0.021	-0.023	0.027	-0.005
	(0.023)	(0.023)	(0.024)	(0.025)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,176	2,176	2,176	1,756
Clusters	203	203	203	200
Adj-R2	0.64	0.61	0.51	0.09
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.480***	0.577***	0.386*	-0.301
	(0.169)	(0.172)	(0.221)	(0.201)
Employment Rate (Men)	-0.017	-0.019	0.031	-0.007
	(0.024)	(0.024)	(0.024)	(0.025)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,174	2,174	2,174	1,756
Clusters	202	202	202	200
Adj-R2	0.64	0.61	0.51	0.09
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment controlling for men employment rate. *Employment rate (Men)* is the share of currently married women who worked in the 12 months before the interview. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A14: Robustness: Baseline controlling for Population Density and Access to Health

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV	0.886***	0.960***	0.788***	-0.334**
	(0.149)	(0.162)	(0.238)	(0.164)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Additional Controls	√	√	√	√
Observations	2,210	2,210	2,210	1,771
Clusters	204	204	204	200
Adj-R2	0.65	0.62	0.51	0.09
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.479***	0.573***	0.402*	-0.322
	(0.170)	(0.173)	(0.222)	(0.198)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Additional Controls	√	√	√	√
Observations	2,208	2,208	2,208	1,771
Clusters	203	203	203	200
Adj-R2	0.64	0.61	0.51	0.09
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment controlling for population density and access to health. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. $Proximity$ is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). $Post$ is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A15: Robustness: Baseline introducing flexible controls

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV	0.960***	0.965***	1.152***	-0.149
	(0.202)	(0.221)	(0.272)	(0.212)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Flexible Controls	√	√	√	√
Observations	2,210	2,210	2,210	1,771
Clusters	204	204	204	200
Adj-R2	0.65	0.62	0.52	0.09
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.489*	0.506*	1.134***	-0.168
	(0.272)	(0.288)	(0.343)	(0.330)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Flexible Controls	√	√	√	√
Observations	2,208	2,208	2,208	1,771
Clusters	203	203	203	200
Adj-R2	0.64	0.61	0.52	0.09
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for effect of ART availability on women's empowerment controlling in a flexible way for population density, access to health, employment rate (Census 1998), and primary education (Census 1998). I define the control as flexible because I allow for heterogenous effects interacting each of them with time dummies. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A16: Falsification test: replace HIV with malaria

Dependent Variable	Decision Making				IPV	
Panel A	All Indicators	Own Health	HH Purchases	Visit Friends/Relatives	Attitude	Experienced
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Malaria × Proximity	0.170**	-0.008	0.135	-0.014	0.040	-0.010
	(0.078)	(0.113)	(0.087)	(0.144)	(0.120)	(0.124)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural	Rural	Rural
Observations	2,239	2,239	2,239	1,555	2,239	1,794
Clusters	204	204	204	195	204	201
Adj-R2	0.65	0.60	0.63	0.46	0.51	0.08
Controls	√	√	√	√		
Traditional Authorities f.e.	√	√	√	√		
Region × Year f.e.	√	√	√	√		

Notes: OLS Estimates for a falsification analysis to show that the effect of ART-rollout campaign works through HIV and not other diseases. *Malaria* × *Proximity* is the interaction between Malaria prevalence and access to the clinic that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel A). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A17: Baseline Analysis: Alternative Clinics (Walking Distance)

Dependent Variable	Women Empowerment Indicators			
	Decision Making		IPV	
Panel A	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.498***	0.604***	0.459*	-0.413*
	(0.173)	(0.178)	(0.257)	(0.230)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	ART	ART	ART	ART
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,208	2,208	2,208	1,771
Clusters	203	203	203	200
Adj-R2	0.64	0.61	0.51	0.09
	Decision Making		IPV	
Panel B	All Indicators	Own Health & HH Purchases	Attitude	Experienced
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.565***	0.655***	0.407	-0.378*
	(0.212)	(0.218)	(0.260)	(0.203)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Public	Public	Public	Public
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,204	2,204	2,204	1,767
Clusters	202	202	202	199
Adj-R2	0.64	0.61	0.51	0.09
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the effect of ART availability on women's empowerment. As a proxy for access to ART, I use the interaction between HIV prevalence and access to the clinic that combines the prevalence of HIV with access to ART ($HIVxProximity$). I use two different variations of my measure exposure to ART based on inverse walking distance, measured in 20-minute units, from different typologies of clinics. In Panel A I restrict the analysis only to the clinics providing ART in 2013. In Panel B I restrict the analysis only to the public clinics. *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women participating in all the decisions available in each specific year; Column (2) share of currently married women participating in decision-making about their health and big purchases in the household; Column (3) share of women who never justify intimate partner violence; Column (4) share of currently married women who have experienced physical violence in the 12 months before the interview. Section 3 provides more details on the outcome variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A18: Channels

Dependent Variable	Share of Women			
Panel A	Employed	Completed Primary	Completed Primary (15-24)	in Polygynous HH
	(1)	(2)	(3)	(4)
Post × HIV	1.113***	0.133	0.558**	0.017
	(0.414)	(0.160)	(0.237)	(0.151)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,210	2,210	2,210	2,210
Clusters	204	204	204	204
Adj-R2	0.22	0.37	0.26	0.29
Panel B	Employed	Completed Primary	Completed Primary (15-24)	in Polygynous HH
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	0.658**	0.130	0.630**	-0.044
	(0.330)	(0.178)	(0.248)	(0.150)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,208	2,208	2,208	2,208
Clusters	203	203	203	203
Adj-R2	0.21	0.38	0.27	0.29
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the channels through which ART availability affects women's empowerment. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. *Proximity* is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married women who worked in the 12 months before the interview; Column (2) share of currently married women who have completed primary education (8 years of schooling); Column (3) share of young women (15-24) who have completed primary education (8 years of schooling); Column (4) share of currently married women who are currently living in polygynous households. Section 3 provides more details on the outcomes variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.

Table A19: Channels: Men's Outcomes

Dependent Variable	Share of Men			
Panel A	Employed	Completed Primary	Completed Primary (15-24)	Never Justify IPV
	(1)	(2)	(3)	(4)
Post × HIV	0.258	-0.142	0.161	0.063
	(0.280)	(0.289)	(0.423)	(0.230)
Proximity Measure	NA	NA	NA	NA
Type of Clinic	NA	NA	NA	NA
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,176	2,176	2,006	2,176
Clusters	203	203	204	203
Adj-R2	0.12	0.17	0.07	0.18
Panel B	Employed	Completed Primary	Completed Primary (15-24)	Never Justify IPV
	(1)	(2)	(3)	(4)
Post × HIV × Proximity	-0.126	0.119	0.389	-0.189
	(0.211)	(0.341)	(0.409)	(0.219)
Proximity Measure	Walking Distance	Walking Distance	Walking Distance	Walking Distance
Type of Clinic	Any	Any	Any	Any
Type of DHS Unit	Rural	Rural	Rural	Rural
Observations	2,174	2,174	2,004	2,174
Clusters	202	202	203	202
Adj-R2	0.12	0.18	0.08	0.18
Controls	√	√	√	√
Traditional Authorities f.e.	√	√	√	√
Region × Year f.e.	√	√	√	√

Notes: OLS Estimates for the channels through which ART availability affects men's outcomes. I use two proxies to measure exposure to ART. In Panel A is HIV prevalence in 2000 (HIV) meant to capture the number of potential recipients of the treatment. In Panel B I use the interaction between HIV prevalence and access to the clinic ($HIVxProximity$) that combines the prevalence of HIV with access to ART. $Proximity$ is measured as the inverse walking distance from the closest clinic, in 15-minute units (Panel B). *Post* is a binary variable taking value 1 after the year 2004.
Dependent variables: Column (1) share of currently married men who worked in the 12 months before the interview; Column (2) share of currently married men who have completed primary education (8 years of schooling); Column (3) share of young men (15-24) who have completed primary education (8 years of schooling). Section 3 provides more details on the outcomes variables. */**/*** indicate significance at 10%/5%/1%, respectively; standard errors in parentheses clustered at the Traditional Authorities Areas level.