

Broadcasting Change: India's Community Radio Policy and Women's Empowerment

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Abstract

I investigate India's 2006 community radio policy. The policy enables educational institutions and NGOs to obtain radio licenses with the purpose of promoting local development. To examine the policy, I collect original data on the content and coverage areas of over 250 radios. Through topic modeling and GPT-based text analysis of transcribed audio recordings, women's empowerment is identified as a key theme in radio programming. To causally investigate the effects of radio on women's empowerment, I exploit topography-driven variation in radio access. I further develop a novel approach for spatial estimation to reduce attenuation bias in the underlying randomly displaced survey data. The results show that exogenous exposure to radio has strong effects on women's empowerment. Women exposed to radio gain an additional 0.3 years of education and are 3.7ppt (9%) more likely to obtain a secondary degree. In line with increased education, exposure reduces child marriages by 1.5ppt (39%). Further, fertility of young women is lowered by more than 10% while they are 12ppt more likely to exhibit autonomy in household decision making. The findings highlight the potential of grassroots media as a policy instrument for empowering women and development more broadly.

Keywords: Mass Media, Policy, Women Empowerment, Education, Fertility, Spatial Econometrics, Radio

JEL Classifications: O12, J13, J18, L82, J16

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1 Introduction

Persistent gender inequality continues to constrain the life opportunities of girls and women. In poor countries, gender inequality is particularly stark as exemplified by the phenomenon of ‘missing women’ (Sen, 1992). Girls in poor countries tend to obtain little education and are often married at an early age. Economic development can empower women in certain areas, but social attitudes and norms significantly limit its effects. Policy interventions are therefore essential to reduce gender inequality (Jayachandran, 2015; Duflo, 2012). The media has been found to change attitudes and behavior when listeners can relate to stories and characters (DellaVigna and La Ferrara, 2015). However, evidence on translating these findings into a policy is largely confined to single issue government campaigns or field experiments.

In 2006, the Indian government implemented a unique grassroots media policy with the aim of fostering local development. The policy enables educational institutions and NGOs to establish community radio stations to broadcast locally produced content. Community radio stations are required to address development issues and to produce the majority of content locally. They are further barred from airing political news. Within this mandate, they make their own editorial choices.

To answer whether community media can be used as a policy instrument for development, I collect novel data on the location, coverage area, launch date, and content of all community radio stations launched by 2020. The more than 250 radio stations’ coverage areas are home to an estimated 331 million people. Given radio stations’ editorial freedom, I first investigate which development issues these focus on. For this, I scrape, transcribe, and translate over 5,000 audio recordings of radio shows and analyze their content using a topic model. I identify women’s empowerment and education as key topics in radio programming. GPT-based content analyses further show that the radio stations air content in favor of girls’ education and family planning, and against child marriage and domestic violence. The radios’ focus on women’s empowerment and education is in line with a widely held view of development issues in India. According to the 2005 World Values Survey, 38% and 36% respectively of India’s population rated the two issues as one of the country’s most serious problems, only surpassed by poverty (Inglehart et al., 2014).

To causally identify the effects of radio, I combine a well-established approach based on topographic variation between radio towers and listeners with a novel approach of dealing with randomly displaced survey data. The survey data I use is the 2015-16 National Family and Health Survey (NFHS). It is part of the Demographic and Health Surveys, a repeated survey conducted across most of the developing world and probably the most widely used survey in development economics. A major challenge of combining survey locations with the coverage area is that coordinates of individuals’ locations

are randomly jittered, i.e. displaced, prior to being reported to researchers. In rural areas, half of all observations are jittered by more than 2.5km. The jittering introduces substantial measurement error in the treatment variable. The attenuation bias resulting from this downward biases estimates of the treatment effect. Instead of relying on jittered locations, as is currently the standard approach in research, I instead draw on the publicly known jittering algorithm to compute the probability density function of original locations conditional on observing a jittered location. The probability density function is then matched with the coverage area to compute the likelihood mass on the coverage area. My approach substantially reduces attenuation bias in comparison to simply using jittered locations.

Moving to the results, I begin by asking whether individuals exogenously exposed to community radio are more likely to listen to radio. I find substantial increases in the consumption of radio. A comparison of effect sizes with the average of the dependent variable suggests that exposure to community radio increases radio consumption by 3.3ppt (17.9%). Further, people exposed to community radio are 5.3ppt (26.9%) and 6.5ppt (39.6%) more likely to have heard a family planning message or message on HIV/Aids on the radio. Community radio stations thus reach an audience and, importantly, increase listeners' exposure to messages typically produced by such radio stations. I find no evidence for substitution away from other media, such as television, internet, or newspapers.

Moving to educational outcomes, I find that exposure to a community radio station increases years of schooling, attendance rates, and the propensity to have obtained a degree. These effects are mainly driven by girls. The results suggest that living in an area exogenously exposed to radio makes young women around 3ppt more likely to have a primary, secondary, and higher degree respectively. Relative increases are strongest for higher (10.6%) followed by secondary (9%) and primary education (4%). Overall, total years of education of 5-30 year old girls/women, i.e. those who may have been affected by community radio, increase by around 0.3 years. These findings are driven by an increase in the willingness to invest in girls' education, increased interest in school, and a decreased dropout rate due to early marriage. While coefficients for boys are positive as well, effect sizes are lower and less robust. The results are in line with the radio stations' strong focus on education and women's empowerment.

Community radio stations also have effects on the marriage market and fertility. Women exposed to radio are less likely to be married between the ages of 13-25. In relative terms, effects on child marriage are particularly strong with a 1.5ppt or 39.5% decrease for girls. Effects for men are lagged by around five years, in line with and likely explained by the average five year age gap between husbands and wives. Regarding fertility, I find decreases in the number of children women bear up to the age of around 35 of around 10-15%. These findings might be driven by both delayed child bearing due to later marriage or decreases completed fertility. Given that most children are born when

mothers are well below 35 years of age, a decrease in lifetime fertility is more likely.

Finally, I test whether community radio stations affect women’s autonomy and variables on domestic violence. Young women, i.e. those most likely to have profited from additional education, are 12ppt (23%) more likely to participate in household decisions or decisions about their own mobility. Men also adjust their attitudes toward the autonomy of women, increasing the share of decisions in which they believe women should participate by around 4.8ppt (6.1%). In addition, I find suggestive evidence of decreases in women’s approval of domestic violence and the experience thereof. Male attitudes towards violence are unaffected.

I rule out multiple potential threats to identification. First, heterogeneity in observables correlated to the treatment variation used for identification is a potential threat to identification. Here, I follow [Yanagizawa-Drott \(2014\)](#) and regress variables related to women’s status but unlikely to be affected by radio on exposure to radio. These include scheduled caste shares, travel times to the nearest city, urbanity, population density, and others. I find no effect of radio exposure on such variables, speaking against this type of endogeneity. Second, heterogeneity in unobservables correlated to the treatment may drive the results. I can test for this in two ways. First, I run regressions on education for age groups whose choices are unlikely to have been altered by radio. This includes cohorts that had already finished their educational choices when the first radio stations launched in 2005. I find no effects of radio exposure on these age cohorts’ education. Second, I re-run all main regressions on the same age groups as in the main sample on a placebo sample. While the main sample includes individuals in the vicinity of a radio station that launches before the data is collected, that is before 2016, the placebo sample includes individuals in the vicinity of a radio station that launches after data collection is finished (2016-20). Individuals in the placebo sample will therefore receive a community radio station at a later point in time with no effects expected at the time of data collection. Again, I find no effects on outcomes. Finally, I vary the regression specifications in several different ways to ensure that the results hold up. Overall, the robustness and exogeneity checks suggest that neither heterogeneity in observables nor in unobservables drives the results, strengthening the results’ causal interpretation.

I contribute to several literatures. First, I contribute to the literature on campaigns and policies to empower women. This encompasses research on large-scale campaigns, such as the distribution of cash transfers ([Baird et al., 2011](#)), education subsidies ([Duflo et al., 2015](#)), and adolescent training programs ([Bandiera et al., 2020](#)). It also covers the evaluation of large-scale policy changes, including inheritance reforms ([Mookerjee, 2019](#)), the elimination of school fees ([Lucas and Mbiti, 2012](#); [Keats, 2018](#)), or pension programs ([Duflo, 2003](#)). As noted by two reviews on the interrelationship between economic growth and women’s empowerment, such policy intervention is required if gender equality is the goal ([Duflo, 2012](#); [Jayachandran, 2015](#)). That is, because gender norms

and social attitudes persist beyond gender differences due to economic realities (Alesina et al., 2013). In addition and beyond slow cultural processes, gender norms may even persist if the majority of the population already updated its views, in part because people underestimate how far their views are spread (Bursztyn et al., 2020, 2023). To affect and question such norms and attitudes, Jayachandran (2015) cites the media as a potential pathway given evidence on entertainment media’s unintentional effects on women’s empowerment. Specifically, La Ferrara et al. (2012) and Chong and La Ferrara (2009) document decreases in fertility and increased divorce rates as telenovelas were introduced in Brazil. Similarly, Jensen and Oster (2009) show that the introduction of television in India was followed by changes in gender attitudes and fertility. Both conclude that this is the result of exposure to different ways of life. I contribute to this literature in multiple ways. First, I provide evidence on the intended use of media as a policy instrument as opposed to unintended effects of entertainment media, such as telenovelas. I, hence, show that such a policy can be effective in affecting the role of women at scale. Further, I provide evidence on grassroots media as opposed to centrally produced media, hence going beyond evidence on single-issue and centrally produced information campaigns (Glennerster et al., 2021; Khalifa, 2022). Grassroots media policies similar to India’s may be a particularly interesting policy instrument to developing countries. These allow poor countries to effectively rely on ‘civil society’s’ (i.e. NGOs’ and educational institutions’) resources and knowledge to affect development outcomes. Drawing on the knowledge of local institutions about local realities may be particularly valuable in culturally and linguistically diverse countries such as India. In addition, community radio has the potential to reach parts of the population that have little trust in government institutions.

I also more broadly contribute to the literature on media and socioeconomic outcomes (for reviews see La Ferrara, 2016; DellaVigna and La Ferrara, 2015; Enikolopov and Petrova, 2017). This literature can broadly be categorized into two main branches: first, as mentioned above, a number of papers study the unintended effects of entertainment media using observational data (Kearney and Levine, 2015). A second strand of the literature tests the effectiveness of exposing individuals to specific television programs in field experiments. For example, Banerjee et al. (2019) invite Nigerians to the screening of an MTV show featuring information on HIV/AIDS. Treatments like these can help to convey information and change attitudes and behavior (Bernard et al., 2014; Berg and Zia, 2017; Arias, 2014; Ravallion et al., 2015; Green and Vasudevan, 2018; Cassidy et al., 2022; Kasteng et al., 2018; Murray et al., 2015; Riley, 2024), although some also find no or unintended negative effects (Coville et al., 2019; Bjorvatn et al., 2020). I contribute by providing evidence on translating the above findings into a large-scale and long-term policy. I demonstrate that the above evidence, which is largely based on singular movies or shows, can be scaled up and have effects on women’s empowerment. In this context, I also contribute to historical studies on propaganda and gender inequality. Qian (2024)

studies Chinese communist propaganda during the Cultural Revolution and finds effects on gender equality in education. Further, [Okuyama \(2023\)](#) studies effects of a radio program produced by the US occupying force in 1945-52 Japan on women’s status. The author documents effects on political participation and fertility but none on education. The key distinguishing feature of my article is the evaluation of grassroots media as opposed to centrally run media as a policy instrument. Further, the policy I investigate is neither the result of authoritarian propaganda nor of a foreign power’s intervention. Instead, it was implemented by a developing country and through democratic processes, making it transferrable to other settings.

Finally, I contribute methodologically to the literature using DHS, MISC, and other geocoded survey data with jittered locations by developing a method to reduce attenuation bias. The DHS is probably the most widely used repeated survey in development economics and used in other fields such as public health.¹ Despite its widespread use, the standard approach of current research is to simply use the jittered locations (e.g. [Hjort and Poulsen, 2019](#); [Guarnieri and Rainer, 2021](#)). Overall, the jittering remains largely unexplored despite substantial measurement error being introduced and a recent focus of econometric research on improving accuracy when working with observational data ([Michler et al., 2022](#))². In my paper, I propose a novel method that can substantially reduce measurement error when working with high-resolution survey data. The correction I propose increases point estimates by more than 50% on average when making the correction. These results are in line with a substantial decrease in attenuation bias due to measurement error in the treatment variable. The insights are relevant for any study using geocoded locations of DHS or other data sets with jittered locations. This also paves the way for further studies using DHS data, particularly in contexts where jittering has previously caused excessive measurement error, making the study design impractical.

Overall, my study combines unique data on community radio in India with a novel approach to causally study effects on women’s empowerment. I find substantial changes through community radio in variables associated with women’s empowerment, i.e., increased education, decreased child marriage, and lower fertility. In addition, I document that women whose education and marriage are most likely to be affected by radio exhibit

¹6.5% of all articles in both the Journal of Development Economics and World Development as well as 117 articles in Economics’ ‘Top 5’ journals cite DHS surveys since 2005. As of February 12, 2024, >17k articles from 2005 mention “*demographic and health survey*” OR “*demographic and health surveys*”. Google Scholar lists 2,330 articles in the JDE published since 2005 (*source: “Journal of Development Economics”*). Of these, 150 mention “*demographic and health survey*” OR “*demographic and health surveys*” OR “*DHS*” and 158 either the DHS or MISC (OR condition extended by “*MISC*”). For World Development, a total of 6,610 articles are listed of whom 419 mention the DHS and 441 the DHS or MISC. Furthermore, 117 articles in Economics’ ‘Top 5’ journals cite the DHS and 174 the DHS or MISC.

²Their paper tests the effect of measurement error in studies on the relationship between weather and agricultural productivity. Given the low resolution of weather data, they find a negligible effect, but note that higher resolution data is likely “[...] to be sensitive to some spatial anonymization techniques” (p. 2).

greater autonomy. The results also suggest that men believe that women should have more autonomy, while I find no evidence of a ‘male backlash’ to women’s empowerment in terms of violence against women or attitudes toward violence.³ In sum, the findings provide strong evidence for the use of grassroots as a policy instrument for women’s empowerment and development more broadly.

2 Context and Policy

2.1 Community Radio

Radio remains one of the most accessible media for people in developing countries. It is cheap, accessible to illiterate populations, low-tech, but is also easily translated into more modern media, e.g., through live streams or podcasts (UNESCO, 2013). The potential of radio to reach poor populations, led policy makers, activists, and international organizations to suggest the use of community radio for development (Fraser and Restrepo-Estrada, 2002; Raghunath, 2020). CRS aim to offer marginalized communities a platform for addressing local concerns, promoting local customs and languages, and delivering information and education (Fraser and Restrepo-Estrada, 2002).

Although there is no comprehensive data on the global diffusion of CRS, many countries, especially across Africa and Latin America, have granted licenses to a large number of CRS. For example, 93% of the villages in northern Benin had access to at least one CRS in 2009 (Keefer and Khemani, 2016). Boas and Hidalgo (2011) count 2,328 CRS in Brazil in 2008. In South Asia, where media is typically more strongly controlled by the state, CRS have only more recently started to gain pace (Raghunath, 2020).

India may be particularly suited to benefit from CRS. While adult literacy has increased, around a quarter of the adult population remains illiterate (World Bank, 2023). India is extremely diverse, both culturally and linguistically, with 122 languages and more local dialects (Census of India, 2002). Furthermore, a large part of the population lacks access to the media. In 2016, 15% of men and 25% of women reported not being regularly exposed to the mass media, such as television, radio, cinema or newspapers (IIPS and ICF, 2017).

2.2 Community Radio in India: Policy

By the 1990s, India’s state-run All India Radio (AIR) covered about 99% of the population. Regularly misused as a government mouthpiece (Kumar, 2003; Thomas, 2013), politicians were hesitant to give up control over airwaves until a 1996 supreme court ruling led to the first auctions of private FM licenses in 1999 (Kumar, 2003). These were

³For example, Guarnieri and Rainer (2021) find evidence of a male backlash to increased empowerment of women due to differences in colonial institutions in Cameroon.

focused on entertainment, cover around 45% of India’s population, and are not allowed to broadcast news (KPMG, 2017) or even sexual education, rendering them “electronic discos for urban youth” (Fraser and Estrada, 2001, p. 28).

It took another decade of pressure from activists with the support of UNESCO for the government to pass legislation allowing the setup of CRS in 2006 (Pavarala and Malik, 2007). Compared to other countries, the regulation of CRS is quite restrictive with respect to the allocation of licenses and the content of radio programs. Starting with eligibility to apply for a license, three types of institutions can setup CRS: educational institutions, NGOs, and Krishi Vigyan Kendras (KvK). KvK are government-financed agricultural centers that aim to improve local agricultural practices (Varshney et al., 2022). Aside from these, neither individuals nor political organizations or commercial enterprises can receive a license. In addition, NGOs must be established for at least three years prior to submitting an application (Govt. of India, 2006).

To obtain a license, radios go through a rigorous licensing process. The process is conducted at the federal level. This means that local or state governments are usually not involved in deciding whether or not a radio is established. There are two key bottlenecks in the application process. First, many applicants fail to provide the necessary documents. Second, many applicants cannot convince the screening committee of their previous involvement with and connection to the community. The screening committee is led by the MOIB and, amongst others, comprises of community radio advocates, practitioners, UNICEF, and other stakeholders (information based on an expert interview with the MOIB and Raghunath (2020)).⁴

Once a station is set up, it is required to adhere to various content-related regulations. Importantly, the policy explicitly states that “the emphasis should be on developmental, agricultural, health, educational, environmental, social welfare, community development and cultural programmes” (Govt. of India, 2006, p. 5). At least half of this content must be produced locally and in a local language or dialect. The policy also prohibits radios from producing certain content. Importantly, it bans radios from airing (political) news.⁵ Further, it holds radios responsible for spreading demeaning content about minorities and disadvantaged groups, such as women (Govt. of India, 2006).

To obtain funds, CRS can run 5 minutes of advertisements per hour. In addition, they can apply for government funding for installation costs, participate in government communication schemes (CRFC, 2022) or seek funding from donors (Govt. of India, 2006).

⁴Specifically, the Community Radio Forum, a think tank of advocates, and the community radio association, an interest group of radio operators are part of the screening committee (Raghunath, 2020).

⁵Radios can, however, air newscasts produced by AIR though, according to multiple expert interviews, this only very rarely done in practice (Myers, 2011).

3 Data and Descriptive Statistics

3.1 Data Collection and Preparation

Community Radio Stations Data on CRS is collected from a variety of sources. First, a list of all 289 CRS as of March 31, 2020 is obtained from the Ministry of Information and Broadcasting (MOIB).⁶ Apart from the address and launch date, the list shows that 49% of CRS are run by NGOs, 45% by educational institutions, and 6% by Krishi Vigyan Kendra (KVK). Up to 2020, an average of 14 radios have been launched each year (also see Figure B.1 in Appendix).

Stations are geolocated through rigorous web search using information on their name, address, and the license holder. The MOIB also provided me with a list including approximate locations (1.2km precision), which I used to verify the collected information. In total, 276 of 289 stations were verified as operational of which 92% or 264 stations were precisely geocoded (see G in Supplementary Material for further information on data collection and geocoding).

Using the precise locations combined with information on radio tower height and transmitter power, radios' coverage areas are estimated using the Longley-Rice/Irregular Terrain Model.^{7,8}

Merger with National Family and Health Survey The main data set for both controls and outcomes is the 2015-16 National Family and Health Survey (NFHS), India's arm of the DHS survey (IIPS and ICF, 2017). The data is representative both nationally and on the district level and includes information on 2.9 million individuals from 601 thousand households. Each of the 28k survey clusters includes around 21 households and is associated with unique coordinates.

I match NFHS cluster coordinates with estimated coverage areas of CRS. Given that many clusters are out of reach of any radio signal, I reduce the sample to observations with a realistic chance of being covered by a radio signal. In the paper's main specifications, this includes all observations at a distance of up to 50km from a radio tower. This includes 96% of the total coverage area.⁹ Additionally, different thresholds are chosen as robustness checks.

I then create two separate and non-exclusive sets of observations: the main sample includes all observations within 50km of a radio that launched before 2016. This covers

⁶The list can be accessed [here](#) (MOIB)

⁷Radio coverage areas are calculated using the ITM algorithm through [cloud.rf](#)'s API.

⁸Kasampalis et al. (2013) shows that the ITM model is highly precise, showing a correlation of 0.8 between estimated and actual coverage. Armand et al. (2020) validate this. In their setting, the correlation is even higher.

⁹Figure B.3 in Appendix.

individuals whose outcomes may have been altered by the presence of a CRS. The placebo sample, on the other hand, includes observations within 50km of a radio launched from 2016-20. Figure 1 shows the included and excluded data for the main sample.

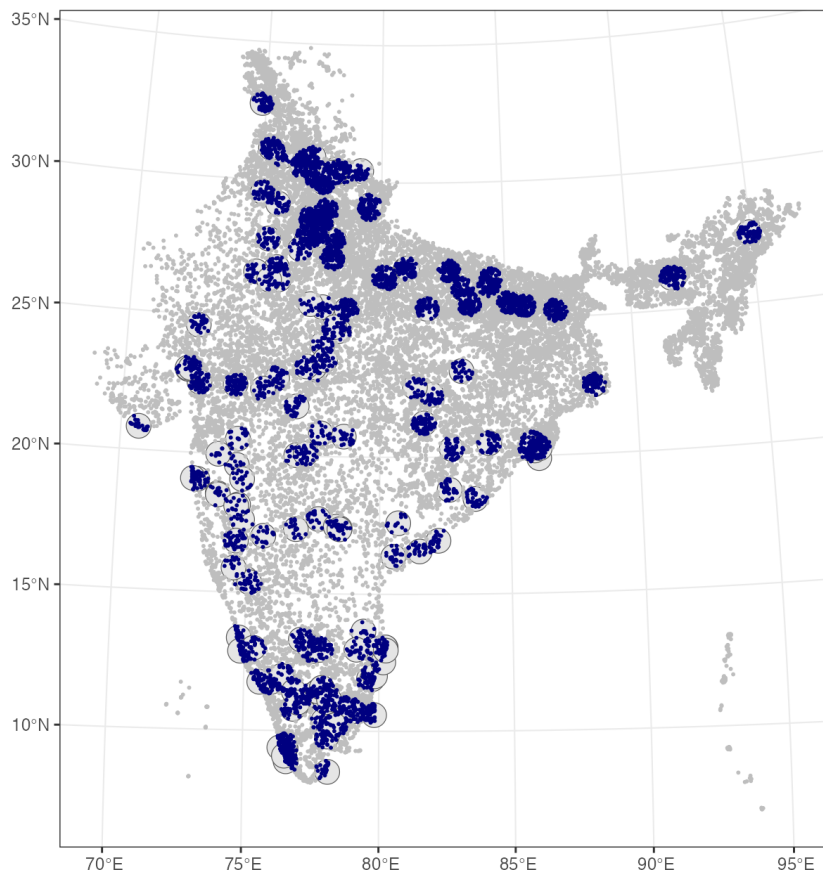


Figure 1: Visualization of NFHS data included (blue) and excluded (grey) in pre-2016 sample.

Observations within 50km of a given station are included, a total of 8,217 clusters. Each cluster includes around approximately 21 households. Colors indicate clusters' probability to be covered by a radio signal.

Treatment and Outcomes

Table 1 provides summary statistics of variables included in the regressions. In total, the data incorporates 821k observations from 8,217 clusters. All variables are reported at the individual level. Table 2 provides detailed descriptions of each variable and its source.

Starting with radio variables, the average probability of an individual being within the coverage area is 47%. Around 19% of individuals listen to radio at least less than once a week, and a similar number have heard a family planning message on radio in the past months. 16% report having received information on HIV/AIDS on radio. In total, only 9% of households possess a radio, suggesting that individuals often jointly listen to

radio. For a developing country, these numbers are rather low. This is likely explained by the early and widespread introduction of television across India (Jensen and Oster, 2009).

The first set of outcomes refers to girls' and women's education, fertility, and marriage. Education is measured in three ways: first, through the number of years individuals spend in school. Second, by their highest earned degree, and third by whether a child is in school at the time of survey. Regarding fertility and marriage, women surveyed have an average of 1.7 living children while 72% have ever been married.

Autonomy describes a woman's ability to affect her life through own actions and decisions. It is an important mechanism through which women can alter their life prospects, including fertility and other outcomes (Jayachandran, 2017). I measure women's autonomy through their say in household decisions and with regard to their mobility. Regarding mobility, women are asked whether they can visit different places alone, with someone else, or not at all. Three places are surveyed: the market, the health facility, and places outside the village. For decisions within the household, women are questioned about whether they make these decisions independently, together with their husband, or whether they are excluded from the decision-making process. Three decisions are surveyed: respondent health care, large household purchases, and visits to friends and family. As a measure of autonomy, I compute the share of places women can visit on their own and decisions they participate in. The variable therefore ranges from 0 to 1. The average suggests that respondents have autonomy with respect to 64% of decisions or mobility choices.

Next, I get an idea of men's standing towards their partners' or wives' autonomy. The questions posed to men differ in two aspects from those posed to female respondents. First, they ask about the respondent's views on who 'should have' rather than who 'factually has' a greater say with respect to different household decisions. Second, they only include variables regarding household decisions, i.e., none on mobility. I, again, code the variables such that a value of 1 means that a respondent believes that his wife should be involved in all household decisions.

Finally, I include outcomes related to domestic violence. These are only available for a small subsample of women and only collected in about 35% of the survey clusters. Starting with attitudes toward violence, questions on whether women find it justified for husbands to beat their wives under specific circumstances are surveyed. These include arguing with husband, burning food, going out unannounced, neglecting children, and refusing sex. Following Jensen and Oster (2009), I count the number of reasons for which a woman finds domestic violence justifiable. An alternative specification simply indicates whether the respondent finds domestic violence justifiable under any circumstance. Approximately 41% of women find domestic violence justifiable, with an average of 1.1 reasons mentioned. Notably, men report being less accepting of domestic violence. 30% agree with any reason for domestic violence. Finally, an even smaller sample of women is asked about

their experiences with domestic violence. 33% of women experienced violence from their partner ever and 27% in the past 12 months.

Additional Variables

A number of different groups of variables are included and are used as controls as described in Chapter 5. The first set of variables pertains to demographics, including age, caste, religion, and sex. The second set of variables relates to variables affecting the propagation of radio signals. This includes the altitude and ruggedness surrounding survey clusters to altitude and ruggedness based on detailed elevation data provided by [Jarvis et al. \(2008\)](#).¹⁰ Propagation controls further include the (expected) distance to the nearest radio tower (also see Chapter 4). In addition, I compute the travel time from each observation to the nearest radio tower using Google’s Direction API.¹¹ Finally, additional geographic controls cover the urbanization, population density, travel times to the nearest city¹², and distances to water bodies and national borders.

3.2 Descriptives: Content

Depending on the audience and aim of the institution running a particular radio station, CRS focus on a host of different issues. The role of women has been a leading cause of activists fighting both for the policy and of operational CRS. [Pavarala and Malik \(2007\)](#) summarize that “gender is a significant dimension in community radio initiatives that are seeking to deploy communication technologies for social change in general and empowerment of women in particular” (p.210). Overall, women are not only addressed as an audience, but also strongly involved in the management structure and content production of many CRS ([Pavarala and Malik, 2007](#); [Nirmala, 2015](#)).

The first source I use to explore radio content are ‘Community Radio Compendia’. These booklets have regularly been published as part of ‘CRS Sammelan’, a facilitator event for CRS. They provide a one-page fact sheet on each participating station, including a short description of the radio’s main focus area and content. For radios that did not participate, the information is enriched with information from radios’ websites (if available). In total, I collect content information on 248 radios.¹³ After identifying the main topics, I go through all the texts, manually marking words related to different topics (see Section ?? in Appendix for more information on the procedure and underlying data). Overall, 129 or 54% of radios explicitly mention words related to ‘women empowerment’ in

¹⁰Specifically, I compute the average altitude and ruggedness within the 5km surrounding the reported location, hence, following the DHS’ practices for computing geographic controls.

¹¹The data is visualized in Figure B.6 (in Appendix).

¹²Travel times to the nearest city are based on [Weiss et al. \(2018\)](#). They define a high-density urban area “[...] as a contiguous area with 1,500 or more inhabitants per square kilometer or a majority of built-up land cover coincident with a population centre of at least 50,000 inhabitants” (p.333).

¹³Of these, information on 211 radios stems from radio compendia. Thereof, 180 descriptions are from the 2019 version.

their self-description, making it one of the most common themes. Education is mentioned by 64% of radio stations. Other key topics are health & hygiene, culture, and agriculture and fishing (see Section H in Appendix for more information).

The widespread coverage of topics related to women empowerment are confirmed by a survey of 160 radios conducted by SMART, an NGO working with community radios in India. It shows that 90% of surveyed stations broadcast programs related to gender and “the majority of community radios are broadcasting programs on child marriage, sexual harassment, gender-based violence, and women and health education (p. 4)”. The survey also shows that more than half of all staff members are women, who particularly work in content production and as radio jockeys. However, leadership roles continue to be dominated by men (SMART, 2023).

To get an idea of what radios are talking about, I crawl all >14k radio shows uploaded to edaa.in, a platform where community radios can upload and exchange content. Using Google’s Speech-to-Text API and Google Translate, I transcribe and upload 5,869 shows from 95 stations which uploaded content to the website.¹⁴ After cleaning the transcripts, Latent Dirichlet allocation (LDA) is applied to identify topics (Blei et al., 2003). LDA is arguably the most widely used method for determining latent topics in a selection of documents. Intuitively, it treats each transcript as a mix of latent topics, where topics are probability distributions over terms. Each document is assumed to have been created by drawing from the distributions of these topics. Based on these assumptions, the terms, and the chosen number of topics, LDA estimates the topic distribution for each document and the term distribution for each topic (Hansen et al., 2018, provide a detailed description of LDA, including its underlying econometrics).¹⁵ The resulting topics are hand-labeled based on each topic’s 15 most predictive terms (see Tables I.4 and I.5 in Supplemental Material). To get an idea of the content, I first collapse the topics into 8 categories.

The graph on the left of Figure 2 visualizes the average radio’s share of development-related content across topics. As visible, radios cover a lot of ground, ranging from agriculture to education and women-specific content. In addition, the topics of women and education make up around half of the total content. The right-hand side of the figure further zooms into women-specific topics. These include subtopics on women’s health, education, maternity, and marriage.

¹⁴Given that some radios uploaded a host of content, I randomly choose up to 578 shows from the radios that uploaded more than that.

¹⁵The transcription and translation of audio files naturally reduced the resulting transcripts’ quality. Although the process retains words used, it often does not retain sentence structures. For this reason, I decided against using topic models that take into account context and sentences.

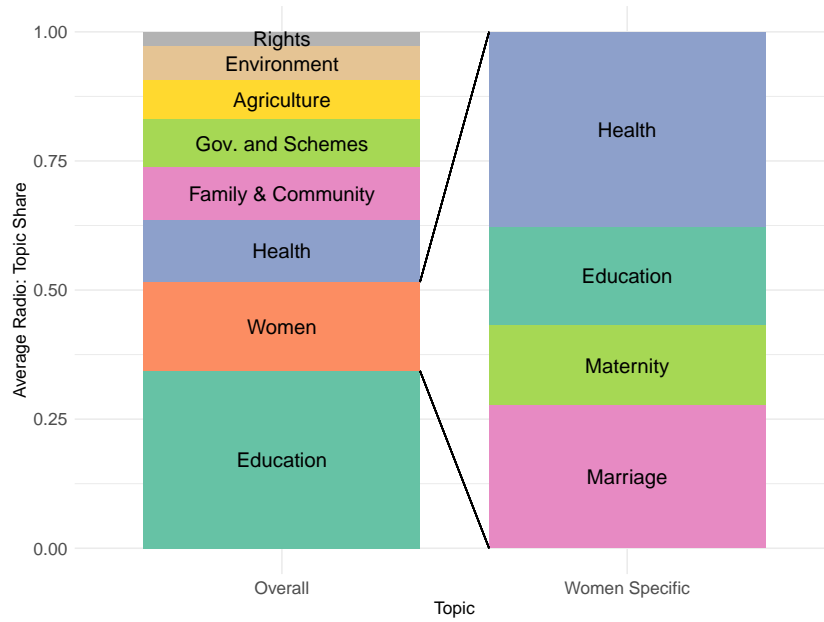


Figure 2: Radios' Share of Content Across Topics Based on LDA

Note: The above figure visualizes the distribution of topics of the average radio station. For this, translated transcripts of radio shows are assigned topic shares using an LDA model. Next, the average transcript is computed by station. Finally, the average radio's content is computed. I exclude entertainment and undefined other topics from the visualization in order to provide an idea of development-related messages.

To empirically test what stance radios take on topics related to women's empowerment, I employ a novel approach to prepare and analyze radio shows using a multistage evaluation of transcripts using Generative Pre-Trained Transformers (GPT). I start by preparing the transcripts for analyses using GPT. The translation and transcription process strongly affects the grammatical structure and interpretability of transcripts. To prepare these for content analyses, I first send all transcripts to OpenAI's ChatGPT-3.5 requesting a restoration of the original transcript without adding any additional information or making assumptions. After preparing the transcripts, I classify whether these discuss topics of child marriage, girls' education, family planning, or violence against women. Specifically, I ask GPT-4 to return a vector with four binary variables indicating whether the respective topic is discussed. Similarly to using multiple research assistants, the request is sent twice and, in case the two answers are in disagreement, a third request is sent, applying a majority rule. I identify potential additional articles on the topics using simple keywords, such as 'child marriage' or 'contraception'. In a final step, I then send all identified transcripts to ChatGPT-4o. I first ask whether the article covers the respective topic and, if so, ChatGPT is asked to state whether the articles are in favor, neutral or against the respective issue (e.g. child marriage or girls' education). Chapter I.2 in Supplementary Material provides a detailed explanation of the approach, including specific prompts.

The results show that 96% of the points of view taken on the above issues can be described as ‘progressive’ in the sense that these argue in favor of girls’ education and family planning as well as against child marriage and domestic violence. In total, 387 or 6.6% of shows are identified to explicitly discuss the issues listed above. These take ‘progressive’ viewpoints 423 times.¹⁶ Only two ‘conservative’ points of view are identified, with another 18 taking no or a neutral position. Overall, this suggests that the content produced by radios can be described as ‘progressive’.

Overall, both sources on radios’ content suffer from potential drawbacks. For instance, radios may upload selective shows or report selective topics they focus on. They may also shift their focus over time. However, it seems rather unlikely that within development related content, radios would

both topic analyses show that women-specific programs are a vital element of CRS’ content. They further show that content produced on women’s empowerment is progressive in the sense that radios produce content in favor of girls’ education, later marriage, lower fertility, and against domestic violence.

¹⁶This number is slightly higher than the number of shows given that some shows discuss multiple issues.

| Variable | cluster | n | mean | sd | median | min | max |
|--|---------|---------|------------|------------|------------|-------|------------|
| RADIO VARIABLES | | | | | | | |
| Exposure | 8,211 | 821,243 | 0.23 | 0.27 | 0.10 | 0 | 0.99 |
| Coverage Probability | 8,211 | 821,243 | 0.47 | 0.44 | 0.33 | 0 | 1 |
| Coverage Probability: Closest Radio | 8,211 | 821,243 | 0.44 | 0.44 | 0.26 | 0 | 1 |
| Radio Owner | 8,207 | 195,584 | 0.09 | 0.29 | 0 | 0 | 1 |
| Radio Consumer | 8,208 | 234,550 | 0.19 | 0.39 | 0 | 0 | 1 |
| Radio Familyplanning | 8,208 | 234,550 | 0.20 | 0.40 | 0 | 0 | 1 |
| Radio HIV/AIDS | 2,844 | 56,782 | 0.16 | 0.37 | 0 | 0 | 1 |
| OUTCOMES | | | | | | | |
| Years of Edu. | 8,210 | 819,532 | 5.90 | 5.25 | 5 | 0 | 20 |
| Completed Primary | 8,210 | 819,532 | 0.50 | 0.50 | 0 | 0 | 1 |
| Completed Secondary | 8,210 | 819,532 | 0.18 | 0.38 | 0 | 0 | 1 |
| Higher than Secondary | 8,210 | 819,532 | 0.11 | 0.31 | 0 | 0 | 1 |
| Ever Married | 8,210 | 620,620 | 0.72 | 0.45 | 1 | 0 | 1 |
| Num. Children | 8,207 | 202,106 | 1.70 | 1.61 | 2 | 0 | 15 |
| Autonomy of Women (Female Respondent) | 2,842 | 24,983 | 0.64 | 0.33 | 0.67 | 0 | 1 |
| Autonomy of Women (Male Respondent) | 2,843 | 31,231 | 0.82 | 0.29 | 1 | 0 | 1 |
| Attitude (Count) | 2,842 | 34,188 | 1.10 | 1.61 | 0 | 0 | 5 |
| Attitude (Any) | 2,842 | 34,188 | 0.41 | 0.49 | 0 | 0 | 1 |
| Attitude (Count) - Male Respondent | 2,842 | 31,628 | 0.70 | 1.28 | 0 | 0 | 5 |
| Attitude (Any) - Male Respondent | 2,842 | 31,628 | 0.30 | 0.46 | 0 | 0 | 1 |
| Experienced Violence by Partner (Ever) | 2,839 | 18,825 | 0.33 | 0.47 | 0 | 0 | 1 |
| Experienced Violence by Partner (Past 12m) | 2,839 | 18,825 | 0.27 | 0.44 | 0 | 0 | 1 |
| CONTROLS: DEMOGRAPHY | | | | | | | |
| Age | 8,210 | 821,138 | 29.33 | 20.11 | 26 | 0 | 95 |
| Female | 8,210 | 821,242 | 0.49 | 0.50 | 0 | 0 | 1 |
| Caste ST | 8,192 | 799,207 | 0.22 | 0.42 | 0 | 0 | 1 |
| Caste: SC | 8,192 | 799,207 | 0.07 | 0.25 | 0 | 0 | 1 |
| Caste: OBC | 8,192 | 799,207 | 0.46 | 0.50 | 0 | 0 | 1 |
| Caste: Other | 8,192 | 799,207 | 0.25 | 0.43 | 0 | 0 | 1 |
| Religion: Hindu | 8,210 | 821,242 | 0.81 | 0.39 | 1 | 0 | 1 |
| Religion: Muslim | 8,210 | 821,242 | 0.14 | 0.34 | 0 | 0 | 1 |
| Religion: Other | 8,210 | 821,242 | 0.06 | 0.23 | 0 | 0 | 1 |
| CONTROLS: PROPAGATION | | | | | | | |
| Travel Time to Radio Tower (min) | 8,194 | 819,525 | 57.28 | 33.89 | 55.18 | 0.75 | 329.83 |
| Distance to Radio Tower (km) | 8,211 | 821,243 | 26.00 | 14.71 | 26.86 | 0.91 | 49.99 |
| Distance to 2nd closest Tower (km) | 8,211 | 821,243 | 67.99 | 58.09 | 53.23 | 1.35 | 433.91 |
| Mean Altitude | 8,211 | 821,243 | 274.85 | 300.71 | 209.30 | -0.06 | 2,471.05 |
| Mean Ruggedness | 8,211 | 821,243 | 10.95 | 17.66 | 5.70 | 2.24 | 156.25 |
| CONTROLS: GEOGRAPHIC | | | | | | | |
| Urban | 8,210 | 821,242 | 0.39 | 0.49 | 0 | 0 | 1 |
| Pop. Density (2015) | 8,211 | 821,243 | 2,509.62 | 5,915.53 | 857.46 | 23.24 | 63,807.06 |
| Travel Time to Nearest City (min) | 8,211 | 821,243 | 14.58 | 17.38 | 11.24 | 0 | 275.48 |
| Proximity: Water (m) | 8,211 | 821,243 | 177,990.70 | 118,651.60 | 174,432.00 | 1.96 | 511,661.20 |
| Proximity: National Borders (m) | 8,211 | 821,243 | 180,751.90 | 130,304.30 | 159,207.20 | 10.38 | 583,496.30 |

Table 1: Summary Statistics: DHS

| Variable | Description | Source |
|--------------------------------------|---|--|
| RADIO VARIABLES | | |
| Exposure | Exposure to radio signal | own data and estimates |
| Coverage Probability | Probability of true location to lie in coverage area | own data and estimates |
| Radio Owner | Age 15 to 49: Household owns a radio | NFHS (women survey) |
| Radio Consumer | Age 15 to 54: Individual listens to radio | NFHS (women survey) |
| Radio Familyplanning | Age 15 to 54: Individual heard family planning message on radio in last few months | NFHS (women & men survey) |
| Radio HIV/AIDS | Age 15 to 49: Individual learned about AIDS from source: RADIO | NFHS (women survey) |
| OUTCOMES | | |
| Years of Edu. | Years of education completed | NFHS (HH member survey) |
| Completed Primary | Completed primary school | NFHS (HH member survey) |
| Completed Secondary | Completed secondary school | NFHS (HH member survey) |
| Higher than Secondary | Education level higher than secondary school | NFHS (HH member survey) |
| Attends School | Age 5 to 18: Currently in School | NFHS (HH member survey) |
| Ever Married | Age >12: Was ever married (incl. divorced, widowed, married) | NFHS (HH member survey) |
| Num. Children | Age 15 to 49: Number of living children | NFHS (women survey) |
| Has Child | Age 15 to 49: Has at least one child that is alive | NFHS (women survey: state module) |
| Attitude (Count) | Age 15 to 49: Number of reasons that individual argues justify that a husband beats or hits his wife (0 to 5) | NFHS (women survey: state module) |
| Attitude (Any) | Age 15 to 49: Argues that husband is justified in hitting or beating his wife for at least on reason (out of 5) | NFHS (women survey: state module) |
| Autonomy | Married, Age 15 to 49: Share of decisions and places respondent participates in / can visit alone | NFHS (women survey) |
| Autonomy (Men) | Age 15 to 54: Share of decisions respondent believes his wife/partner should participate in | NFHS (men survey) |
| Any Violence (Ever) | Married, Age 15 to 49: Ever experienced any violence from partner (physical, emotional, sexual) | NFHS (women survey: state module) |
| Any Violence (past 12m) | Married, Age 15 to 49: Ever experienced any violence from partner (physical, emotional, sexual) | NFHS (women survey: state module) |
| CONTROLS: DEMOGRAPHY | | |
| Age | Age of individual | NFHS (HH member survey) |
| Female | Individual is female | NFHS (HH member survey) |
| Caste ST | Individual is part of a Scheduled Tribe (inferred from caste of HH head) | NFHS (HH member survey) |
| Caste: SC | Individual is part of a Scheduled Caste (inferred from caste of HH head) | NFHS (HH member survey) |
| Caste: OBC | Individual is part of a Caste classified as Other Backward Caste (inferred from caste of HH head) | NFHS (HH member survey) |
| Caste: Other | Individual is part of another caste (inferred from caste of HH head) | NFHS (HH member survey) |
| Religion: Hindu | Individual is Hindu (inferred from religion of HH head) | NFHS (HH member survey) |
| Religion: Muslim | Individual is Muslim (inferred from religion of HH head) | NFHS (HH member survey) |
| Religion: Other | Individual is Other (inferred from religion of HH head) | NFHS (HH member survey) |
| CONTROLS: PROPAGATION | | |
| Travel Time to Radio Tower (min) | Travel time (by car) to nearest radio tower that launched pre-2016 | DHS locations & Google Directions API |
| Distance to Radio Tower (m) | Distance to nearest radio tower that launched before 2016 | DHS locations & own data/ estimates |
| Expected Distance to Radio Tower (m) | Expected distance to nearest radio tower that launched before 2016 | DHS locations & own data/ estimates |
| Mean Altitude | Mean altitude of 5km area surrounding observation | own estimates based on Jarvis et al. (2008) |
| Mean Ruggedness | Mean ruggedness of 5km area surrounding observation | own estimates based on Jarvis et al. (2008) |
| CONTROLS: ADD. GEO. | | |
| Urban | Cluster is classified as urban | |
| Pop. Density (2015) | Population density in | DHS Geospatial Covariate Dataset |
| Travel Time to Nearest City | Avg. time (minutes) required to reach the nearest high-density urban center | DHS Geospatial Covariate Dataset & Weiss et al. (2018) |
| Proximity: Water (m) | Geodesic distance to either a lake or the coastline | DHS Geospatial Covariate Dataset |
| Proximity: National Borders (m) | geodesic distance to the nearest international borders | DHS Geospatial Covariate Dataset |

Table 2: Variable Descriptions and Sources

4 Spatial Jittering

A key component of the treatment variable of this study describes whether or not an individual lives in the treatment area, i.e., whether she is covered by a radio signal. As in many other developing countries, one of the most comprehensive sources of individual-level outcomes are DHS surveys.

In the DHS/NFHS surveys, enumerators gather precise coordinates of the central point of each enumeration area. These areas are small geographical units that typically cover about 20 households in India. However, to ensure privacy, the actual coordinates are not disclosed. Instead, the DHS adjusts the true locations by jittering them within a range of 0 to 2km in urban areas and 0 to 5km in rural areas.¹⁷ This introduces substantial measurement error and as I will show below, some bias in studies drawing on geographic coordinates of DHS observations. This is particularly the case if treatment areas or distances to treatments are small relative to the displacement.

The jittering follows the “random direction, random distance” method (for a detailed description see [Burgert et al., 2013](#))¹⁸:

1. randomly choose an angle between 0 and 360 degrees with uniform distribution
2. randomly choose a distance according to the type of cluster (urban/rural) with uniform distribution across the distance
3. combine both draws to obtain a new coordinate

As a result, the PDF of the jittering algorithm resembles a ‘circus tent’. The algorithm further has one important exception: if the jittered location drawn above lies outside the administrative unit (e.g. district or state), a new location is drawn until the draw results in a location within the given administrative unit.

The PDF of drawing location x^* conditional on original location x can be characterized as follows:

¹⁷Further, in rural areas, 1% of clusters are displaced by up to 10km. Given that, in expectation, only 0.5% of the clusters are jittered by more than 5km, this part of the jittering process is ignored here, as it has virtually no impact on estimation while substantially increasing computational costs when estimating coverage.

¹⁸For a formalization of the displacement see [Altay et al. \(2022\)](#).

$$f(x^*|x) = \frac{I(A(x) = A(x^*)) \times I(d(x, x^*) \leq \bar{d})}{d(x, x^*)} / \int_{\hat{x}} \frac{I(A(x) = A(\hat{x})) \times I(d(x, \hat{x}) \leq \bar{d})}{d(x, \hat{x})} d\hat{x} \quad (1)$$

$$= \begin{cases} \frac{1}{d(x, x^*)} \times \frac{1}{w(x)}, & \text{if } A(x) = A(x^*) \text{ and } d(x, x^*) \leq \bar{d} \\ 0, & \text{otherwise} \end{cases} \quad (2)$$

$$\text{where, } w(x) = \int_{\hat{x}} \frac{I(A(x) = A(\hat{x})) \times I(d(x, \hat{x}) \leq \bar{d})}{d(x, \hat{x})} d\hat{x} \quad (3)$$

$A(\cdot)$ describes the administrative unit of a given location, $d(\cdot, \cdot)$ describes the distance between two locations, and \bar{d} describes the maximum jittering distance, i.e., 2km in urban and 5km in rural areas. As shown, for valid locations x^* , the PDF depends on two components: $d(x, x^*)$, and $w(x)$. Importantly, $w(x)$ can be understood as the share of the full ‘circus tent’ distribution lying within the administrative boundaries of $A(x)$. This means that for valid x^* , $f(x^*|x)$ increases for locations in the vicinity of a border. To see this, consider two locations x_1 and x_2 . x_1 is far from the border and its jittering PDF follows a circus tent. x_2 is just next to a straight border. Here, the circus tent is cut in half. As a result, the probability weight on any viable location x^* doubles as $w(x_1) \approx 2 \times w(x_2)$.

Information on the jittering algorithm in combination with the observed jittered location x^* can be used to estimate with what probability a location observed at location x^* originally comes from the treatment area:

$$\Pi(T = 1|x^*) = \frac{\int_x f(x|x^*) \times T(x) dx}{\int_x f(x|x^*) dx} \quad (4)$$

where $T(x) \in \{0, 1\}$ is the treatment status of location x . This hinges on $f(x|x^*)$, which can be derived using Bayes’ theorem for random variables. More precisely:

$$f(x|x^*) \stackrel{(1)}{=} \frac{f(x^*|x)f(x)}{\int_x f(x^*|x)f(x)dx} \stackrel{(2)}{=} f(x^*|x) \quad (5)$$

Step (1) follows from Bayes’ Theorem. Step (2) follows by assuming $f(x)$ to be uniform (Altay et al., 2022). In effect, this is equivalent to being agnostic about the DHS’s survey sampling within small areas, i.e., making no assumptions about which direction or distance the x^* is more likely to have come from. This is consistent with the random distance, random direction jittering algorithm and essentially translates to not making further assumptions about which small geographic areas enumerators are more likely to have been to. Importantly, this step does not assume that the DHS/NFHS is equally likely to choose areas to survey across India. Rather, information on the DHS’s choices are

preserved in the observed locations x^* . For instance, if the DHS conducted a random draw of individuals across India, the distribution of x^* would follow the population distribution, given the “random direction, random distance” jittering method.¹⁹

$\Pi(T = 1|x^*)$ can then be written as follows:

$$\Pi(T = 1|x^*) = \frac{\int_x \frac{T(x)}{d(x,x^*) \times w(x)} dx}{\int_x \frac{1}{d(x,x^*) \times w(x)} dx} \quad (6)$$

and computationally be implemented as follows:

For each location x^* :

1. create an equidistant grid of points x within distance \bar{d} and administrative unit $A(x^*)$
2. for each x : generate a second grid with points z at distance \bar{d} of x and in administrative unit $A(x^*)$ and compute
$$w(x) = \sum_z \frac{1}{d(x,z)}.$$
3. estimate: $\Pi(T = 1|x^*) = \frac{\sum_x T(x)/(w(x) \times d(x,x^*))}{\sum_x 1/(w(x) \times d(x,x^*))}$

The result $\Pi(T = 1|x^*)$ is what I, for simplicity, term ‘coverage probability’: the probability mass on original locations located within the treatment area, conditional on observing a jittered location at coordinate x^* . Figure 3 visualizes the idea. The left hand figure shows the entire PDF and the right hand side the probability mass on original locations within the treatment area.

¹⁹While the most agnostic approach with respect to DHS’s decisions in the field, a potential improvement to this would be weighting $f(x)$ using high-resolution population data and/or by estimating which areas the DHS defines as urban or rural. However, given that both are subject to measurement error and author assumptions regarding the DHS’s decisions, this paper’s author prefers the more agnostic approach. For example, weighting $f(x)$ using high-resolution population data would assume that the DHS/NFHS’s sampling frame follows the population distribution. While this might be a reasonable assumption, the DHS oversamples some populations, as indicated by sample weights. Therefore, following the population-weighted approach would require additional information or assumptions about the survey weights and its interaction with high resolution population data.

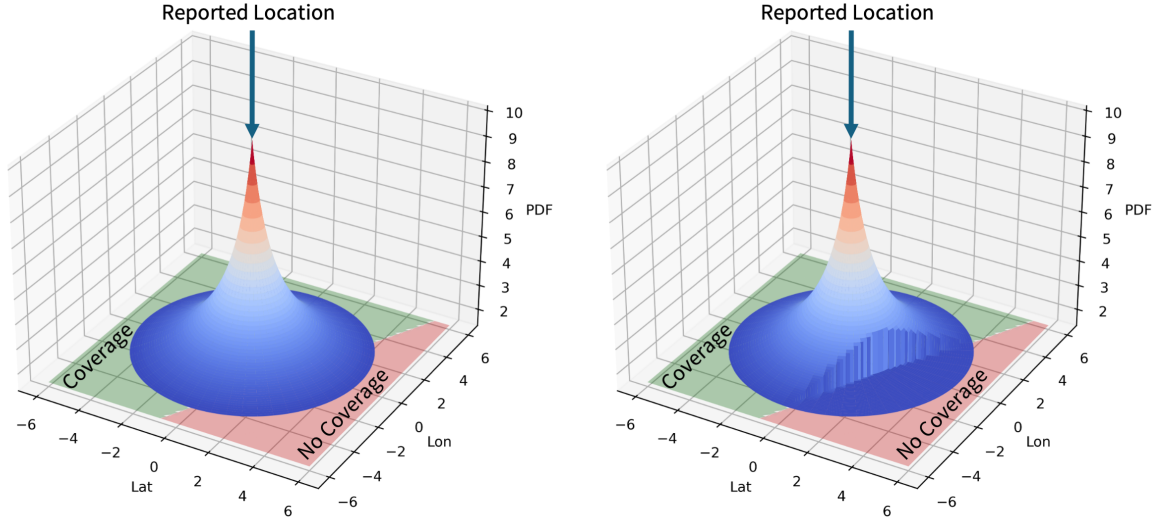


Figure 3: Visualization of Jittering Correction

Note: The figures above show the PDF of x conditional on observing x^* (Reported Location). The figure on the left shows the full likelihood mass, and the one on the right the likelihood mass on the treatment area. The PDF is rescaled for illustrative purposes. While it follows a similar circus tent shape, it is ‘steeper’ in reality.

4.1 Expected (Squared) Distances

The jittering does not solely affect the measurement of treatment status. Importantly, it also affects the calculation of distances between observed locations x^* and other points of interest. In this study, this is particularly relevant for the control of the distance between an observed location x^* and a given radio tower t . In other studies, this is relevant to compute distances to treatment areas (such as in RDD settings), schools, Christian missions, public services, etc.

First note that when computing the distance between an observed location x^* and a radio tower t , the observed distance based on x^* and t generally does not equal the expected distance when taking into account the jittering algorithm. To see this, first note that:

$$\mathbb{E}(d(x, t)) = \int_x f(x|x^*)d(x, t)dx \quad (7)$$

The computation can be performed using the box provided above by simply computing a distance between x and t in Step 2 and replacing $T(x)$ by $d(x, t)$ in Step 3. For locations whose jittering is unaffected by an administrative border, one can further derive a closed-form solution for both the expected and expected squared distance.

This can be done using donuts. To see this, first note that displacement is uniform in direction and distance. Thus, if one were to split the 5km circle around the reported loca-

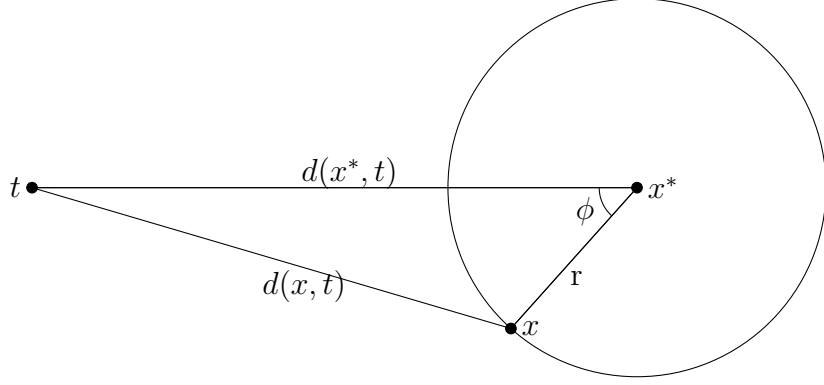


Figure 4: Visualization of setup and Law of Cosines

tion into two ‘donuts’, one going from 0 to $0.5\bar{d}$ and the other going from $0.5\bar{d}$ to \bar{d} , each donut contains the same probability mass of original locations. Similarly, when drawing a large number of donuts with the same width, each contains the same probability mass given uniform jittering across the distance. Now consider drawing one of these donuts at distance r from x^* and a potential original location x that lies on this donut as shown in Figure 4. To calculate the distance $d(x, t)$ between x and a radio tower t , one can draw on the Law of Cosines, which states $d(x, t) = \sqrt{r^2 + d(x^*, t)^2 - 2rd(x^*, t)\cos(\phi)}$. Integrating the distance formula for a uniformly distributed variable $\phi \in [0, 2\pi)$ then provides the expected distance between the point t and any x on the circle. Intuitively, this moves x in infinitesimal steps once around the circle. At each step, $d(x, t)$ is calculated and, overall, expectation:

$$\mathbb{E}(d(x, t)|r) = \frac{1}{2\pi} \int_0^{2\pi} \sqrt{r^2 + d(x^*, t)^2 - 2rd(x^*, t)\cos(\phi)} d\phi \quad (8)$$

$$= \frac{2}{\pi} (r + d(x^*, t))^2 E\left(\frac{2\sqrt{rd(x^*, t)}}{r + d(x^*, t)}\right) \quad (9)$$

Equation 9 follows by rewriting the equation as a function of the elliptic integral of the second kind $E(\cdot)$, which allows for efficient calculation of the expected distance as a function of r and $d(x^*, t)$ (see Appendix A for a detailed derivation).

Given that r is generally unknown and anywhere between 0 and \bar{d} the expected distance between x and t can be obtained by integrating over all donuts within distance \bar{d} with uniform priors, as suggested by the “random distance, random direction” jittering algorithm:

$$\mathbb{E}(d(x, t)) = \frac{1}{\bar{d}} \int_0^{\bar{d}} \frac{2}{\pi} (r + d(x^*, t))^2 E\left(\frac{2\sqrt{rd(x^*, t)}}{r + d(x^*, t)}\right) dr \quad (10)$$

Comparing the expected difference between x and t to the reported one between x^*

and t yields several insights: First, as shown in Figure A.1, no location is expected to be at a distance below 2.5km from the radio tower (1km in urban areas). This is true, even if x^* exactly equals t . To see this, note that even if this were the case, the original location lies anywhere between 0 and \bar{d} from the observed location with uniform probability across the distance. Therefore, x is expected to be at a distance of $\frac{1}{2}\bar{d}$ from the tower. Second, the absolute and relative difference between $d(x^*, t)$ and $\mathbb{E}(d(x, t))$ decreases in $d(x^*, t)$. However, $d(x^*, t)$ is always smaller than $\mathbb{E}(d(x, t))$. Third, given that the difference increases in \bar{d} , differences for urban areas are smaller.

Figure A.2 further compares the theoretical result in Equation 10 to results obtained when empirically estimating expected distances using the grid in the above box. As expected, for observations whose jittering is unaffected by an administrative border, the empirical results equal those of the theoretical result. For those affected by a border, the distances are scattered around the theoretical line.

Finally, the expected squared distance can be derived following the same logic as above:

$$\mathbb{E}(d(x, t)^2) = \int_0^{\bar{d}} \frac{1}{2\pi} \int_0^{2\pi} r^2 + d(x^*, t)^2 - 2rd(x^*, t)\cos(\phi) d\phi dr \quad (11)$$

$$= d(x^*, t)^2 + \frac{1}{\bar{d}} \int_0^{\bar{d}} r^2 dr \quad (12)$$

$$= \begin{cases} d(x^*, t)^2 + 8.\bar{3} & \text{in urban clusters} \\ d(x^*, t)^2 + 1.\bar{3} & \text{in rural clusters} \end{cases} \quad (13)$$

The above equation shows that the expected squared distance only varies between urban and rural clusters, i.e., by how far locations are jittered. Thus, other than for the expected distance, the difference between the expected squared distance and $d(x^*, t)$ is a constant number. In relative terms, this again means that the difference is much higher for low $d(x^*, t)$ as visualized in Figure ??.

Overall, the results regarding expected (squared) differences suggest that studies controlling for distances between DHS observations and any geographic object or border should correct for these, especially when working on rather small geographic areas or when distances are vital controls, such as distances to treatment areas or locations.

5 Empirical Strategy

To identify the causal effect of community radios, variation in coverage due to local topographical features is exploited (Olken, 2009).²⁰ This is done in several steps: First, using the irregular terrain model (ITM, Hufford (2002)) and with information on the power, location, and height of the radio transmitter as well as the topography of India, the coverage area of each CRS is estimated.²¹ Given that the location of the transmitter may be correlated with other unobservable characteristics, e.g., if radios tend to be built in more or less developed areas, controls for the distance to the transmitter are included (Yanagizawa-Drott, 2014).²² The remaining variation in the signal strength is driven by differences in the line of sight between the transmitter and the observation. This is affected by both the topography between the observation and the transmitter, as well as the topography of the observation’s immediate surroundings. The latter may directly affect outcomes, for example, because places up in the mountains may be less likely to receive the signal and be more conservative. To control for this, topography controls are added. These include second-order polynomials of the altitude and ruggedness of observations. Finally, I control for the time it takes to travel to the radio tower. This additional control directly captures both the distance to the closest radio tower and the geographic surroundings of specific locations. The topography between the radio tower and the surroundings drives the remaining variation in coverage.

To account for level differences between different parts of India, radio fixed effects are added, where each observation obtains the fixed effect of the closest radio station (that was launched before data collection). The resulting estimator exploits the variation in received radio signals within such areas.

Given that radios launch at different points in time (see Figure B.1), the potential effects of radio do not solely depend on their presence at the time of data collection but also on how long they have been on the air. Thus, even if an individual lives right next door to a CRS, the radio is not expected to have any effect if it is launched a day before data collection. Following the logic of Armand et al. (2020), treatment is thus defined as follows:

$$Exposure_{c(i)} = \sum_{r=1}^R AddedCoverageProbability_{c(i),R} \times f(Timeshare_R) \quad (14)$$

²⁰The strategy was used in a number of papers, e.g. Adena et al. (2020); Armand et al. (2020); Enikolopov et al. (2011); Bursztyn and Cantoni (2016); Adena et al. (2015); DellaVigna et al. (2014), and Yanagizawa-Drott (2014)

²¹The height is officially restricted to be between 15 and 30m. However, multiple expert interviews at NGOs and the ministry and visits to four radio stations confirmed that radios maximize their coverage by building a 30m tower.

²²an alternative is to control for the theoretical radio signal received by the observation in free space (e.g. see Durante et al. (2019) and Olken (2009)). It does not fit the context of this paper, given that it is unclear how to define the coverage probability in such a setup.

where $f(Timeshare_R)$ is a function of the share of time between 2005 and 2015 that radio R was on air where $Timeshare_R$ ranges from 0 to 1. $AddedCoverageProbability_{c(i),R}$ describes the increase in probability to be covered by a radio signal that radio R brings (ranging from 0 to 1) in addition to previously launched radios. Therefore, if individual i is covered with full probability by a radio that launches in 2005 ($AddedCoverageProbability_{c(i),1} = 1$) and a second radio launches in $t=2$ and covers the location with some nonzero probability, then $AddedCoverageProbability_{c(i),2} = 0$. As a result, $(\sum_{r=1}^R AddedCoverageProbability_{c(i),R}) \in [0, 1]$ and $Exposure_c(i) \in [0, 1]$. For example, a value of $Exposure_c(i) = 1$ means that the radio covers individual i with full probability and is on air from 2005 to 2015.

This assumes a linear treatment effect over time. This may be the most agnostic approach given that it is hard to form expectations on the ‘true’ functional form, which may further differ from outcome to outcome. I explore alternative functional forms in Chapter C in Supplementary Material. The results suggest that the effect of radio may be nicely resembled by a quadratic effect over time. Though I keep the linear effect as the default, I repeat all regressions using a quadratic effect over time, i.e., replacing $Timeshare_R$ by $Timeshare_R^2$ in Equation 14.

Moving the above into a regression framework yields the following specification:

$$y_i = \beta Exposure_{c(i)} + Distance_{c(i)}\delta + Geography_{c(i)}\omega + X_i\lambda + \gamma_{r(i)} + \epsilon_{i,c(i),r(i)} \quad (15)$$

here, y_i is the outcome of interest for individual i . $Distance_{c(i)}$ includes second-order distance polynomials to the closest, second, and third closest radio towers for i ’s cluster $c(i)$.²³ Further, I control for the travel time between the cluster and the closest radio tower.²⁴ $Geography_{c(i)}$ includes topography controls, i.e. second-order polynomials of ruggedness and altitude. In addition, X_i includes several individual-level covariates and variables related to clusters’ surroundings, such as population density or travel time to the nearest city. Finally, $\gamma_{r(i)}$ are fixed effects for radio r closest to individual i . This controls for level differences across treatment areas. Finally, $Exposure_{c(i)}$ is the effect of treatment of interest, which describes the exposure of cluster $c(i)$ to CRS.

Identification relies on exogenous variation in exposure to CRS driven by topographical features between the radio tower and the observation. Although the treatment variable includes the share of time a radio was present in a given region, it is important to note that γ_c effectively controls for any specific characteristics of the coverage area. This includes the fact that certain areas receive a CRS at an earlier point in time. Thus, identification is based on topographical features. Specifically, the identification assumption is that the remaining variation of exposure is driven by topographical features between

²³values for the second and third closest towers are capped at 50km.

²⁴see Figure B.6 for a visualization

the transmitter and the receiver and uncorrelated with all other determinants of women’s empowerment.

In addition to the variables mentioned above, X_i includes a number of controls: on the cluster level these include the log. population density, log. travel time to the nearest urban area²⁵, proximity to national borders and water bodies, and whether the cluster is defined as urban by the NFHS.²⁶ On the individual level, I control for age dummies, caste (ST/SC/OBC/Other), religion (Hindu/Muslim/Other), gender, and an interaction between urbanity and gender to account for general differences in women empowerment between urban and rural India.²⁷

All regressions are estimated using OLS. In line with [Armand et al. \(2020\)](#) and [Yanagizawa-Drott \(2014\)](#), I account for spatial autocorrelation using [Conley \(1999, 2010\)](#) Standard Errors with a 100km spherical kernel. In addition, the main results are estimated using heteroskedasticity robust standard errors clustered at the subdistrict level (see Supplemental Material J). This follows [Durante et al. \(2019\)](#), [DellaVigna et al. \(2014\)](#), [Adena et al. \(2020\)](#), and [Olken \(2009\)](#).²⁸

6 Results

6.1 Exogeneity Check

I start by testing the treatment’s correlation with pre-determined cluster characteristics that are unlikely to be affected by the radio but likely predictive of outcomes. That is, I test for heterogeneity in observables being correlated to the treatment variation used in my paper. I follow [Yanagizawa-Drott \(2014\)](#) and regress various characteristics on the treatment variable. The regressions slightly differ from Equation 15 by excluding variables in X_i which partially serve as outcomes here.

The regressions reported in Table D.13 include outcomes potentially correlated with the role of women but unlikely to be affected by radio: population density, caste (SC/ST), Muslim, urbanity, proximity to national borders, travel time to nearest city, and travel time to the nearest radio tower. The regression on travel time to the nearest radio naturally excludes this variable from the set of controls.

The results are insignificant across all variables. This holds across different specifications, i.e., when assuming either linear and quadratic effects of radio over time. Overall,

²⁵Travel times are based on [Weiss et al. \(2018\)](#)’s definition of high-density urban areas. They define these “as a contiguous area with 1,500 or more inhabitants per square kilometer or a majority of built-up land cover coincident with a population centre of at least 50,000 inhabitants” (p.333).

²⁶The NFHS follows the 2011 Indian population census’ definition of urban/rural, see [Census of India \(2011\)](#).

²⁷Note that in regressions that only include women, variables on gender are irrelevant.

²⁸Key packages used: Regressions: *fixest* ([Bergé, 2018](#)); Spatial operations: *sf* ([Pebesma, 2018](#)); Table Export: *modelsummary* ([Arel-Bundock et al., 2023](#)) (all in R)

this strengthens the causal interpretation of the variation used in this paper. Nevertheless, it is important to note that all the outcomes used in the exogeneity regressions are included as controls in regressions below.

6.2 Radio Consumption and Content Reception

Next, I test whether exposure affects radio consumption, including the consumption of development-related content. Table 3 reports the results. Starting with Column (2), being fully exposed to the radio from 2005 to 2016 is estimated to increase radio consumption by 3.3pp. in the linear and 5pp. in the quadratic model. This corresponds to an increase of 17 to 27% percent compared to the baseline. Given that the baseline includes treated units, the actual relative effect is likely greater.²⁹

Columns (3) and (4) provide evidence on development-related content. These variables get closest to measuring exposure to content typically produced by CRS, as suggested by the content analyzes above. The survey includes questions about having heard messages related to family planning or HIV/AIDS on the radio in the past months. The results show strong increases across these variables, ranging from 5.3 to 7.6pp. depending on variable and model. This suggests strong increases by 27 to 46% compared to baseline when fully exposed over the entire period of time. Regarding gender differences in radio and content exposure, Table D.1 (in the appendix) shows that the observed effects are greater in magnitude for women.

Column (1) shows that the observed effects are not driven by increased radio ownership. This may be unsurprising given that (in cash-constrained settings) it is rather unlikely for individuals to purchase a radio due to the arrival of a single additional radio station. As the difference between the ownership rate and consumption indicates, people also listen to radio jointly. This is likely to be the case for CRS, which attempts to bring communities or specific groups, such as women, together.

Finally, Table D.12 (in the appendix) tests the effects of CRS on other media. On the one hand, this resembles a flawed robustness check, as one would not expect exposure to have a strong positive effect on other media. It is flawed in the sense that one may expect negative coefficients if people substitute other media for listening to radio. The results provide no such evidence. Exposure is not related to watching television, reading newspapers, using the Internet or mobile phones. This is reassuring of the exogeneity check and suggests that people do not stop consuming other media to listen to radio.

Overall, the results show that CRS increases radio consumption and strongly increases individuals' propensity to have listened to a development-related show. These effects are not driven by substitution away from other media.

²⁹Table D.2 (in the appendix) shows that around half of the effect is driven by people that rarely listen to radio, i.e. 'less than once a week'. The other half is driven by daily or weekly listeners.

Panel A: Linear Effects Over Time

| | Radio Owner | Radio Consumer | Radio Familyplanning | Radio HIV/AIDS |
|----------|-------------------|-------------------|----------------------|--------------------|
| exposure | −0.010 (0.018) | 0.033* (0.019) | 0.053** (0.026) | 0.065** (0.027) |
| Num.Obs. | 190 157 | 228 289 | 228 289 | 55 508 |
| R2 Adj. | 0.065 | 0.073 | 0.098 | 0.092 |
| Mean Y | 0.095 | 0.184 | 0.197 | 0.164 |
| SD Y | 0.293 | 0.388 | 0.398 | 0.37 |

Panel B: Quadratic Effects Over Time

| | Radio Owner | Radio Consumer | Radio Familyplanning | Radio HIV/AIDS |
|-----------|-------------------|--------------------|----------------------|---------------------|
| exposure2 | −0.004 (0.016) | 0.050** (0.020) | 0.062** (0.027) | 0.076*** (0.029) |
| Num.Obs. | 190 157 | 228 289 | 228 289 | 55 508 |
| R2 Adj. | 0.065 | 0.073 | 0.098 | 0.092 |
| Mean Y | 0.095 | 0.184 | 0.197 | 0.164 |

Table 3: Exposure and Radio Consumption

Note: The table shows the regression of radio consumption related variables on exposure. Regressions include all controls mentioned in Chapter 5. The dependent variables are defined as follows: radio owner: household owns a radio; radio consumer: dummy indicating whether individual listens to radio at least less than once a week; radio family planning: dummy for whether individual heard a family planning message in last few months. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

6.3 Education, Marriage, and Fertility

Moving to key variables related to women’s empowerment, the effects on three interrelated variables are investigated: education, marriage, and fertility. Education has generally been linked to reduced fertility (Basu, 2002) while the lack thereof remains an important barrier to women’s empowerment in India (Jensen and Oster, 2009). Child marriage is another key constraint on women’s empowerment, including by making women dependent on older men. Child marriage substantially limits women’s potential to accumulate skills and human capital as girls often drop out of school before or once they get married. This also places restrictions on women’s participation in the labor market (Field and Ambrus, 2008). Parent’s aspirations to marry their daughters at an early age may further reduce their willingness to invest in education (Maertens, 2013). Finally, lower fertility is often viewed as a key component to women’s empowerment. On the one hand, it reduces the health risks of women due to birth and increases incentives to invest in women’s human capital (Jayachandran and Lleras-Muney, 2009). On the other hand, it directly frees up women’s time which they can spend on breaking out of traditional roles, e.g. by acquiring more education or participating in the labor market (Miller, 2010; Goldin, 2006).

6.3.1 Education

Starting with education, three variables are available: first, I estimate effects on years of education obtained across school types. Second, I estimate effects on the degree obtained. Finally, I test the effects on school attendance at the time the survey was conducted.

I start by evaluating the effects on years of education obtained. For this, I first define age groups that correspond to the age at which individuals are typically in lower primary (5-10), upper primary (11-14), lower secondary (15-16), upper secondary (16-18), and higher education (19-30) (Anderson and Lightfoot, 2019). Given that the underlying data constitute a cross section, effects regarding years of education are potentially additive between school types, as educational choices may have been altered at earlier stages of their school life. Furthermore, since the first radios launched around 10 years before the data was collected, no effects on education of individuals above the age of 30 are expected, who are likely to have completed their educational choices when the first radios launched.

Table 4 provides estimates on the education of boys and girls in the respective age cohorts. Strong effects on girls' and positive though lower effects on boys' education are shown. The latter are insignificant in regressions with linear effects over time and significant when allowing for quadratic effects. The impact on education increases between age groups and most strongly so when moving to upper primary, lower secondary, and higher education. Increasing coefficients in general suggests that effects are present in schools of all types.

Panel A: Linear Effects Over Time

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|-------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|--------------------|
| Female x Exposure | 0.070 (0.064) | 0.245*** (0.093) | 0.392** (0.162) | 0.282 (0.189) | 0.493** (0.219) | 0.309** (0.122) |
| Male x Exposure | 0.051 (0.059) | 0.223*** (0.082) | 0.139 (0.117) | 0.121 (0.189) | 0.195 (0.199) | 0.178 (0.120) |
| Num.Obs. | 91 341 | 62 587 | 31 705 | 45 395 | 174 402 | 392 353 |
| R2 Adj. | 0.637 | 0.345 | 0.195 | 0.186 | 0.233 | 0.534 |
| Mean Y | 1.68 | 5.941 | 8.345 | 9.66 | 9.458 | 6.996 |
| SD Y | 1.635 | 2.116 | 2.584 | 3.406 | 4.912 | 4.855 |

Panel B: Quadratic Effects Over Time

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|---------------------------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|---------------------|
| is female = 1 x exposure ² | 0.062 (0.067) | 0.252** (0.108) | 0.494*** (0.168) | 0.522** (0.230) | 0.770*** (0.236) | 0.461*** (0.138) |
| is female = 0 x exposure ² | 0.053 (0.057) | 0.259*** (0.076) | 0.137 (0.107) | 0.418** (0.201) | 0.552*** (0.195) | 0.370*** (0.122) |
| Num.Obs. | 91 341 | 62 587 | 31 705 | 45 395 | 174 402 | 392 353 |
| R2 Adj. | 0.637 | 0.345 | 0.195 | 0.186 | 0.233 | 0.534 |
| Mean Y | 1.68 | 5.941 | 8.345 | 9.66 | 9.458 | 6.996 |

Table 4: Effects of CRS on years of education by age group

Note: The tables show separate regressions of years of education by age cohort on exposure to radio.

Panel A assumes linear effects over time and Panel B quadratic effects. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Next, I investigate whether exposure to radio affects the degree completed. Other than India's school system, the NFHS only differentiates between three types of degrees:

primary, secondary, and ‘higher’. I restrict the sample to those who have had the opportunity to obtain the respective degree and whose choices may have been altered by the CRS. Based on NFHS data, this includes people between the ages of 15 and 30 for primary and 18 to 30 for secondary or higher education.

The results shown in Table 5 suggest that exposure to radio during the entire period of time increases the probability for girls of obtaining a degree by 3pp at all levels of schooling. Using a squared effect over time suggests similar results and effects for boys as well. In general, the findings confirm the additive interpretation of the results in Table 4.

Moving to school attendance, Table D.11 (in the appendix) tests effects on the propensity of a child to be in school at the time of the survey. This information is only collected for individuals between the ages of 5 to 18 and therefore does not cover higher education. The results suggest an increase in attendance in lower secondary and, in particular, higher secondary education.

But why does education increase? To answer this, I draw on information on the reasons for which 5-18 year olds drop out of school. Tables D.3 and D.4 (in the appendix) show the results on reasons for dropout. Panel (A) starts with a simple regression of having dropped out of school on exposure. As expected, the results closely mirror those of school attendance, showing a fall in dropout rates for girls in higher and lower secondary education. Next, I create indicator variables for different reasons for dropout. I set the variables to zero for those still in school or those who have dropped out for another reason. The results in Panels (B) to (G) show that falls in dropout rates are primarily driven by three factors. First, fewer students report a loss of interest in school as a reason for dropout. This particularly applies to girls and boys in lower secondary school (Panel B). Costs are also substantially less likely to be cited as a reason for dropout for girls in higher secondary school. The third main reason is that fewer girls in upper secondary school drop out due to marriage. Interestingly, reasons that primarily pertain to girls, such as safety, the lack of female teachers, lack of a school for girls, or household and care work, do not drive lower dropout rates. Similarly, work as a reason for dropout is unaffected.

Overall, results on education suggest strong effects on girls’ and lower, often insignificant effects on boys’ education. Although the results vary slightly by outcome and specification, the picture that emerges is consistent with additive effects across school types. This means that the propensity for kids to obtain additional education increases at all levels of education. The results on years of education and school attendance further suggest that the effects are strongest for secondary and higher education and weakest for lower primary education. This is consistent with the fact that while a large share of students finish primary school, secondary and higher education are the key barriers at which girls especially tend to drop out (Anderson and Lightfoot, 2019). The reasons for school

dropout further suggest that effects are driven by increased interest in school, higher willingness to pay, and a decrease in the propensity of girls to enter an early marriage. This is indicative of an overall higher value placed on girls' education.

Panel A: Linear Effects Over Time

| | Primary | Secondary | Higher |
|-------------------|--------------------|-------------------|-------------------|
| Female x Exposure | 0.032** (0.015) | 0.037* (0.021) | 0.027* (0.015) |
| Male x Exposure | 0.013 (0.013) | 0.017 (0.021) | 0.015 (0.016) |
| Num.Obs. | 238 425 | 191 899 | 191 899 |
| R2 Adj. | 0.161 | 0.160 | 0.134 |
| Mean Y | 0.807 | 0.41 | 0.255 |
| SD Y | 0.395 | 0.492 | 0.436 |

Panel B: Quadratic Effects Over Time

| | Primary | Secondary | Higher |
|---------------------------------------|---------------------|---------------------|---------------------|
| is female = 1 x exposure ² | 0.050*** (0.017) | 0.063*** (0.023) | 0.044*** (0.015) |
| is female = 0 x exposure ² | 0.031** (0.013) | 0.059*** (0.021) | 0.052*** (0.015) |
| Num.Obs. | 238 425 | 191 899 | 191 899 |
| R2 Adj. | 0.161 | 0.160 | 0.134 |
| Mean Y | 0.807 | 0.41 | 0.255 |

Table 5: Effects of CRS level of education achieved.

Note: The dependent variable indicates whether an individual has obtained this degree, including individuals that obtained a higher degree. The results are presented for individuals aged 15-30 for primary and 18-30 for secondary and higher education at time of data collection (2015-16). These age groups are chosen as their choices may have been affected by CRS and given that they have been able to finish the respective degree. Panel A assumes linear effects over time and Panel B quadratic effects. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

6.3.2 Marriage

Moving to the marriage market, Figure 5 provides evidence on the effects of radio by age group and sex. Across all regressions, the dependent variable describes whether an individual has ever been married. As before, coefficients arise from separate regressions by age group. The results show that the propensity for a woman to marry decreases up to her mid-20s, including decreases in early marriage between the ages of 13 to 18. I include 18 into 'early marriage' given that the age describes the age at which the survey took place rather than the age of marriage. The result confirms the above results on marriage being less frequently cited as a reason for school dropout. Although early marriage results

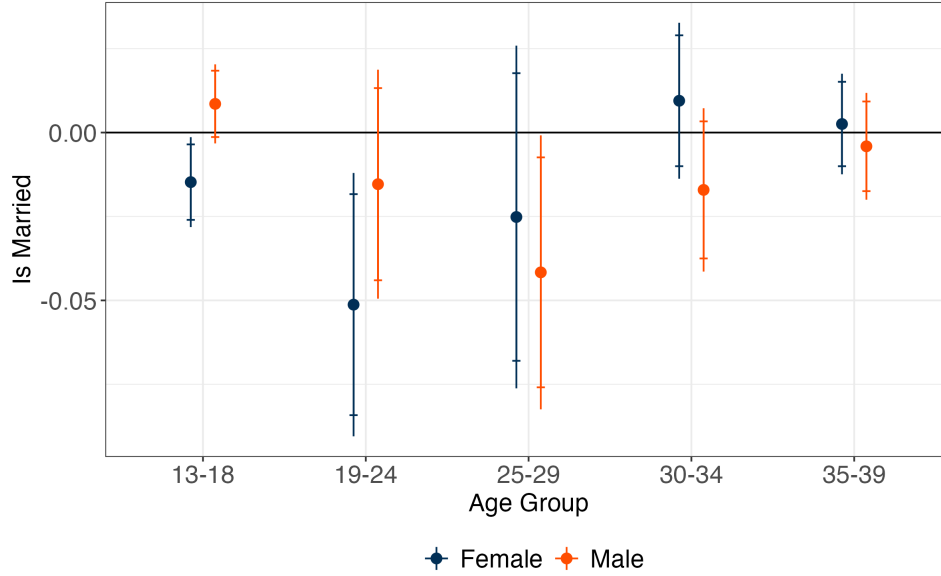


Figure 5: Exposure and Radio Consumption

Note: The figure shows coefficients with 90 and 95% Confidence Intervals of regressions of a dummy for being married interacted with gender on radio exposure. Regressions are run separately by age group.

These include all controls mentioned in Chapter 5. Full regression results are shown in Table D.5. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010).

are low in absolute terms, they are high in relative terms. The point estimate of the linear model suggests a 40% decrease in the average of the dependent variable when exposed over the entire time period. At 14%, the relative effect is lower but remains high for women between the ages of 19 and 24. For men, the results are similar but lagged by around 5 years. Men's marriage rates decrease most strongly between the ages of 25 and 29. This is consistent with an average age gap between husbands and wives of approximately 5 years. By the age of 30 to 34, coefficients return to zero. At this age, most individuals in the sample are married, with little difference to the overall marriage rate beyond this age (92% for 30-34 and 97% for 35-39 year olds). Table D.5 (in the appendix) provides the full regression results and confirms the above results using the quadratic model.

Overall, these findings suggest that exogenous exposure to CRS results in substantial delays in marriage, including early marriage of girls.

6.3.3 Fertility

Table 6 presents the results with respect to the fertility of women. More specifically, it shows the number of children of women, both in general and by age group. The findings indicate that exposure to radio throughout the time frame reduces the number of children by 0.1. Effects are particularly strong for individuals between the ages of 19 and 35. In absolute terms, effects are strongest for women aged 31-35, while there are no effects for older cohorts. The strong effect might be explained by older individuals having had more

time to both have and not have children. Decreased fertility might be driven by both delayed child bearing due to later marriage or decreases in total lifetime fertility. Given that most children are born when mothers are well below 35 years of age, a decrease in lifetime fertility appears a more likely explanation.

Overall, the results with respect to fertility, marriage, and education suggest strong effects of radio exposure on women's status. In particular, educational choices can be interpreted as changes in attitudes toward girls' education while education is - in itself - an important mechanism to increase women's agency (Basu, 2002). Delayed marriage and reduced fertility provide further evidence of a change in the role of women.

Panel A: Linear Effects Over Time

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|----------|--------------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| exposure | -0.001 (0.003) | -0.079** (0.034) | -0.138** (0.069) | -0.210** (0.098) | -0.033 (0.074) | -0.012 (0.104) |
| Num.Obs. | 20 747 | 56 848 | 32 510 | 26 469 | 24 899 | 35 064 |
| R2 Adj. | 0.011 | 0.306 | 0.198 | 0.232 | 0.254 | 0.282 |
| Mean Y | 0.006 | 0.624 | 1.882 | 2.429 | 2.735 | 2.993 |
| SD Y | 0.084 | 0.899 | 1.199 | 1.295 | 1.43 | 1.633 |

Panel B: Quadratic Effects Over Time

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|-----------|--------------------|---------------------|----------------------|----------------------|--------------------|--------------------|
| exposure2 | -0.001 (0.003) | -0.097** (0.038) | -0.188*** (0.064) | -0.306*** (0.085) | -0.164 (0.111) | -0.141 (0.097) |
| Num.Obs. | 20 747 | 56 848 | 32 510 | 26 469 | 24 899 | 35 064 |
| R2 Adj. | 0.011 | 0.306 | 0.199 | 0.233 | 0.255 | 0.282 |
| Mean Y | 0.006 | 0.624 | 1.882 | 2.429 | 2.735 | 2.993 |

Table 6: Fertility: Number of Children

Note: The tables show separate regressions the number of children a woman has by age cohort on exposure to radio. Panel A assumes linear effects over time and Panel B quadratic effects. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

6.4 Autonomy and Attitudes

While the above findings suggest improvements in women's autonomy and status, this section extends the analysis to attitudes toward domestic violence and women's autonomy. Surveys on these are only conducted in around a third of survey clusters, meaning that the treatment variation available for identification is substantially reduced.

Panels (A) and (B) of Table 7 present regressions on autonomy, where the dependent variable is the share of decisions a woman participates in and the places she is allowed to visit on her own. The results show overall positive effects driven by young women between the ages of 15 and 25.³⁰ Panel (C) and (D) show a shift in men's views on their wives

³⁰Tables D.6 and D.7 show separate results for women's autonomy with respect to decisions and mobility, respectively. These show that the effect is driven by both mobility and decision-making power.

involvement in household decisions as well. Other than for women, the coefficients are positive in age groups up to the age of 45. However, only two coefficients are significant at the 5 or 10% level, hence results should be taken with a grain of salt.

Regarding attitudes, Table D.8 (in the appendix) shows regressions on whether women find it justifiable for their husbands to beat their wives under any circumstance in Columns (1) and (2). Columns (3) and (4) provide evidence on the number of reasons women list that justify domestic violence. The results are congruent with those on autonomy in the sense that coefficients suggest decreases in approval of domestic violence, especially among younger cohorts. However, they are also insignificant. The results for men suggest no change in attitudes (Table D.9 in the appendix).

Finally, Table D.10 tests the effects of exposure to any sexual, physical, or emotional violence from partner. Similarly to the results on women’s attitudes toward domestic violence, point estimates suggest a reduction, and more strongly so for younger cohorts. This is driven by decreases in the experience of physical rather than sexual or emotional violence. However, most coefficients are insignificant, rendering the results rather suggestive.

Overall, I document increases in young women’s autonomy and men’s attitudes toward women’s autonomy. The results further suggest improvements in women’s attitudes toward and experiences of domestic violence. However, given the small sample size, results on domestic violence are rarely significant and should be interpreted with caution. The results do, however, suggest no ‘male backlash’ against improvements in female empowerment. The lack of a ‘male backlash’ may be explained by the nature of community radio which transmit information and views by community members. Hearing peers on the radio may make it less likely for backlash to occur. The fact that men’s views become more favorable toward women’s autonomy underlines the idea that their views are also altered by CRS. The potential of peer effects being activated by community radio may therefore have advantages compared to social change originating outside the community (e.g. [Guarnieri and Rainer, 2021](#)).

6.5 Robustness and Placebo

In this section, I discuss robustness and placebo checks. A first potential threat to identification is heterogeneity in observables related to the treatment variation I am using for identification. Section 6.1 suggests that this does not drive the results.

A second potential threat is heterogeneity in unobservables. I test for this in two ways. First, I repeat regressions on school degrees and years of education for individuals that have likely finished their educational choices by the time the first radios arrive. Specifically, I repeat regressions for individuals above the age of 30. These were aged 20 and above when the first radios launched. Tables F.1 and F.2 (in the appendix) show

Panel A: Women - Linear Effects Over Time

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-49) |
|----------|-------------------|---------------------|------------------|-------------------|------------------|
| exposure | 0.037* (0.021) | 0.120*** (0.034) | 0.009 (0.024) | -0.001 (0.028) | 0.068 (0.064) |
| Num.Obs. | 24 411 | 5484 | 9572 | 7212 | 2143 |
| R2 Adj. | 0.147 | 0.138 | 0.097 | 0.091 | 0.106 |
| Mean Y | 0.635 | 0.505 | 0.639 | 0.704 | 0.718 |
| SD Y | 0.329 | 0.336 | 0.322 | 0.309 | 0.308 |

Panel B: Women - Quadratic Effects Over Time

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-49) |
|-----------|------------------|--------------------|-------------------|-------------------|------------------|
| exposure2 | 0.018 (0.027) | 0.104** (0.050) | -0.003 (0.031) | -0.028 (0.027) | 0.065 (0.068) |
| Num.Obs. | 24 411 | 5484 | 9572 | 7212 | 2143 |
| R2 Adj. | 0.147 | 0.137 | 0.097 | 0.091 | 0.106 |
| Mean Y | 0.635 | 0.505 | 0.639 | 0.704 | 0.718 |

Panel C: Men - Linear Effects Over Time

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-54) |
|----------|------------------|-------------------|------------------|-------------------|-------------------|
| exposure | 0.048 (0.031) | 0.058* (0.030) | 0.040 (0.039) | 0.083* (0.042) | -0.027 (0.041) |
| Num.Obs. | 30 580 | 10 766 | 8571 | 6862 | 4381 |
| R2 Adj. | 0.079 | 0.078 | 0.086 | 0.079 | 0.087 |
| Mean Y | 0.816 | 0.816 | 0.816 | 0.818 | 0.812 |
| SD Y | 0.285 | 0.284 | 0.282 | 0.287 | 0.292 |

Panel D: Men - Quadratic Effects Over Time

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-54) |
|-----------|------------------|-------------------|------------------|--------------------|-------------------|
| exposure2 | 0.044 (0.033) | 0.063* (0.034) | 0.032 (0.043) | 0.078** (0.038) | -0.038 (0.043) |
| Num.Obs. | 30 580 | 10 766 | 8571 | 6862 | 4381 |
| R2 Adj. | 0.079 | 0.078 | 0.085 | 0.079 | 0.088 |
| Mean Y | 0.816 | 0.816 | 0.816 | 0.818 | 0.812 |
| SD Y | 0.285 | 0.284 | 0.282 | 0.287 | 0.292 |

Table 7: Autonomy of Women (Share) with Respect to HH Decision-Making and Mobility and men's beliefs towards the share of decisions women should participate in

Note: The tables show separate regressions of autonomy by age cohort on exposure to radio. For women, autonomy is defined as the share of decisions a woman participates in / places she can visit on her own. For men, the variable is defined as the share of decisions he believes a woman should participate in. Panels A and C assume linear effects over time and Panel B and D quadratic effects. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels:

*10%, **5%, ***1%.

no effects of exposure to radio on these cohorts' educational outcomes. As a second test, I repeat all main regressions on a placebo sample. The placebo sample includes observations in the vicinity of a radio station that launches after data collection, that is,

from 2016-20. In total, 84 radios launched post-2015 are included in the placebo data, covering 6,620 survey clusters (in comparison to 8k in the main data). Interestingly, 51% of observations in the placebo sample are also part of the main sample given their vicinity to both a station that launches pre- and post-2015. This suggests comparable radio placement patterns between the two periods as also visible in Figure B.5 (in the appendix). Tables F.3 and F.4 (in the appendix) show the results of all main regressions for the placebo sample allowing for linear or quadratic effects over time. The regressions show no effects on outcomes. This speaks against heterogeneity in unobservables being correlated with the variation in radio exposure used in this paper.

A final threat to identification is the possibility of a change happening in coverage areas simultaneously to but independently of the launch of radios. To interfere with the variation I am using, such a change would have to closely follow radios' coverage areas rather than, e.g., being related to the travel time between survey clusters and the radio tower for which I control. In addition, it would have to be closely associated with the timing of radio stations' launch date. While such a change is difficult to imagine, one piece of evidence speaks against it. Specifically, thinking of education, such a change could be a supply side effect of schooling (though, again, it seems unlikely that such an effect would closely follow the radio stations' coverage area). In Tables D.3 and D.4 (in the appendix), I study changes in reasons for school dropout. If such an effect were present, effects would likely be driven by the availability of a school for girls or improved transport to school. I find no evidence for such supply side factors speaking against this being a driver of the results.

Finally, I test the robustness of the results with respect to regression specifications. The above results show that the results are robust to varying the functional form of the treatment variable or definitions of the dependent variable (in the context of educational outcomes). In addition, Section J (in the appendix) applies different standard errors, this time clustered at the subdistrict level. Further, Section K (in the appendix) varies the threshold of data inclusion by reducing it to observations within 40km of the radio tower (instead of 50km). The results are robust to any of the above changes.

Overall, the robustness and placebo checks support the causal interpretation of the effects of the treatment variation exploited in this paper.

6.6 Evaluating the Jittering Correction

Finally, I compare the results in the main regressions presented in Sections 6.3 and 6.4 to those if I had not corrected for jittering. For results without the correction, I simply measure whether the location as reported by the NFHS lies within the treatment area. To get a measure of exposure, I multiply the dummy variable by the share of time the respective radio has been present in the region. The variable is equal to the exposure

variable for locations certainly covered or not covered by the radio signal. It only differs for location in the vicinity of the coverage area. In addition, I change distance controls to simply control for the line of sight between the reported location and the radio tower (instead of the expected distance).

The results on all main outcomes are presented in Table E.2 (in the appendix). These show that correcting for the jittering substantially improves the precision of estimates and suggest significant improvements due to a reduction in attenuation bias. A simple comparison is the number of significant estimates from the main paper that remain without the correction. Of the 16 significant coefficients, only seven remain. Further, only two of the 16 coefficients remain at the same level of significance. These numbers are driven by the size of coefficients rather than changes in standard errors. While the latter generally slightly increase when applying the proposed corrections, coefficients simultaneously increase substantially more. On average, their size grows by 65% when correcting for the jittering. This is in line with a substantial reduction of attenuation bias, which would downward bias coefficients due to measurement error in the treatment variable.

The number of coefficients significant and at the same level of significance increase to eleven and three respectively when correcting for the expected distance instead of the simple line of sight (see Table E.3 in the appendix). However, coefficients remain around 53% smaller in size when compared to those in the main results.

While the simple comparison made above is clearly imperfect, it nevertheless suggests that the correction I propose substantially improves upon the attenuation bias introduced by the jittering of survey coordinates. This is likely particularly relevant in settings with scattered treatment or coverage areas as well as when studying phenomena that are relatively local when compared to the distance across which the jittering is performed.

7 Summary and Concluding Remarks

This paper evaluates India's 2006 community radio policy, which was established to further local development. Based on information gathered on the content of community radio stations, I focus on women's empowerment and education, two of the radios' main themes. For identification, I exploit topographic features in combination with a novel approach to reduce attenuation bias in randomly jittered survey coordinates. The results show that community radio stations have substantial effects on attitudes and behavior of and toward women and girls. Areas exogenously exposed to CRS show increased education and degree completion rates for girls. Young women marry later and have fewer kids with strong decreases in child marriage. I also find evidence for greater autonomy of young women. Suggestive results further point toward changes in women's attitudes toward domestic violence and fewer experiences thereof. In addition, men are more

supportive of women’s autonomy, suggesting no ‘male backlash’ in response to women’s empowerment.

Overall, the results demonstrate that grassroots media can be used as a large-scale and long-term policy instrument to affect development outcomes. These insights complement and go beyond earlier research which largely focuses on the unintended impacts of entertainment media or experiments (DellaVigna and La Ferrara, 2015) as well as findings on single issue government campaigns (Khalifa, 2022) or propaganda (Okuyama, 2023; Qian, 2024). Grassroots media policies akin India’s may serve as an effective policy tool for developing countries. Given limited resources of developing countries, the policy provides a way to draw on ‘civil society’s’ (i.e. NGOs’ and educational institutions’) resources and knowledge to affect development outcomes. Local institutions’ knowledge of local issues is likely to be particularly valuable in culturally and linguistically diverse countries, a characteristic India shares with much of the developing world. Further, community radio can potentially address populations with little trust in the government and, hence, government media campaigns.

While radio remains an integral part of most countries’ media spheres, an important question for future research and policy making is how the concept of community radio can be translated into other types of media. Some CRS have already taken first steps, e.g., by joining social media or broadcasting online.³¹ In addition, research on other themes of community radio programming would be an important addition to this paper’s insights. Although this paper focuses on women’s empowerment and education related outcomes, the content analyses suggest that radios discuss a variety of other topics. For instance, future research may evaluate effects on agricultural yields or the uptake of government schemes. The results further speak to India’s policy in particular. While India is very diverse and inhabits 17% of the world’s population, the policy may function differentially in other contexts (Bureau, August 2024). It would therefore be important to expand the evidence to other countries. South Asia may be a good place to start, as countries, like Bangladesh, passed similar community radio policies at around the same time as India (Raghunath, 2020). Another interesting avenue for future research would be an investigation of the channels driving effects of community radio. Specifically, the effects observed may be driven by changes in information, attitudes, or beliefs about others’ points of view (i.e. peer effects). Community radio may be particularly able to activate the latter. To investigate this, field work, such as through RCTs, may be a viable path. Finally, and in addition to the topical contribution, my paper also suggests a novel approach to deal with spatially jittered survey data. As I demonstrate, the correction strongly improves on attenuation bias. This opens the path for future research using such data, especially when working in settings where the jittering imposes challenges to identify effects and potentially deems previous research designs infeasible. Such research

³¹For example, [radio.garden](#) features many CRS around the world, including India.

would also help to better understand under which circumstances the approach yields the largest benefits and where its application is less beneficial, e.g., because treatment areas are sufficiently large or do not matter as much for identification.

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Online Appendix

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A Spatial Jittering: Expected Distance

The Elliptic Integral of the Second Kind can be expressed as follows:

$$E(x) = \int_0^{\frac{\pi}{2}} \sqrt{1 - x^2 \sin^2(\phi)} d\phi \quad (16)$$

The distance formula can be re-formulated as the Elliptic Integral of Second Kind:

$$\begin{aligned}
\mathbb{E}(d(x, t)|r) &= \frac{1}{2\pi} \int_0^{2\pi} \sqrt{r^2 + d(x^*, t)^2 - 2rd(x^*, t) \cos(\phi)} d\phi & | \quad \text{By symmetry of circle} \\
&= \frac{1}{2\pi} \int_0^{2\pi} \sqrt{r^2 + d(x^*, t)^2 + 2rd(x^*, t) \cos(\phi)} d\phi & | \quad \text{By symmetry of circle} \\
&= \frac{1}{\pi} \int_0^{\pi} \sqrt{r^2 + d(x^*, t)^2 + 2rd(x^*, t) \cos(\phi)} d\phi & | \quad \text{Define: } \phi = 2k \\
&= \frac{2}{\pi} \int_0^{\frac{\pi}{2}} \sqrt{r^2 + d(x^*, t)^2 + 2rd(x^*, t) \cos(2k)} dk & | \quad \cos(2k) = 1 - 2\sin^2(k) \\
&= \frac{2}{\pi} \int_0^{\frac{\pi}{2}} \sqrt{r^2 + d(x^*, t)^2 + 2rd(x^*, t)(1 - 2\sin^2(k))} dk \\
&= \frac{2}{\pi} \int_0^{\frac{\pi}{2}} \sqrt{(r + d(x^*, t))^2 - 4rd(x^*, t) \sin^2(k)} dk \\
&= \frac{2}{\pi} (r + d(x^*, t)) \int_0^{\frac{\pi}{2}} \sqrt{1 - \frac{4rd(x^*, t)}{(r + d(x^*, t))^2} \sin^2(k)} dk \\
&= \frac{2}{\pi} (r + d(x^*, t)) \int_0^{\frac{\pi}{2}} \sqrt{1 - \left(\frac{2\sqrt{rd(x^*, t)}}{r + d(x^*, t)}\right)^2 \sin^2(k)} dk & | \quad \text{Following Eq. 16} \\
&= \frac{2}{\pi} (r + d(x^*, t)) E\left(\frac{2\sqrt{rd(x^*, t)}}{r + d(x^*, t)}\right)
\end{aligned} \quad (17)$$

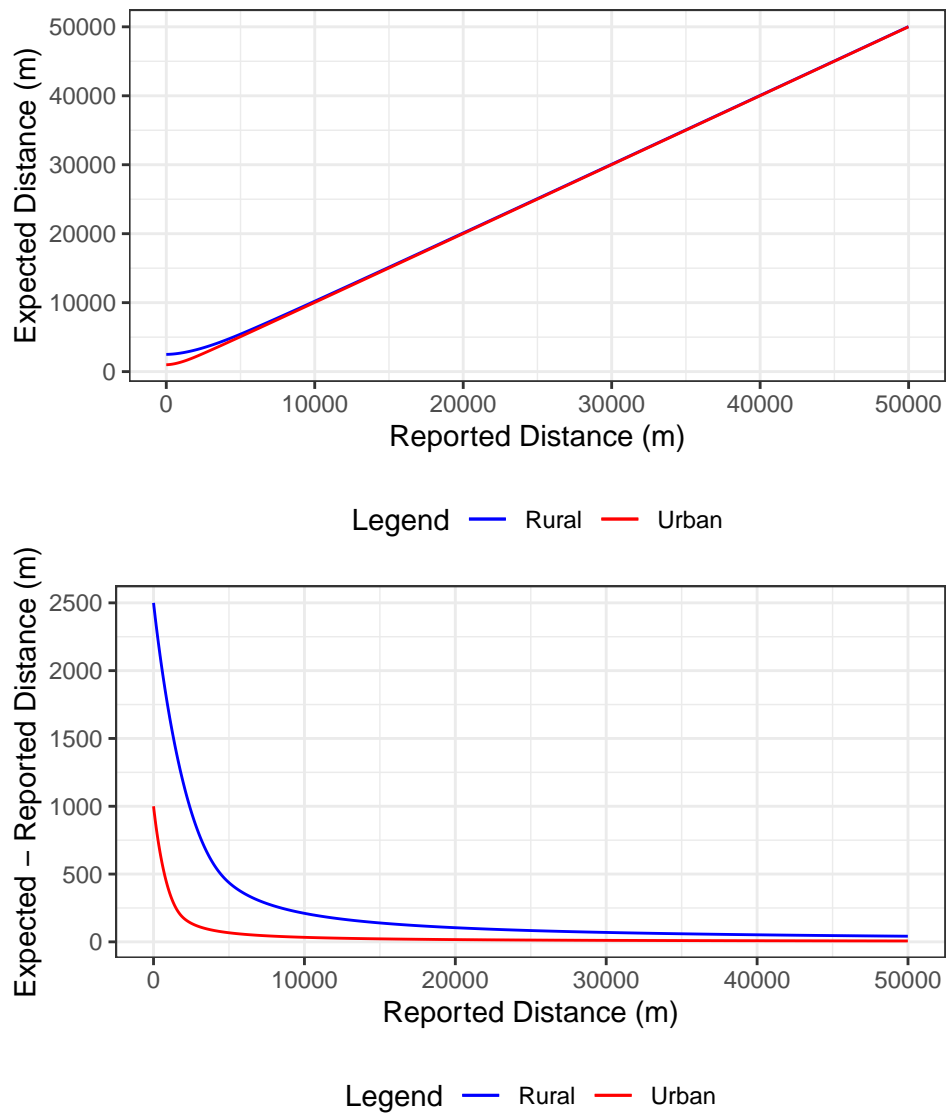


Figure A.1: Comparison: Reported and Expected Difference

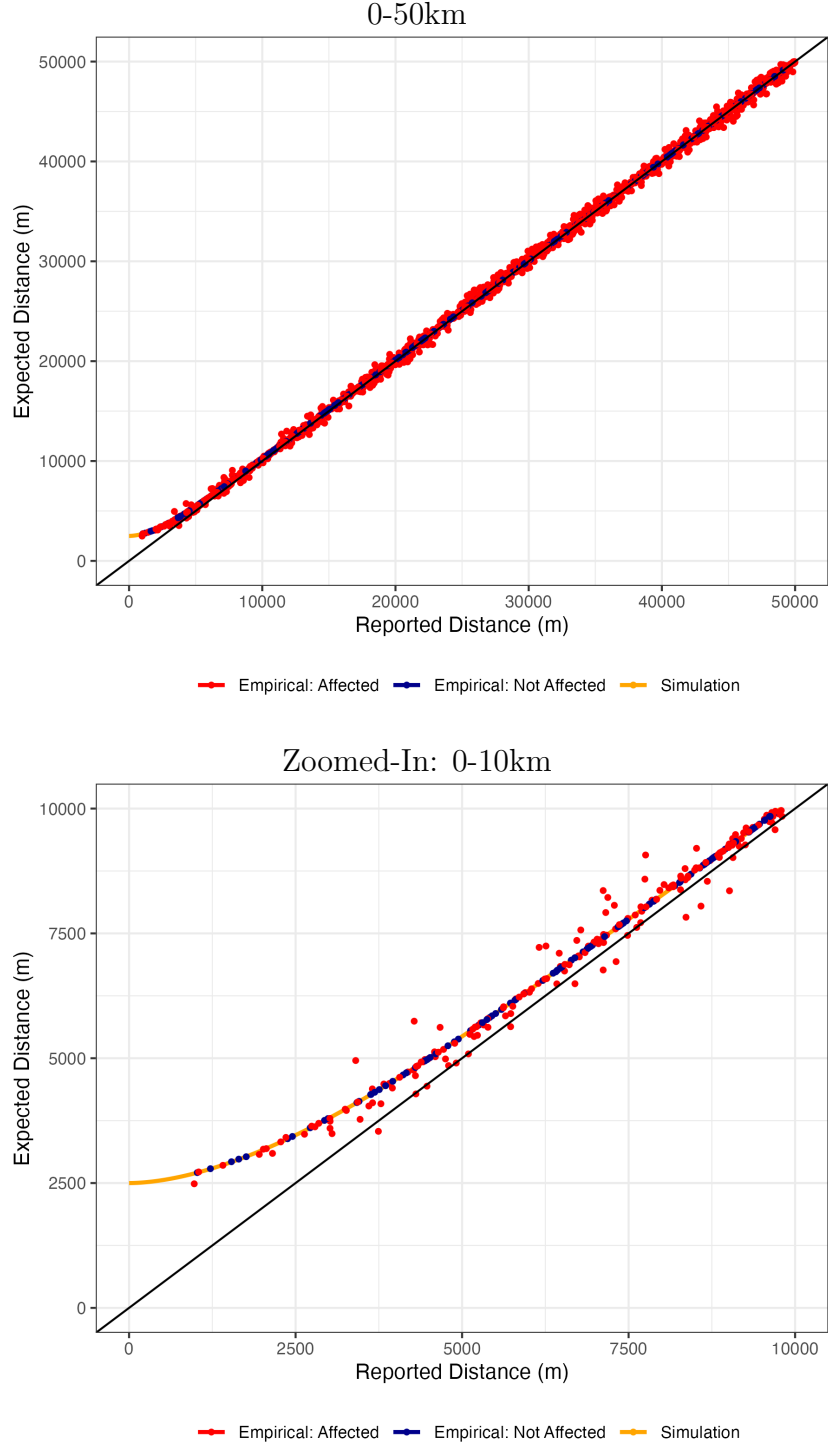


Figure A.2: Comparison: Reported and Expected Difference

Note: The above graphs compare three different distance measures: The x-axis shows the distance between the closest radio tower and a given DHS cluster as computed based on the displaced location indicated in the DHS data. The y-axis provides the Expected Distance between the radio and the DHS observation taking into account the displacement. The orange line (“Simulation”) compares the reported and expected distance based upon Equation 8. The dots (“Empirical”) indicate the expected distance as simulated using a grid around reported locations. These are split into two groups: the unaffected group includes locations whose displacement was not affected by a district border. For these, the results should hold as reported in Equation 8. For the affected group, the expected distance can vary from the equation due to the district border. The results show that this is indeed the case. While the unaffected locations lie on the simulation line, the affected ones vary slightly from it. Further, it is visible that the displacement mainly affects distances within the first 10km.

B Descriptives

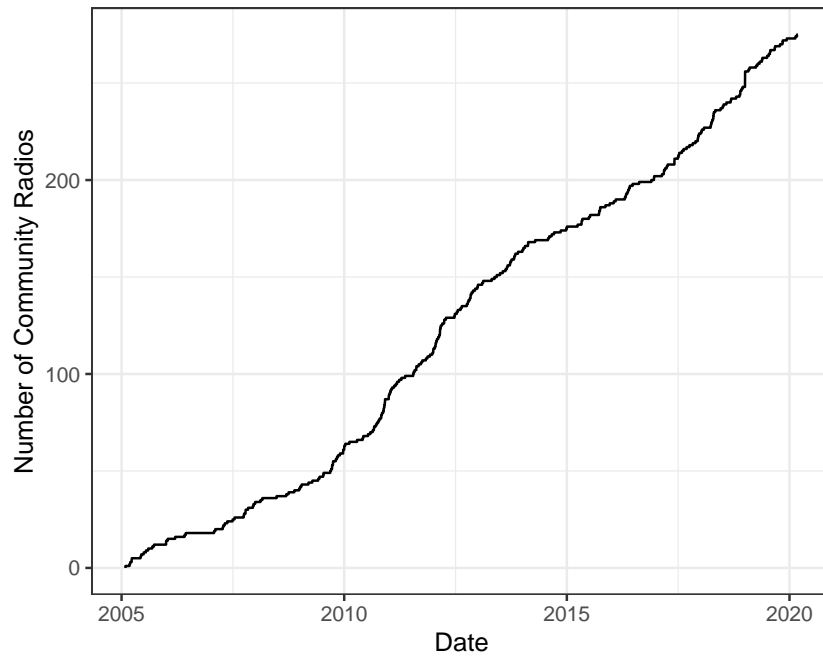


Figure B.1: Total number of CRS on air by date

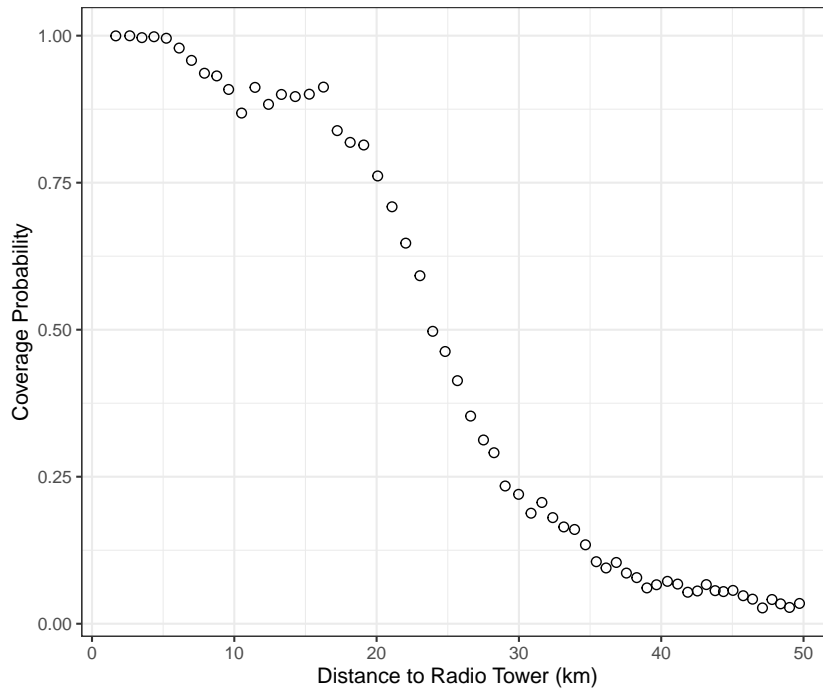


Figure B.2: Binscatter Plot of Coverage Probability and Distance to Radio

Note: The plot is created based on the *binsreg* package in R ([Cattaneo et al., 2024](#)) using default settings. The underlying data are the pooled coverage probabilities and distances to the first radio station from both the main and placebo data.

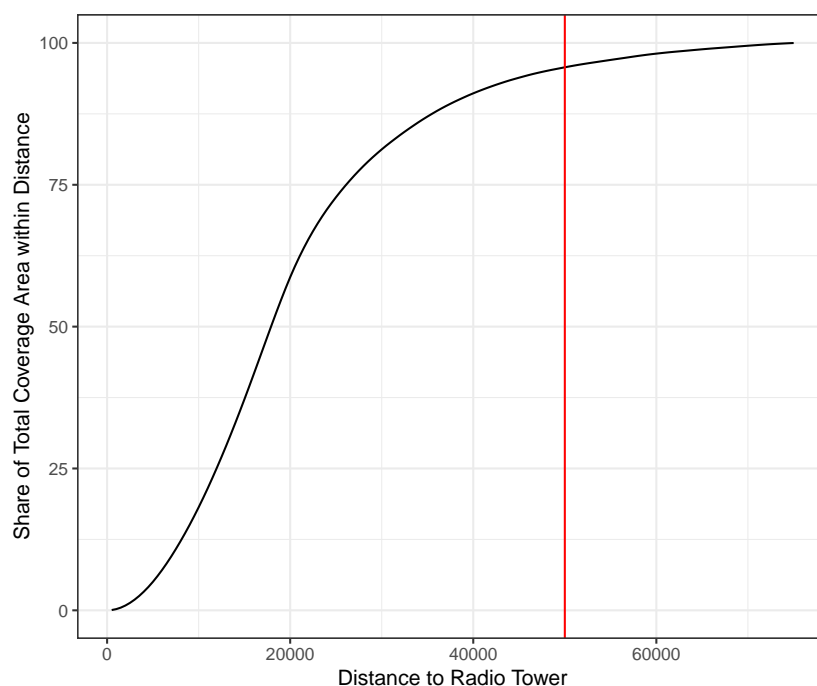


Figure B.3: Share of Total Coverage Area Within Distance

Note: The above graph visualizes the share of CRs' total coverage area by distance to the radio tower. 58% lies within 20km, 81% within 30km, 91% within 40km, 96% within 50km, 98% within 60km, and 99.9% within 75km.

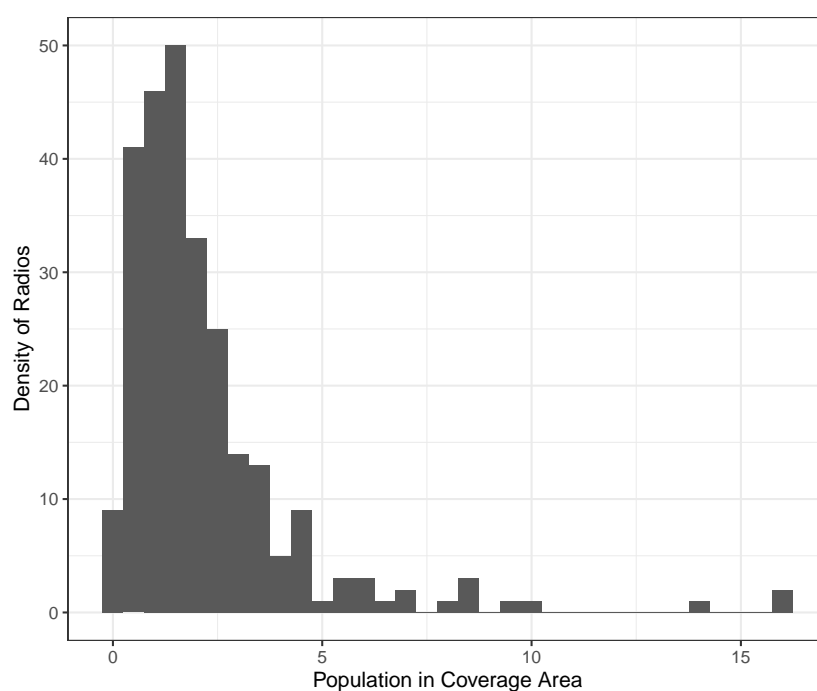


Figure B.4: Estimated Population within Coverage Area

Note: The above figure includes information on the total population within reach of 264 radio stations. 2016 Population estimates are based on [WorldPop \(2020\)](#). Note that the total number of individuals reached by any community radio is not equal to the sum of the population reached by the radios above, given that coverage areas overlap.

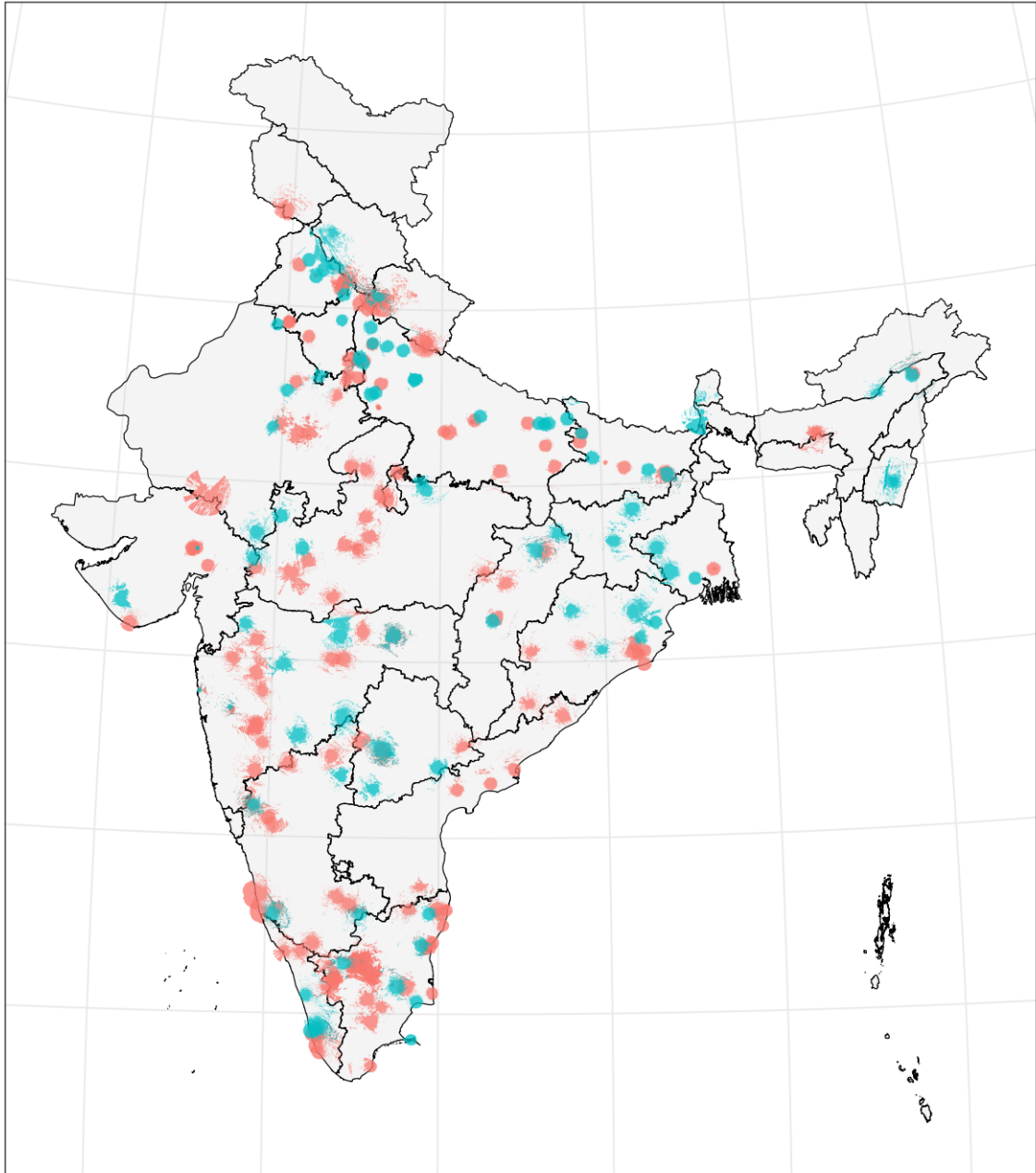


Figure B.5: Visualization of Coverage Areas of all 264 Radio Stations

Note: The above graph shows the coverage areas of all 264 geolocated radio stations launched by 2020. Colors indicate whether radios are launched before (red) or after (blue) 2016

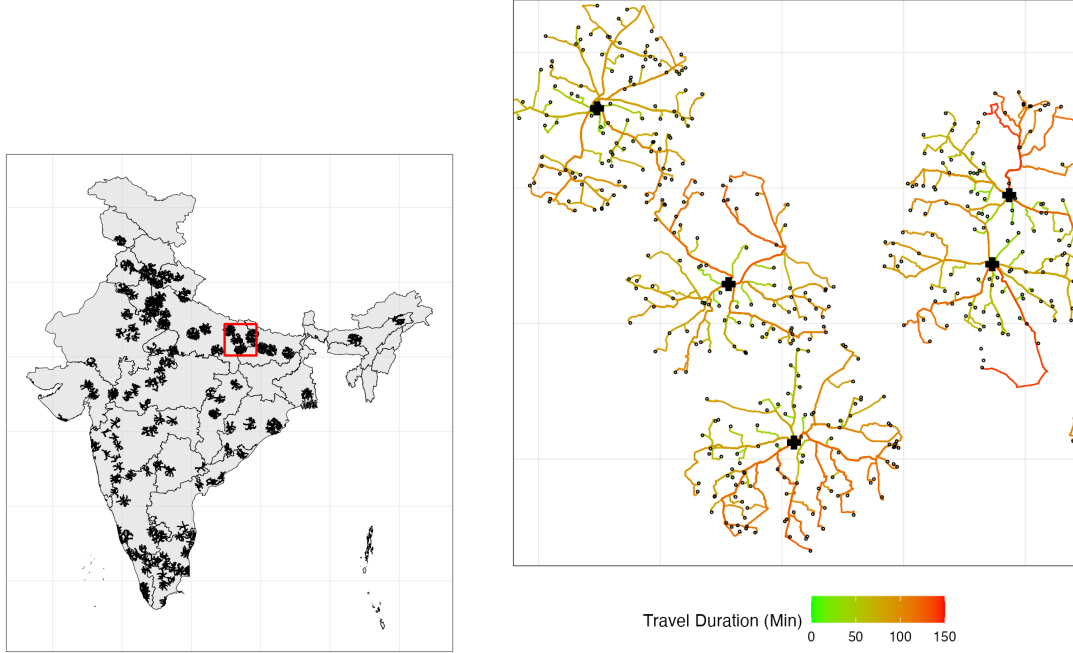


Figure B.6: Visualization of Travel Time from DHS Observation to Radio Tower

Note: the above map visualizes the data on travel times from the radio tower to the observation. The first map shows all travel routes obtained through Google Directions API. The map below shows a more detailed picture of the area in the red box above, showing travel routes, colored by travel time, from each DHS location in the vicinity of the radio station. The crosses indicate the radio tower locations. The dots indicate the locations of cluster observations as reported by the NFHS.

C Functional Form: Explorative Analysis

In Equation 15, radio exposure is expected to exhibit a linear effect over time. To explore which alternative functional form may fit the regressions, I first define $Exposure_{i,m} = \sum_{r=1}^R AddedCoverageProbability_{i,R} \times Timeshare_R^m$ for $m \in \{1, 2, 3\}$. Next, I run the regression in Equation 15 while adding all three exposure variables. I then take the derivative with respect to the timeshare and plot. The derivative differs for any variable y_i . To get an idea of the functional form, I focus on the effect of CRS on having listened to a family planning message on radio, an outcome that clearly relates to both listening to radio and the radios' topics.

Figure C.1 shows the resulting graph. Specifically, it plots the linear function as used in the paper and the polynomial described above. The polynomial appears to closely follow a quadratic form. Access to radio appears to have some immediate effects, which increasingly get stronger over time. These further closely resemble a quadratic functional form. Given that the polynomial is difficult to analyze in a table, for instance providing little information on whether effects are significant, I complement the linear effect by instead assuming that the effect of radio is quadratic over time, i.e. $Exposure_{i,2} = \sum_{r=1}^R AddedCoverageProbability_{i,R} \times Timeshare_R^2$. As the Figure shows, this graph closely follows that of the Polynomial. I, thus, report all results for both a linear and quadratic functional form in the paper.

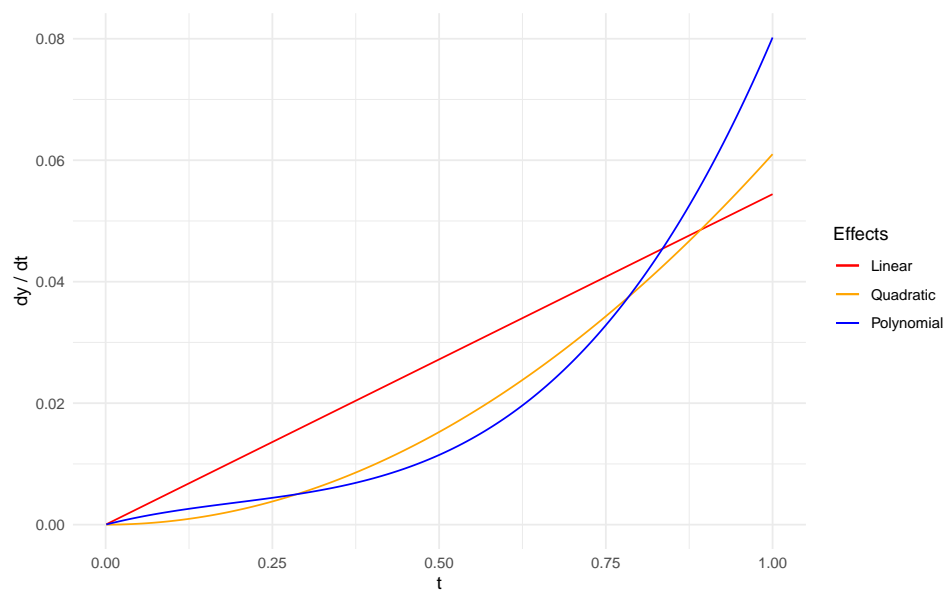


Figure C.1: Exploring Non-Linearity in Treatment Effects over Time

D Additional Results

Panel A: Linear Effects Over Time

| | Radio Consumer | Radio Familyplanning | Radio: HIV/AIDS |
|-------------------|-------------------|----------------------|--------------------|
| Female x Exposure | 0.033* (0.019) | 0.057** (0.025) | 0.071** (0.029) |
| Male x Exposure | 0.035 (0.036) | 0.031 (0.035) | 0.058** (0.029) |
| Num.Obs. | 228 289 | 228 289 | 55 508 |
| R2 Adj. | 0.073 | 0.098 | 0.092 |
| Mean Y | 0.184 | 0.197 | 0.164 |
| SD Y | 0.388 | 0.398 | 0.37 |

Panel B: Quadratic Effects Over Time

| | Radio Consumer | Radio Familyplanning | Radio: HIV/AIDS |
|---------------------------------------|--------------------|----------------------|--------------------|
| is female = 1 x exposure ² | 0.048** (0.020) | 0.066** (0.026) | 0.083** (0.036) |
| is female = 0 x exposure ² | 0.061 (0.040) | 0.044 (0.042) | 0.070** (0.029) |
| Num.Obs. | 228 289 | 228 289 | 55 508 |
| R2 Adj. | 0.073 | 0.098 | 0.092 |
| Mean Y | 0.184 | 0.197 | 0.164 |
| SD Y | 0.388 | 0.398 | 0.37 |

Table D.1: Exposure and Radio Consumption by Gender

Note: The table shows the regression of radio consumption related variables on exposure. Regressions include all controls mentioned in Chapter 5. The dependent variables are defined as follows: radio owner: household owns a radio; radio consumer: dummy indicating whether individual listens to radio at least less than once a week; radio family planning: dummy for whether individual heard a family planning message in last few months. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: Linear Effects Over Time

| | Radio Consumer | Radio Intensity (0-3) | Radio: None (0) | Radio: (Almost) Daily (3) | Radio: At Least Weekly (2) | Radio: Less Than Weekly (1) |
|----------|--------------------|-----------------------|---------------------|---------------------------|----------------------------|-----------------------------|
| exposure | 0.038** (0.018) | 0.066* (0.035) | -0.038** (0.018) | 0.009 (0.008) | 0.010 (0.008) | 0.019** (0.009) |
| Num.Obs. | 196 537 | 196 537 | 196 537 | 196 537 | 196 537 | 196 537 |
| R2 Adj. | 0.060 | 0.063 | 0.060 | 0.041 | 0.019 | 0.019 |
| Mean Y | 0.165 | 0.322 | 0.835 | 0.047 | 0.063 | 0.055 |
| SD Y | 0.371 | 0.792 | 0.371 | 0.212 | 0.242 | 0.229 |

Panel B: Quadratic Effects Over Time

| | Radio Consumer | Radio Intensity (0-3) | Radio: None (0) | Radio: (Almost) Daily (3) | Radio: At Least Weekly (2) | Radio: Less Than Weekly (1) |
|-----------|---------------------|-----------------------|----------------------|---------------------------|----------------------------|-----------------------------|
| exposure2 | 0.055*** (0.020) | 0.109** (0.045) | -0.055*** (0.020) | 0.017 (0.013) | 0.020** (0.009) | 0.018** (0.009) |
| Num.Obs. | 196 537 | 196 537 | 196 537 | 196 537 | 196 537 | 196 537 |
| R2 Adj. | 0.060 | 0.063 | 0.060 | 0.041 | 0.019 | 0.019 |
| Mean Y | 0.165 | 0.322 | 0.835 | 0.047 | 0.063 | 0.055 |
| SD Y | 0.371 | 0.792 | 0.371 | 0.212 | 0.242 | 0.229 |

Table D.2: Intensity of Radio Consumption

Note: The table shows the regression of radio consumption related variables on exposure. Regressions include all controls mentioned in Chapter 5. The dependent variables are defined as follows: radio consumer: individual listens to radio; radio intensity: ordinal scale of intensity ranging from not at all (0) to (almost) daily (3). The following columns are four indicator variables for each level of intensity. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010).

Significance levels: *10%, **5%, ***1%.

(A) Child Does Not Go to School

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|-------------------|---------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure | -0.014** (0.007) | -0.002 (0.002) | -0.002 (0.008) | -0.039** (0.019) | -0.053** (0.023) |
| Male x exposure | -0.008* (0.005) | 0.000 (0.003) | -0.006 (0.005) | -0.030** (0.014) | -0.023 (0.016) |
| Mean Y | 0.087 | 0.006 | 0.046 | 0.162 | 0.312 |

(B) Reason: Interest

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|-------------------|---------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure | -0.008** (0.004) | 0.000 (0.001) | -0.003 (0.005) | -0.029*** (0.010) | -0.018 (0.015) |
| Male x exposure | -0.004 (0.004) | -0.001 (0.001) | -0.006 (0.005) | -0.021** (0.010) | 0.002 (0.014) |
| Mean Y | 0.028 | 0.002 | 0.017 | 0.056 | 0.094 |

(C) Reason: Costs too High

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|-------------------|--------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure | -0.005 (0.004) | -0.001 (0.001) | -0.001 (0.003) | -0.004 (0.013) | -0.024* (0.014) |
| Male x exposure | -0.005* (0.003) | 0.000 (0.001) | -0.003 (0.002) | -0.010 (0.011) | -0.020 (0.015) |
| Mean Y | 0.017 | 0.001 | 0.01 | 0.032 | 0.058 |

(D) Reason: Marriage

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|-------------------|--------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure | -0.002* (0.001) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.003) | -0.019* (0.010) |
| Male x exposure | 0.001 (0.001) | 0.000 (0.000) | 0.000 (0.000) | 0.000 (0.002) | 0.003 (0.008) |
| Mean Y | 0.004 | 0 | 0 | 0.003 | 0.026 |

(E) Reason: Mostly Female-specific Household and care work, no school for girls available, not safe, no female teacher

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|-------------------|------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure | 0.000 (0.003) | -0.001 (0.001) | 0.002 (0.003) | -0.003 (0.008) | 0.003 (0.010) |
| Male x exposure | 0.000 (0.002) | -0.001 (0.001) | 0.002 (0.002) | 0.006 (0.007) | -0.009 (0.010) |
| Mean Y | 0.014 | 0.001 | 0.008 | 0.027 | 0.049 |

(F) Reason: Work Work in Family Business or Outside Home

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|-------------------|-------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure | 0.001 (0.002) | 0.000 (0.000) | 0.000 (0.002) | 0.006 (0.006) | -0.002 (0.007) |
| Male x exposure | -0.001 (0.002) | 0.000 (0.000) | 0.001 (0.002) | -0.008 (0.005) | -0.001 (0.009) |
| Mean Y | 0.005 | 0 | 0.003 | 0.009 | 0.021 |

(G) Reason: Availability Too far away, Transport

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|-------------------|------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure | 0.000 (0.002) | -0.001 (0.001) | 0.000 (0.002) | -0.012* (0.006) | 0.011 (0.008) |
| Male x exposure | 0.002 (0.002) | -0.001 (0.001) | 0.002 (0.002) | -0.003 (0.005) | 0.009 (0.007) |
| Mean Y | 0.006 | 0.001 | 0.003 | 0.013 | 0.02 |

(H) Reason: Other Not Necessary, Failure, Not Admitted to School, Other

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|-------------------|------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure | 0.000 (0.003) | 0.001 (0.001) | -0.001 (0.002) | 0.001 (0.007) | -0.005 (0.010) |
| Male x exposure | 0.000 (0.003) | 0.001 (0.002) | -0.002 (0.002) | 0.005 (0.009) | -0.008 (0.011) |
| Mean Y | 0.012 | 0.002 | 0.005 | 0.022 | 0.045 |

Table D.3: Linear model – Reasons for not going to school

Note: The table shows regressions of reasons for not going to school on exposure interacted with a child's gender. Table (A) is an indicator for not going to school. All other variables are indicators for whether a child dropped out of school for the specified reason. The variable is defined as zero for all children still going to school at the time of the survey and for those dropping out for a different reason. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

(A) Child Does Not Go to School

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|--------------------|----------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure2 | -0.020*** (0.008) | -0.005* (0.003) | -0.007 (0.007) | -0.036 (0.025) | -0.077*** (0.024) |
| Male x exposure2 | -0.007 (0.005) | -0.001 (0.003) | -0.006 (0.005) | -0.019 (0.015) | -0.035** (0.016) |
| Mean Y | 0.087 | 0.006 | 0.046 | 0.162 | 0.312 |

(B) Reason: Interest

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|--------------------|-------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure2 | -0.006 (0.004) | 0.000 (0.001) | -0.002 (0.004) | -0.018 (0.013) | -0.015 (0.015) |
| Male x exposure2 | -0.004 (0.003) | -0.001 (0.001) | -0.007 (0.004) | -0.021** (0.010) | -0.004 (0.015) |
| Mean Y | 0.028 | 0.002 | 0.017 | 0.056 | 0.094 |

(C) Reason: Costs too High

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|--------------------|---------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure2 | -0.007** (0.003) | -0.002 (0.001) | -0.003 (0.003) | -0.007 (0.012) | -0.027** (0.011) |
| Male x exposure2 | -0.006** (0.003) | 0.000 (0.001) | -0.005 (0.003) | -0.011* (0.006) | -0.018 (0.014) |
| Mean Y | 0.017 | 0.001 | 0.01 | 0.032 | 0.058 |

(D) Reason: Marriage

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|--------------------|----------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure2 | -0.004*** (0.001) | 0.000 (0.000) | 0.000 (0.000) | -0.003 (0.003) | -0.026*** (0.010) |
| Male x exposure2 | 0.000 (0.001) | 0.000 (0.000) | 0.000 (0.000) | -0.001 (0.002) | -0.001 (0.009) |
| Mean Y | 0.004 | 0 | 0 | 0.003 | 0.026 |

(E) Reason: Mostly Female-specific Household and care work, no school for girls available, not safe, no female teacher

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|--------------------|-------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure2 | -0.001 (0.003) | -0.001* (0.000) | 0.001 (0.003) | -0.005 (0.008) | -0.001 (0.012) |
| Male x exposure2 | 0.000 (0.002) | -0.001 (0.001) | 0.003 (0.002) | 0.011 (0.007) | -0.014 (0.009) |
| Mean Y | 0.014 | 0.001 | 0.008 | 0.027 | 0.049 |

(F) Reason: Work Work in Family Business or Outside Home

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|--------------------|------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure2 | 0.002 (0.002) | 0.000 (0.000) | 0.001 (0.002) | 0.009 (0.007) | 0.000 (0.007) |
| Male x exposure2 | 0.001 (0.002) | 0.000 (0.000) | 0.002 (0.002) | -0.009* (0.005) | 0.010 (0.011) |
| Mean Y | 0.005 | 0 | 0.003 | 0.009 | 0.021 |

(G) Reason: Availability Too far away, Transport, Not Admitted to School

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|--------------------|------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure2 | 0.000 (0.002) | -0.001* (0.001) | 0.000 (0.002) | -0.009 (0.006) | 0.011 (0.011) |
| Male x exposure2 | 0.002 (0.002) | -0.001 (0.001) | 0.003 (0.002) | 0.002 (0.005) | 0.007 (0.007) |
| Mean Y | 0.006 | 0.001 | 0.003 | 0.013 | 0.02 |

(H) Reason: Other Not Necessary, Failure, Other

| | All (5-18) | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|--------------------|-------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x exposure2 | -0.004 (0.003) | -0.001 (0.001) | -0.004 (0.002) | -0.003 (0.009) | -0.018 (0.012) |
| Male x exposure2 | 0.000 (0.003) | 0.001 (0.002) | -0.002 (0.002) | 0.011 (0.009) | -0.015 (0.011) |
| Mean Y | 0.012 | 0.002 | 0.005 | 0.022 | 0.045 |

Table D.4: Quadratic model – Reasons for not going to school (Quadratic Effects over Time)

Note: The table shows regressions of reasons for not going to school on exposure with quadratic effects over time interacted with a child's gender. Table (A) is an indicator for not going to school. All other variables are indicators for whether a child dropped out of school for the specified reason. The variable is defined as zero for all children still going to school at the time of the survey and for those dropping out for a different reason. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: Linear Effects Over Time

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|-------------------|---------------------|----------------------|---------------------|-------------------|-------------------|
| Female x Exposure | −0.015** (0.007) | −0.051*** (0.020) | −0.025 (0.026) | 0.009 (0.012) | 0.005 (0.008) |
| Male x Exposure | 0.009 (0.006) | −0.015 (0.017) | −0.042** (0.021) | −0.017 (0.012) | −0.004 (0.009) |
| Num.Obs. | 95 359 | 87 467 | 68 256 | 57 081 | 46 469 |
| R2 Adj. | 0.060 | 0.284 | 0.193 | 0.069 | 0.019 |
| Mean Y | 0.038 | 0.388 | 0.76 | 0.924 | 0.968 |
| SD Y | 0.192 | 0.487 | 0.427 | 0.265 | 0.175 |

Panel B: Quadratic Effects Over Time

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|---------------------------|---------------------|---------------------|----------------------|-------------------|-------------------|
| is female = 1 x exposure2 | −0.023** (0.009) | −0.061** (0.025) | −0.043 (0.030) | 0.010 (0.010) | −0.002 (0.009) |
| is female = 0 x exposure2 | 0.009 (0.006) | −0.019 (0.022) | −0.064*** (0.024) | −0.018 (0.012) | −0.008 (0.010) |
| Num.Obs. | 95 359 | 87 467 | 68 256 | 57 081 | 46 469 |
| R2 Adj. | 0.060 | 0.284 | 0.193 | 0.068 | 0.019 |
| Mean Y | 0.038 | 0.388 | 0.76 | 0.924 | 0.968 |

Table D.5: Effect of CRS on Marriage Status

Note: The tables show separate regressions for whether the person surveyed has ever been married by age cohort on exposure to radio. Panel A assumes linear effects over time and Panel B quadratic effects. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: Linear Effects Over Time

| | Autonomy Decision | Autonomy Decision (15-25) | Autonomy Decision (26-35) | Autonomy Decision (36-45) | Autonomy Decision (45-49) |
|----------|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| exposure | 0.042 (0.030) | 0.129*** (0.040) | 0.036 (0.044) | -0.021 (0.029) | 0.078 (0.071) |
| Num.Obs. | 24 411 | 5484 | 9572 | 7212 | 2143 |
| R2 Adj. | 0.058 | 0.065 | 0.035 | 0.040 | 0.036 |
| Mean Y | 0.741 | 0.655 | 0.744 | 0.786 | 0.793 |
| SD Y | 0.382 | 0.419 | 0.378 | 0.355 | 0.355 |

Panel B: Quadratic Effects Over Time

| | Autonomy Decision | Autonomy Decision (15-25) | Autonomy Decision (26-35) | Autonomy Decision (36-45) | Autonomy Decision (45-54) |
|-----------|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| exposure2 | 0.029 (0.038) | 0.129*** (0.048) | 0.025 (0.050) | -0.034 (0.032) | 0.081 (0.077) |
| Num.Obs. | 24 411 | 5484 | 9572 | 7212 | 2143 |
| R2 Adj. | 0.058 | 0.065 | 0.035 | 0.040 | 0.036 |
| Mean Y | 0.741 | 0.655 | 0.744 | 0.786 | 0.793 |
| SD Y | 0.382 | 0.419 | 0.378 | 0.355 | 0.355 |

Table D.6: Autonomy of Women (Decisions)

Note: The tables show separate regressions of the share of decisions a woman participates in on exposure to radio. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: Linear Effects Over Time

| | Autonomy Mobility | Autonomy Mobility (15-25) | Autonomy Mobility (26-35) | Autonomy Mobility (36-45) | Autonomy Mobility (45-49) |
|----------|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| exposure | 0.031 (0.030) | 0.080* (0.044) | -0.023 (0.030) | 0.010 (0.048) | 0.074 (0.067) |
| Num.Obs. | 34 324 | 13 451 | 10 386 | 8000 | 2487 |
| R2 Adj. | 0.165 | 0.114 | 0.116 | 0.097 | 0.125 |
| Mean Y | 0.506 | 0.368 | 0.545 | 0.637 | 0.667 |
| SD Y | 0.456 | 0.436 | 0.454 | 0.435 | 0.428 |

Panel B: Quadratic Effects Over Time

| | Autonomy Mobility | Autonomy Mobility (15-25) | Autonomy Mobility (26-35) | Autonomy Mobility (36-45) | Autonomy Mobility (45-54) |
|-----------|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| exposure2 | 0.013 (0.031) | 0.076 (0.050) | -0.028 (0.033) | -0.036 (0.045) | 0.041 (0.073) |
| Num.Obs. | 34 324 | 13 451 | 10 386 | 8000 | 2487 |
| R2 Adj. | 0.165 | 0.114 | 0.116 | 0.097 | 0.124 |
| Mean Y | 0.506 | 0.368 | 0.545 | 0.637 | 0.667 |
| SD Y | 0.456 | 0.436 | 0.454 | 0.435 | 0.428 |

Table D.7: Autonomy of Women (Mobility)

Note: The table shows separate regressions of the share of places a woman can visit on her own by age cohort on exposure to radio. Panel A assumes linear effects over time and Panel B quadratic effects. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: Linear Effects Over Time

| | Attitude Any | Attitude Any | Attitude Count | Attitude Count |
|------------------|-------------------|-------------------|-------------------|-------------------|
| exposure | −0.040 (0.039) | | −0.105 (0.132) | |
| 15-24 x exposure | | −0.058 (0.043) | | −0.129 (0.152) |
| 25-34 x exposure | | −0.036 (0.037) | | −0.127 (0.129) |
| 35-44 x exposure | | −0.039 (0.039) | | −0.099 (0.121) |
| 45-49 x exposure | | −0.002 (0.052) | | 0.021 (0.172) |
| Num.Obs. | 33 442 | 33 442 | 33 442 | 33 442 |
| R2 Adj. | 0.146 | 0.146 | 0.129 | 0.129 |
| Mean Y | 0.406 | 0.406 | 1.098 | 1.098 |
| SD Y | 0.491 | 0.491 | 1.606 | 1.606 |

Panel B: Quadratic Effects Over Time

| | Attitude Any | Attitude Any | Attitude Count | Attitude Count |
|-------------------|-------------------|-------------------|-------------------|-------------------|
| exposure2 | −0.039 (0.042) | | −0.095 (0.131) | |
| 15-24 x exposure2 | | −0.054 (0.048) | | −0.091 (0.160) |
| 25-34 x exposure2 | | −0.039 (0.040) | | −0.124 (0.128) |
| 35-44 x exposure2 | | −0.032 (0.041) | | −0.111 (0.111) |
| 45-49 x exposure2 | | −0.010 (0.067) | | 0.020 (0.200) |
| Num.Obs. | 33 442 | 33 442 | 33 442 | 33 442 |
| R2 Adj. | 0.146 | 0.146 | 0.129 | 0.129 |
| Mean Y | 0.406 | 0.406 | 1.098 | 1.098 |
| SD Y | 0.491 | 0.491 | 1.606 | 1.606 |

Table D.8: Attitudes of Women Towards Domestic Violence

Note: The above table regresses a variable for whether women in the NFHS's domestic violence sample agree that men are justified to beat their wife under a surveyed circumstances. These include: going out without telling husband, neglecting children, arguing with husband, refusing to have sex, or improper cooking. *Attitude Any* is a dummy for whether the woman agrees with any of the reasons. *Attitude Count* is an additive variable for the number of reasons a woman agrees with. Data on domestic violence stems from the NFHS's state module, which is carried out in 15% households and 30% of clusters and substantially longer than the standard questionnaire. In each selected household, a random woman above the age of 15 was selected for the survey. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: Linear Effects Over Time

| | Attitude Any | Attitude Any | Attitude Count | Attitude Count |
|------------------|-------------------|-------------------|-------------------|-------------------|
| exposure | −0.040 (0.039) | | −0.105 (0.134) | |
| 15-24 x exposure | | −0.060 (0.044) | | −0.142 (0.154) |
| 25-34 x exposure | | −0.036 (0.038) | | −0.128 (0.130) |
| 35-44 x exposure | | −0.038 (0.039) | | −0.095 (0.123) |
| 45-49 x exposure | | −0.001 (0.052) | | 0.025 (0.173) |
| Num.Obs. | 33 440 | 33 440 | 33 440 | 33 440 |
| R2 Adj. | 0.146 | 0.146 | 0.129 | 0.129 |
| Mean Y | 0.406 | 0.406 | 1.098 | 1.098 |
| SD Y | 0.491 | 0.491 | 1.606 | 1.606 |

Panel B: Quadratic Effects Over Time

| | Attitude Any | Attitude Any | Attitude Count | Attitude Count |
|-------------------|------------------|-------------------|------------------|-------------------|
| exposure2 | 0.024 (0.045) | | 0.081 (0.126) | |
| 15-24 x exposure2 | | 0.013 (0.057) | | 0.081 (0.164) |
| 25-34 x exposure2 | | 0.033 (0.042) | | 0.042 (0.111) |
| 35-44 x exposure2 | | 0.025 (0.043) | | 0.126 (0.122) |
| 45-49 x exposure2 | | −0.031 (0.045) | | −0.192 (0.121) |
| Num.Obs. | 30 970 | 30 970 | 30 970 | 30 970 |
| R2 Adj. | 0.103 | 0.103 | 0.088 | 0.088 |
| Mean Y | 0.303 | 0.303 | 0.696 | 0.696 |
| SD Y | 0.46 | 0.46 | 1.28 | 1.28 |

Table D.9: Men's Attitudes Toward Domestic Violence

Note: The above table regresses a variable for whether men agree that a husband is justified to beat his wife under a surveyed circumstances. These include: going out without telling husband, neglecting children, arguing with husband, refusing to have sex, or improper cooking. Attitude (Any) is a dummy for whether the man agrees with any of the reasons. Attitude (Count) describes the number of reasons the respondent agreed with. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: Linear Effects Over Time

| | Any Violence Ever | Any Violence Ever | Any Violence 12m | Any Violence 12m | Sexual Viol. 12m | Sexual Viol. 12m | Emotional Viol. 12m | Emotional Viol. 12m | Physical Viol. 12m | Physical Viol. 12m |
|------------------|-------------------|-------------------|-------------------|-------------------|------------------|-------------------|---------------------|---------------------|--------------------|--------------------|
| exposure | -0.031 (0.032) | | -0.011 (0.031) | | 0.012 (0.021) | | 0.014 (0.028) | | -0.028 (0.027) | |
| 15-24 x exposure | | -0.042 (0.051) | | -0.034 (0.047) | | -0.014 (0.029) | | 0.029 (0.046) | | -0.048 (0.040) |
| 25-34 x exposure | | -0.037 (0.037) | | -0.020 (0.037) | | 0.017 (0.023) | | 0.004 (0.031) | | -0.041 (0.031) |
| 35-44 x exposure | | -0.028 (0.035) | | 0.002 (0.031) | | 0.014 (0.020) | | 0.015 (0.030) | | -0.018 (0.032) |
| 45-49 x exposure | | -0.004 (0.040) | | 0.017 (0.036) | | 0.017 (0.023) | | 0.031 (0.035) | | 0.013 (0.033) |
| Num.Obs. | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 |
| R2 Adj. | 0.082 | 0.082 | 0.072 | 0.072 | 0.024 | 0.024 | 0.039 | 0.039 | 0.069 | 0.069 |
| Mean Y | 0.332 | 0.332 | 0.27 | 0.27 | 0.057 | 0.057 | 0.113 | 0.113 | 0.232 | 0.232 |
| SD Y | 0.471 | 0.471 | 0.444 | 0.444 | 0.232 | 0.232 | 0.317 | 0.317 | 0.422 | 0.422 |

Panel B: Quadratic Effects Over Time

| | Any Violence Ever | Any Violence Ever | Any Violence 12m | Any Violence 12m | Sexual Viol. 12m | Sexual Viol. 12m | Emotional Viol. 12m | Emotional Viol. 12m | Physical Viol. 12m | Physical Viol. 12m |
|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|-------------------|---------------------|---------------------|--------------------|---------------------|
| exposure2 | -0.045 (0.039) | | -0.007 (0.036) | | 0.014 (0.024) | | 0.012 (0.032) | | -0.032 (0.029) | |
| 15-24 x exposure2 | | -0.081 (0.060) | | -0.052 (0.058) | | -0.027 (0.031) | | 0.012 (0.059) | | -0.073 (0.047) |
| 25-34 x exposure2 | | -0.066 (0.044) | | -0.032 (0.041) | | 0.022 (0.027) | | 0.004 (0.034) | | -0.066** (0.032) |
| 35-44 x exposure2 | | -0.011 (0.044) | | 0.032 (0.040) | | 0.016 (0.022) | | 0.020 (0.040) | | 0.009 (0.035) |
| 45-49 x exposure2 | | -0.023 (0.050) | | 0.028 (0.048) | | 0.026 (0.033) | | 0.021 (0.040) | | 0.026 (0.044) |
| Num.Obs. | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 | 18 392 |
| R2 Adj. | 0.082 | 0.082 | 0.072 | 0.072 | 0.024 | 0.024 | 0.039 | 0.039 | 0.069 | 0.070 |
| Mean Y | 0.332 | 0.332 | 0.27 | 0.27 | 0.057 | 0.057 | 0.113 | 0.113 | 0.232 | 0.232 |
| SD Y | 0.471 | 0.471 | 0.444 | 0.444 | 0.232 | 0.232 | 0.317 | 0.317 | 0.422 | 0.422 |

Table D.10: Experience of Domestic Violence in Past 12 Months

Note: The above table regresses a variable for whether a woman in the NFHS's domestic violence sample experienced form of violence from her partner ever or in the past 12 months (Columns 1-4). Columns (5) to (10) show the different types of violence surveyed, including sexual, physical, and emotional violence. The outcome variables are binary. Data on domestic violence stems from the NFHS's state module, which is carried out in 15% households and 30% of clusters and substantially longer than the standard questionnaire. In each selected household, a random woman above the age of 15 was selected for the survey. Panel A assumes linear effects over time and Panel B quadratic effects. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: Linear Effects Over Time

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|-------------------|----------------------|-----------------------|-------------------------|--------------------------|
| Female x Exposure | -0.004 (0.013) | 0.003 (0.010) | 0.043** (0.022) | 0.052** (0.021) |
| Male x Exposure | 0.000 (0.014) | 0.007 (0.010) | 0.024 (0.016) | 0.030* (0.017) |
| Num.Obs. | 91 376 | 62 630 | 31 737 | 32 339 |
| R2 Adj. | 0.136 | 0.094 | 0.127 | 0.137 |
| Mean Y | 0.904 | 0.922 | 0.799 | 0.648 |
| SD Y | 0.295 | 0.267 | 0.4 | 0.478 |

Panel B: Quadratic Effects Over Time

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|---------------------------|----------------------|-----------------------|-------------------------|--------------------------|
| is female = 1 x exposure2 | -0.002 (0.013) | 0.005 (0.011) | 0.045 (0.028) | 0.084*** (0.023) |
| is female = 0 x exposure2 | -0.002 (0.016) | 0.009 (0.010) | 0.017 (0.017) | 0.052*** (0.018) |
| Num.Obs. | 91 376 | 62 630 | 31 737 | 32 339 |
| R2 Adj. | 0.136 | 0.094 | 0.127 | 0.137 |
| Mean Y | 0.904 | 0.922 | 0.799 | 0.648 |
| SD Y | 0.295 | 0.267 | 0.4 | 0.478 |

Table D.11: Exposure and School Attendance by Age Group

Note: The dependent variable in the above regressions indicates whether an individual in a given age group attended school at the time of the survey. The variable is only collected for children up to the age of 18. Panel A assumes linear effects over time and Panel B quadratic effects. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010).

Significance levels: *10%, **5%, ***1%.

Panel A: Linear Effects Over Time

| | TV Owner | TV Consumer | Newspaper Consumer | Internet User | Mobile Phone Owner |
|----------|-------------------|-------------------|--------------------|------------------|--------------------|
| exposure | −0.019 (0.023) | −0.006 (0.020) | −0.004 (0.017) | 0.008 (0.015) | 0.028 (0.035) |
| Num.Obs. | 190 157 | 196 537 | 196 537 | 167 111 | 34 324 |
| R2 Adj. | 0.295 | 0.237 | 0.189 | 0.174 | 0.213 |
| Mean Y | 0.752 | 0.817 | 0.45 | 0.148 | 0.494 |
| SD Y | 0.432 | 0.387 | 0.498 | 0.355 | 0.5 |

Panel B: Quadratic Effects Over Time

| | TV Owner | TV Consumer | Newspaper Consumer | Internet User | Mobile Phone Owner |
|-----------|------------------|------------------|--------------------|------------------|--------------------|
| exposure2 | 0.015 (0.031) | 0.018 (0.027) | 0.004 (0.023) | 0.016 (0.020) | 0.023 (0.033) |
| Num.Obs. | 190 157 | 196 537 | 196 537 | 167 111 | 34 324 |
| R2 Adj. | 0.295 | 0.237 | 0.189 | 0.174 | 0.213 |
| Mean Y | 0.752 | 0.817 | 0.45 | 0.148 | 0.494 |
| SD Y | 0.432 | 0.387 | 0.498 | 0.355 | 0.5 |

Table D.12: Exposure and Non-Radio Media

Note: The above regressions test whether treatment affects other types of media consumption. This includes whether (1) household has a TV, (2) a dummy indicating whether individual watches TV or (3) reads the newspaper at least less than once week, (4) the household has access to internet, or (5) owns a mobile phone. Panel A assumes linear effects over time and Panel B quadratic effects. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter

5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

| | Caste SC/ST | Caste SC/ST | Muslim | Muslim | Urban | Urban | Log. Pop. Density | Log. Pop. Density | Log. Travel Time City (min) | Log. Travel Time City (min) | Proximity Borders (m) | Proximity Borders (m) | Travel Time Radio (min) | Travel Time Radio (min) |
|-----------|-------------|-------------|---------|---------|---------|---------|-------------------|-------------------|-----------------------------|-----------------------------|-----------------------|-----------------------|-------------------------|-------------------------|
| exposure | 0.003 | | 0.021 | | 0.002 | | 0.248 | | 0.115 | | 1139.465 | | 4.355 | |
| | (0.022) | | (0.019) | | (0.075) | | (0.237) | | (0.186) | | (2895.347) | | (2.887) | |
| exposure2 | | -0.029 | | 0.005 | | 0.015 | | 0.267 | | 0.089 | | 512.614 | | 2.686 |
| | | (0.025) | | (0.023) | | (0.087) | | (0.255) | | (0.224) | | (2960.084) | | (2.745) |
| Num.Obs. | 167 111 | 167 111 | 171 903 | 171 903 | 171 903 | 171 903 | 171 903 | 171 903 | 171 903 | 171 903 | 171 903 | 171 903 | 171 903 | 171 903 |
| R2 Adj. | 0.074 | 0.074 | 0.100 | 0.100 | 0.361 | 0.361 | 0.796 | 0.796 | 0.586 | 0.586 | 0.985 | 0.985 | 0.825 | 0.825 |

Table D.13: Exogeneity check: correlation of treatment variation with other covariates of women empowerment

Note: The table show regressions of different covariates that are unlikely to be affected by radio on radio exposure. Regressions control for propagation controls and CRS dummies only.

Regressions on travel time to the nearest radio station additionally exclude this variable from the set of propagation controls. Standard errors in parentheses are adjusted for spatial correlation ([Conley, 1999, 2010](#)). Significance levels: *10%, **5%, ***1%.

E Results without Jittering Correction

Panel A.1: Linear Effects Over Time - Reported Distance

| | Radio Owner | Radio Consumer | Radio Familyplanning | Radio HIV/AIDS |
|------------------|-------------------|------------------|----------------------|--------------------|
| exposure (point) | −0.002 (0.011) | 0.012 (0.012) | 0.030** (0.014) | 0.047** (0.020) |
| Num.Obs. | 190 157 | 228 289 | 228 289 | 55 508 |
| R2 Adj. | 0.065 | 0.073 | 0.098 | 0.092 |
| Mean Y | 0.095 | 0.184 | 0.197 | 0.164 |

Panel B.1: Quadratic Effects Over Time - Reported Distance

| | Radio Owner | Radio Consumer | Radio Familyplanning | Radio HIV/AIDS |
|-------------------|-------------------|------------------|----------------------|---------------------|
| exposure2 (point) | −0.001 (0.012) | 0.035 (0.021) | 0.050** (0.022) | 0.076*** (0.027) |
| Num.Obs. | 190 157 | 228 289 | 228 289 | 55 508 |
| R2 Adj. | 0.065 | 0.073 | 0.098 | 0.093 |
| Mean Y | 0.095 | 0.184 | 0.197 | 0.164 |

Panel A.2: Linear Effects Over Time - Expected Distance

| | Radio Owner | Radio Consumer | Radio Familyplanning | Radio HIV/AIDS |
|------------------|-------------------|------------------|----------------------|--------------------|
| exposure (point) | −0.003 (0.011) | 0.014 (0.013) | 0.032** (0.014) | 0.047** (0.020) |
| Num.Obs. | 190 157 | 228 289 | 228 289 | 55 508 |
| R2 Adj. | 0.065 | 0.073 | 0.098 | 0.092 |
| Mean Y | 0.095 | 0.184 | 0.197 | 0.164 |

Panel B.2: Quadratic Effects Over Time - Expected Distance

| | Radio Owner | Radio Consumer | Radio Familyplanning | Radio HIV/AIDS |
|-------------------|-------------------|-------------------|----------------------|---------------------|
| exposure2 (point) | −0.002 (0.012) | 0.039* (0.022) | 0.053** (0.023) | 0.079*** (0.027) |
| Num.Obs. | 190 157 | 228 289 | 228 289 | 55 508 |
| R2 Adj. | 0.065 | 0.073 | 0.098 | 0.093 |
| Mean Y | 0.095 | 0.184 | 0.197 | 0.164 |

Table E.1: Radio Consumption: Evaluation of Jittering Algorithm

Note: Panels report the results using either a linear or quadratic effect over time. This is done using the reported location (“exposure (point)”). Panel A.1 and A.2 use distance controls relying on the “Reported Distance”, i.e., solely relying on the distance between the jittered location and the radio tower. Panels A.2 and B.2 correct this distance by taking the jittering into account, controlling for expected distances.

The dependent variables are defined as follows: radio owner: household owns a radio; radio consumer: dummy indicating whether individual listens to radio at least less than once a week; radio family planning: dummy for whether individual heard a family planning message in last few months. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: years of education

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|----------------------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|-------------------|
| is female = 1 x exposure (point) | 0.062 (0.038) | 0.143 (0.095) | 0.219 (0.135) | 0.158 (0.139) | 0.290* (0.165) | 0.183* (0.105) |
| is female = 0 x exposure (point) | 0.031 (0.035) | 0.110 (0.077) | 0.028 (0.096) | 0.080 (0.134) | 0.044 (0.169) | 0.071 (0.104) |
| Num.Obs. | 91 341 | 62 587 | 31 705 | 45 395 | 174 402 | 392 353 |
| R2 Adj. | 0.637 | 0.345 | 0.194 | 0.185 | 0.232 | 0.534 |
| Mean Y | 1.68 | 5.941 | 8.345 | 9.66 | 9.458 | 6.996 |

Panel B: degree obtained

| | Primary | Secondary | Higher |
|----------------------------------|-------------------|------------------|------------------|
| is female = 1 x exposure (point) | 0.020* (0.011) | 0.021 (0.018) | 0.019 (0.013) |
| is female = 0 x exposure (point) | 0.004 (0.010) | 0.007 (0.019) | 0.009 (0.013) |
| Num.Obs. | 238 425 | 191 899 | 191 899 |
| R2 Adj. | 0.161 | 0.160 | 0.134 |
| Mean Y | 0.807 | 0.41 | 0.255 |

Panel C: is married

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|----------------------------------|---------------------|--------------------|-------------------|---------------------|------------------|
| is female = 1 x exposure (point) | -0.006 (0.007) | -0.027* (0.015) | -0.013 (0.021) | 0.002 (0.007) | 0.005 (0.005) |
| is female = 0 x exposure (point) | 0.014*** (0.005) | 0.004 (0.012) | -0.028 (0.017) | -0.020** (0.009) | 0.001 (0.008) |
| Num.Obs. | 95 359 | 87 467 | 68 256 | 57 081 | 46 469 |
| R2 Adj. | 0.060 | 0.284 | 0.193 | 0.069 | 0.019 |
| Mean Y | 0.038 | 0.388 | 0.76 | 0.924 | 0.968 |

Panel D: number of children

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|------------------|--------------------|--------------------|--------------------|---------------------|--------------------|--------------------|
| exposure (point) | -0.002 (0.003) | -0.037 (0.024) | -0.067 (0.053) | -0.151** (0.070) | -0.038 (0.067) | -0.038 (0.073) |
| Num.Obs. | 20 747 | 56 848 | 32 510 | 26 469 | 24 899 | 35 064 |
| R2 Adj. | 0.011 | 0.306 | 0.198 | 0.232 | 0.254 | 0.282 |
| Mean Y | 0.006 | 0.624 | 1.882 | 2.429 | 2.735 | 2.993 |

Panel E: autonomy of women

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-49) |
|------------------|--------------------|---------------------|------------------|------------------|-------------------|
| exposure (point) | 0.035** (0.016) | 0.092*** (0.030) | 0.022 (0.015) | 0.006 (0.022) | 0.070* (0.041) |
| Num.Obs. | 24 411 | 5484 | 9572 | 7212 | 2143 |
| R2 Adj. | 0.148 | 0.138 | 0.097 | 0.091 | 0.106 |
| Mean Y | 0.635 | 0.505 | 0.639 | 0.704 | 0.718 |

Table E.2: main results with point exposure and distance (i.e. without jittering correction)

Note: The tables repeat the paper's main regressions with point exposure as the treatment variable. Further, expected distance controls are replaced by point distance controls. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: years of education

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|----------------------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|--------------------|
| is female = 1 x exposure (point) | 0.069* (0.040) | 0.162* (0.090) | 0.233* (0.140) | 0.178 (0.134) | 0.309* (0.158) | 0.200** (0.102) |
| is female = 0 x exposure (point) | 0.039 (0.036) | 0.131* (0.074) | 0.042 (0.099) | 0.102 (0.124) | 0.062 (0.161) | 0.089 (0.100) |
| Num.Obs. | 91 341 | 62 587 | 31 705 | 45 395 | 174 402 | 392 353 |
| R2 Adj. | 0.637 | 0.345 | 0.195 | 0.186 | 0.233 | 0.534 |
| Mean Y | 1.68 | 5.941 | 8.345 | 9.66 | 9.458 | 6.996 |

Panel B: degree obtained

| | Primary | Secondary | Higher |
|----------------------------------|-------------------|------------------|------------------|
| is female = 1 x exposure (point) | 0.021* (0.011) | 0.023 (0.018) | 0.021 (0.013) |
| is female = 0 x exposure (point) | 0.004 (0.010) | 0.010 (0.018) | 0.011 (0.013) |
| Num.Obs. | 238 425 | 191 899 | 191 899 |
| R2 Adj. | 0.161 | 0.160 | 0.134 |
| Mean Y | 0.807 | 0.41 | 0.255 |

Panel C: is married

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|----------------------------------|---------------------|--------------------|-------------------|---------------------|------------------|
| is female = 1 x exposure (point) | -0.007 (0.007) | -0.028* (0.016) | -0.013 (0.022) | 0.002 (0.008) | 0.005 (0.005) |
| is female = 0 x exposure (point) | 0.013*** (0.005) | 0.003 (0.012) | -0.029 (0.018) | -0.019** (0.010) | 0.001 (0.008) |
| Num.Obs. | 95 359 | 87 467 | 68 256 | 57 081 | 46 469 |
| R2 Adj. | 0.060 | 0.284 | 0.193 | 0.069 | 0.019 |
| Mean Y | 0.038 | 0.388 | 0.76 | 0.924 | 0.968 |

Panel D: number of children

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|------------------|--------------------|--------------------|--------------------|---------------------|--------------------|--------------------|
| exposure (point) | -0.002 (0.003) | -0.042* (0.024) | -0.075 (0.059) | -0.145** (0.073) | -0.036 (0.067) | -0.030 (0.077) |
| Num.Obs. | 20 747 | 56 848 | 32 510 | 26 469 | 24 899 | 35 064 |
| R2 Adj. | 0.011 | 0.306 | 0.198 | 0.232 | 0.254 | 0.282 |
| Mean Y | 0.006 | 0.624 | 1.882 | 2.429 | 2.735 | 2.993 |

Panel E: autonomy of women

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-49) |
|------------------|--------------------|---------------------|------------------|------------------|------------------|
| exposure (point) | 0.037** (0.016) | 0.096*** (0.029) | 0.021 (0.015) | 0.009 (0.022) | 0.070 (0.043) |
| Num.Obs. | 24 411 | 5484 | 9572 | 7212 | 2143 |
| R2 Adj. | 0.148 | 0.138 | 0.097 | 0.091 | 0.107 |
| Mean Y | 0.635 | 0.505 | 0.639 | 0.704 | 0.718 |

Table E.3: observations at a distance of 50km from a radio station with point exposure and expected distance (i.e. only distance is corrected for jittering)

Note: The tables repeat the paper's main regressions with point exposure as the treatment variable. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

F Placebo and Robustness

| | Primary | Primary | Secondary | Secondary | Higher | Higher |
|-------------------|------------------|-------------------|------------------|-------------------|------------------|------------------|
| exposure | 0.002 (0.016) | | 0.005 (0.018) | | 0.007 (0.015) | |
| Female x Exposure | | 0.025 (0.018) | | 0.015 (0.019) | | 0.007 (0.015) |
| Male x Exposure | | -0.021 (0.019) | | -0.005 (0.019) | | 0.007 (0.016) |
| Num.Obs. | 108 281 | 108 281 | 108 281 | 108 281 | 108 281 | 108 281 |
| R2 Adj. | 0.225 | 0.225 | 0.152 | 0.152 | 0.120 | 0.120 |
| Mean Y | 0.636 | 0.636 | 0.253 | 0.253 | 0.155 | 0.155 |
| SD Y | 0.481 | 0.481 | 0.434 | 0.434 | 0.362 | 0.362 |

Table F.1: Robustness: Effect of Exposure on Education Levels of Individuals Aged 30 to 40

Note: The tables regress the degree obtained for individuals aged 30 to 40 on exposure to radio. This age group is unlikely to actually be affected by radio in their educational choices, as the first radios launched when they were around 20 to 30 years old. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

| | Lower Primary (30-35) | Upper Primary (36-39) | Lower Secondary (40-41) | Higher Secondary (42-44) | Higher Education (45-49) | All (30-49) |
|-------------------|-----------------------|-----------------------|-------------------------|--------------------------|--------------------------|-------------------|
| Female x Exposure | 0.145 (0.268) | 0.357 (0.303) | 0.448 (0.340) | -0.019 (0.307) | 0.151 (0.268) | 0.187 (0.221) |
| Male x Exposure | -0.113 (0.199) | -0.232 (0.345) | -0.159 (0.342) | -0.489 (0.333) | -0.101 (0.269) | -0.196 (0.220) |
| Num.Obs. | 75 215 | 34 983 | 22 840 | 22 937 | 44 109 | 200 084 |
| R2 Adj. | 0.263 | 0.283 | 0.286 | 0.307 | 0.315 | 0.294 |
| Mean Y | 7.872 | 7.471 | 6.588 | 6.875 | 5.972 | 7.122 |
| SD Y | 5.276 | 5.313 | 5.39 | 5.395 | 5.353 | 5.379 |

Table F.2: Robustness: Effect of Exposure on Years of Education of Individuals Aged 30 to 50

Note: The tables regress the years of education obtained for individuals aged 30 to 50 by age group on exposure to radio. These age groups are unlikely to actually be affected by radio in their educational choices, as the first radios launched when they were around 20 to 40 years old. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: Years of education

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|--------------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|-------------------|
| is female = 1 x exposure | 0.016 (0.046) | -0.066 (0.110) | 0.010 (0.107) | -0.065 (0.186) | -0.126 (0.176) | -0.077 (0.113) |
| is female = 0 x exposure | 0.026 (0.049) | -0.025 (0.088) | -0.028 (0.136) | -0.246 (0.175) | -0.286* (0.173) | -0.119 (0.098) |
| Num.Obs. | 75 528 | 51 086 | 25 964 | 36 825 | 141 241 | 320 039 |
| R2 Adj. | 0.620 | 0.325 | 0.163 | 0.156 | 0.217 | 0.529 |
| Mean Y | 1.633 | 5.82 | 8.234 | 9.503 | 9.356 | 6.873 |
| SD Y | 1.618 | 2.146 | 2.574 | 3.407 | 4.869 | 4.821 |

Panel B: degree obtained

| | Primary | Secondary | Higher |
|--------------------------|-------------------|-------------------|-------------------|
| is female = 1 x exposure | -0.006 (0.013) | -0.025 (0.018) | -0.019 (0.019) |
| is female = 0 x exposure | -0.017 (0.015) | -0.023 (0.015) | -0.011 (0.015) |
| Num.Obs. | 155 556 | 155 556 | 155 556 |
| R2 Adj. | 0.155 | 0.148 | 0.124 |
| Mean Y | 0.785 | 0.397 | 0.24 |
| SD Y | 0.411 | 0.489 | 0.427 |

Panel C: is married

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|--------------------------|-------------------|-------------------|-------------------|-------------------|------------------|
| is female = 1 x exposure | -0.010 (0.007) | 0.013 (0.019) | 0.000 (0.028) | 0.007 (0.016) | 0.004 (0.012) |
| is female = 0 x exposure | 0.010 (0.008) | 0.034* (0.019) | -0.010 (0.025) | -0.012 (0.019) | 0.004 (0.015) |
| Num.Obs. | 77 640 | 70 719 | 55 370 | 46 710 | 37 048 |
| R2 Adj. | 0.068 | 0.271 | 0.181 | 0.066 | 0.027 |
| Mean Y | 0.042 | 0.392 | 0.754 | 0.916 | 0.962 |
| SD Y | 0.2 | 0.488 | 0.431 | 0.277 | 0.19 |

Panel D: number of children

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| exposure | -0.001 (0.006) | 0.027 (0.026) | 0.015 (0.058) | 0.122* (0.069) | 0.060 (0.068) | 0.009 (0.091) |
| Num.Obs. | 16 897 | 46 327 | 26 309 | 21 216 | 19 943 | 27 676 |
| R2 Adj. | 0.015 | 0.295 | 0.205 | 0.222 | 0.231 | 0.258 |
| Mean Y | 0.008 | 0.623 | 1.85 | 2.426 | 2.753 | 3.055 |
| SD Y | 0.094 | 0.906 | 1.22 | 1.326 | 1.465 | 1.644 |

Panel E: autonomy of women

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-54) |
|----------|-------------------|------------------|-------------------|-------------------|-------------------|
| exposure | -0.016 (0.027) | 0.032 (0.038) | -0.026 (0.035) | -0.025 (0.036) | -0.055 (0.060) |
| Num.Obs. | 19 055 | 4365 | 7436 | 5612 | 1642 |
| R2 Adj. | 0.164 | 0.155 | 0.103 | 0.115 | 0.098 |
| Mean Y | 0.642 | 0.505 | 0.65 | 0.711 | 0.726 |
| SD Y | 0.326 | 0.332 | 0.316 | 0.306 | 0.301 |

Table F.3: Placebo Linear model – observations at a distance of 50km from a radio station launched post 2015

Note: The tables repeat the paper's main regressions on the placebo sample, i.e., individuals in the vicinity and (potentially) coverage area of radios that launch post data collection (post 2015). Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

Panel A: Years of education

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|---------------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|-------------------|
| is female = 1 x exposure2 | 0.044 (0.043) | 0.153 (0.098) | 0.260* (0.151) | -0.103 (0.321) | 0.527 (0.646) | 0.252 (0.318) |
| is female = 0 x exposure2 | -0.032 (0.066) | -0.069 (0.095) | -0.184 (0.239) | -0.197 (0.283) | 0.162 (0.310) | -0.025 (0.183) |
| Num.Obs. | 75 528 | 51 086 | 25 964 | 36 825 | 141 241 | 320 039 |
| R2 Adj. | 0.620 | 0.325 | 0.164 | 0.155 | 0.217 | 0.529 |
| Mean Y | 1.633 | 5.82 | 8.234 | 9.503 | 9.356 | 6.873 |
| SD Y | 1.618 | 2.146 | 2.574 | 3.407 | 4.869 | 4.821 |

Panel B: degree obtained

| | Primary | Secondary | Higher |
|---------------------------|------------------|-------------------|------------------|
| is female = 1 x exposure2 | 0.023 (0.044) | 0.026 (0.046) | 0.042 (0.046) |
| is female = 0 x exposure2 | 0.001 (0.026) | -0.004 (0.029) | 0.011 (0.017) |
| Num.Obs. | 155 556 | 155 556 | 155 556 |
| R2 Adj. | 0.155 | 0.148 | 0.124 |
| Mean Y | 0.785 | 0.397 | 0.24 |
| SD Y | 0.411 | 0.489 | 0.427 |

Panel C: is married

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|---------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|
| is female = 1 x exposure2 | -0.026* (0.015) | -0.023 (0.069) | 0.012 (0.036) | -0.009 (0.020) | -0.013 (0.014) |
| is female = 0 x exposure2 | -0.005 (0.011) | 0.004 (0.047) | -0.082 (0.062) | -0.052 (0.037) | 0.002 (0.014) |
| Num.Obs. | 77 640 | 70 719 | 55 370 | 46 710 | 37 048 |
| R2 Adj. | 0.068 | 0.271 | 0.181 | 0.066 | 0.027 |
| Mean Y | 0.042 | 0.392 | 0.754 | 0.916 | 0.962 |
| SD Y | 0.2 | 0.488 | 0.431 | 0.277 | 0.19 |

Panel D: number of children

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|-----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| exposure2 | -0.004 (0.005) | 0.064 (0.079) | -0.100 (0.117) | -0.096 (0.163) | 0.040 (0.120) | -0.029 (0.153) |
| Num.Obs. | 16 897 | 46 327 | 26 309 | 21 216 | 19 943 | 27 676 |
| R2 Adj. | 0.015 | 0.295 | 0.205 | 0.221 | 0.231 | 0.258 |
| Mean Y | 0.008 | 0.623 | 1.85 | 2.426 | 2.753 | 3.055 |
| SD Y | 0.094 | 0.906 | 1.22 | 1.326 | 1.465 | 1.644 |

Panel E: autonomy of women

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-54) |
|-----------|------------------|--------------------|-------------------|------------------|------------------|
| exposure2 | 0.037 (0.057) | 0.152** (0.063) | -0.045 (0.056) | 0.048 (0.060) | 0.070 (0.058) |
| Num.Obs. | 19 055 | 4365 | 7436 | 5612 | 1642 |
| R2 Adj. | 0.164 | 0.156 | 0.103 | 0.115 | 0.098 |
| Mean Y | 0.642 | 0.505 | 0.65 | 0.711 | 0.726 |
| SD Y | 0.326 | 0.332 | 0.316 | 0.306 | 0.301 |

Table F.4: Placebo Quadratic model – observations at a distance of 50km from a radio station launched post 2015

Note: The tables repeat the paper’s main regressions on the placebo sample, i.e., individuals in the vicinity and (potentially) coverage area of radios that launch post data collection (post 2015). Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

G Data on Radios: Data Gathering and Preparation

Data on Community Radios and their locations was manually gathered from a number of sources.

The precise information on the location was then hand collected from various sources in May 2021. The starting point was always the list of radio stations issued by the Ministry of Broadcasting and Information in March 2020 (MOIB, 2020). This list includes addresses, names of organizations and other information. Furthermore, this information is enriched using a list of operational stations compiled by Jacob (2021) of the National Institute of Amateur Radio and other sources, mainly from MOIB (e.g. CRFC, 2021).³² Based on this data, radios are searched for via Google Maps. Many of these stations have their own Google Maps entry and were geocoded accordingly. Others are identified via their parent organization. Locations are verified (where possible) via websites and by searching for pictures taken and posted on Google Maps in the vicinity of a radio tower (e.g., of local stores). In total, 276 out of 289 stations in the list were identified as operational as of May 2020. Of these, 264 or 96% could be precisely geocoded using the above approach. In the process, I identified 110 radio towers in pictures, which verifies the precision of the location. Finally, the MOIB shared a list of radio tower coordinates with me. Unfortunately, this list only had a precision of around 1.2km. However, I used it to verify and improve the precision of coordinates in my data.

Regarding technical specifications, radios are, by regulation, limited to transmitting at a power of 50W, putting Indian CRS at the lower end of the typical power permitted to a CRS (Fraser and Estrada, 2001), and to building towers at a height of 30m (Govt. of India, 2006). Based on multiple interviews with experts, NGOs working with CRS and MOIB, as well as visits to multiple community radio stations and receiving reports on visits from Jose Jacob at the National Institute of Amateur Radio, I verified that virtually all radios maximize their coverage by transmitting at this frequency using 30m or close to 30m towers.

H Radio Content I: Information from Compendia

In total, I collected information on radios' self-descriptions. The primary source of this are Radio Compendia. These are regularly created booklets that summarize the content of a given radio station on a single page, as shown in Figure H.1. They are created as part of the Community Radio Sammelan, a facilitation event for CRS. In case such data is not available, websites of radios and other sources on the radio (such as articles in newspapers) are searched for information on the content. In total, I collect information on the content of 237 out of 264 CRS or around 90%. 90% of the content information stems from Compendia, most of which is from the 2019 edition (180 of 211).

The content information is then manually coded by topic. First, I go through the compendia to identify the main topics mentioned. Next, I use CATMA (Gius et al., 2023), a QTA text annotation software, to manually annotate words that are related to the respective topic. I tag texts in two categories: words related to content and words related to a radio's audience, format, or protagonists. In the coding process I follow the following logic:

For content related words, I only tag words that directly relate to the respective topic and are required to understand the context. This usually does not include the entire sentence. For example: "The radio is focused on **women empowerment**, in particular **child marriage** and **dowry**". Words that are ambiguous with respect to whether they relate to a given topic are only marked if the text contains other words that make this link clear. For example "skill development" is only marked under "economic" if

³²Thank you to Jose Jacob for also sharing his reports from visits to multiple CRS with me, including on their technical details.

the text contains a word related to the economic development of listeners, such as “career guidance”.

The following topics are coded:

- agriculture & fishing: e.g. advise and technology transfer
- culture: anything related to the preservation of local culture, such as the support of local talent
- economic: specifically focuses on furthering individuals’ economic well-being, e.g., entrepreneurship, personal finance, career counselling etc. (excl. agricultural advice)
- education: e.g. educational programs or underlining the importance of education
- environment: environmental concerns and disaster prevention and mitigation
- governance: local governance and information on government schemes
- social empowerment & rights: focus on the legal rights of marginalized groups and the empowerment of marginalized groups such as ST/SC (excl. women and children, except if legal rights of these groups were explicitly mentioned). Note that I did not include generic words such as ‘social issues’ or ‘social development’, as these are ambiguous.
- women empowerment: topics related to the empowerment of women, e.g., dowry, child marriage, girls’ education etc.
- health & hygiene: focus on health information, including nutrition, disease information (TB, HIV/AIDS, etc.), sanitation, and hygiene
- youth empowerment: focus on empowering youth, including children and adolescents specifically.

Further, regarding radios’ format, content, and audience, I further marked every word related to these topics.

ANDHRA PRADESH
Radio Vishnu
90.4 MHz



Radio Vishnu
Shri Vishnu Engineering College for Women,
Vishnupur, Bhimavaram, Andhra Pradesh - 534 202
Website: www.radiovishnu.com
Contact: Dr. S. Hanumantha Rao
Email: radiovishnu@gmail.com
Phone: 09849782622, 08816250864

| | |
|------------------------------------|--|
| Launch Date 15-4-2007 | Broadcast Timing 6.00 AM - 10.00 AM 12.00 PM - 20.00 PM |
| Broadcast Hours 12 hours | Languages Telugu, Hindi and English |

GENESIS
The management of Sri Vishnu Educational Society realised the crucial role of community radio in uplifting village people socially. The station was set up to provide students with ample opportunities to acquaint themselves practically with radio and TV technologies. In this way, the station was created to enable students to acquire technical management skills for better career opportunities.

THEMATIC FOCUS
The community radio station focuses on various issues, including health and nutrition, women



Enabling students to acquire skills

SIGNATURE PROGRAMMES
Rythanna, Aharam Arogyam, Mahila and Balavinodini.

INNOVATIONS IN FORMAT
Expert talks and interviews are given by Krishi Vigyan Kendra (KVK) scientists. Also, many outreach programmes are undertaken in different villages for radio broadcast. The station also broadcasts the experiences of farmers to highlight their problems.

KEY PARTNERS
Krishi Vigyan Kendra (KVK), Undi; Rice Research Station, Manuteru; Vishnu Dental College, Bhimavaram

CORE TEAM
V.V. Subrahmanyam; T. Madhu; K. Vijaya Lakshmi and P.N.V. Krishna

CRMC MEMBERS
G. Srinivasa Rao, J. Prasad Raju, P. Srinivasa Raju, Dr. U. V. Ramana Raju, P. Annamani, Dr. S. Hanumantha Rao.

Figure H.1: Example page of radio compendium of ‘Radio Vishnu’

In a next step, the words and information on the related radio station are exported. To get an idea on the distribution of topics over radios, I first create a dummy for each radio indicating whether it

mentions each of the above topics as one of their key themes (see Figure H.3). To get a better idea of the content of each topic, I further create wordclouds as shown in Figure H.2. These are created after further pre-processing the highlighted words by removing stop words, moving to lower case, and stemming and by removing infrequent terms. Finally, Figure H.4 gives an idea of the formats in which programs are produced, who appears on radio, and who listens to radio according to radio compendia.

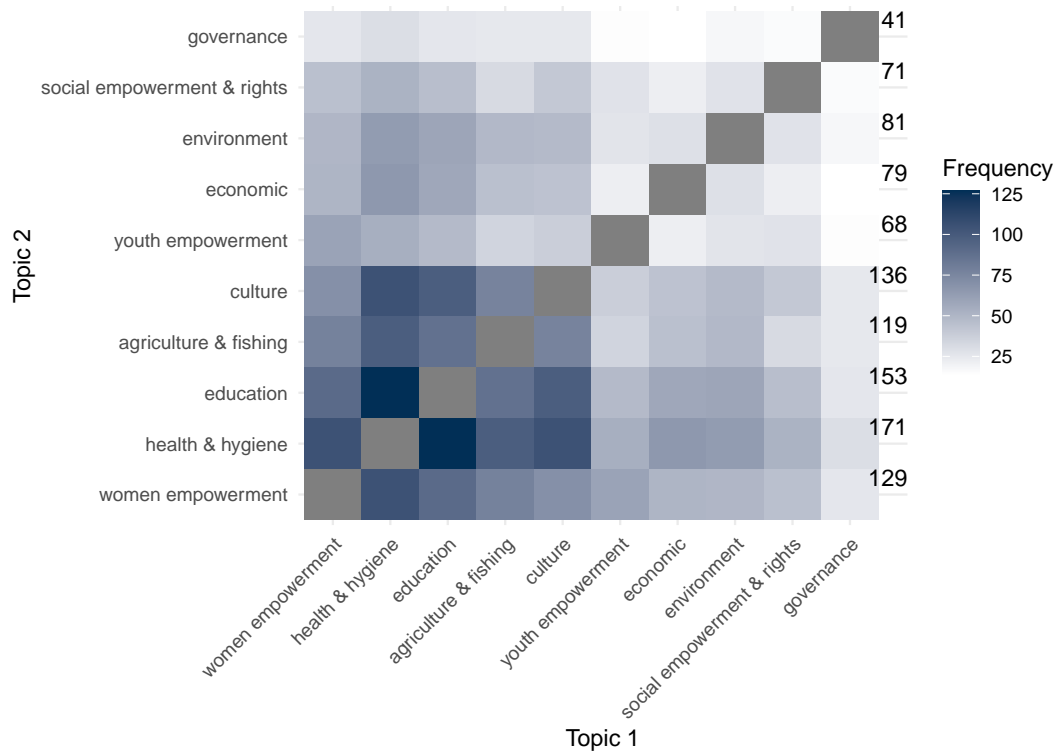


Figure H.3: Correlations in Radio Topics Based on Radio Compendia
Note: The Figure shows the correlation between topics discussed by different radio stations.



Figure H.4: Word Clouds of Protagonists, Format, and Audience of Radio Shows

Note: The wordcloud is created by pooling all words or sentences that were manually coded to be related to the respective topic. These are pre-processed by removing stop words, changed to lower case letters, and stemmed. Then 1, 2, and 3 grams are created and used to plot the wordcloud based on term frequencies. Words are scaled by the square root of their frequency.

I Radio Content II: Information from Radio Show Recordings

I.1 Data Preparation and Topic Model

This subsection describes the application of the topic model and its underlying data regarding radios’ audio files.

Starting with Table I.1, the underlying data from edaa.in is discussed. It shows the number of shows uploaded by each radio station. As visible, a couple of radio stations are responsible for most of the content. Regarding the format, CRS indicate that shows are produced in a variety of formats as Table I.2, ranging from discussions to documentaries, music, and phone-in/-out shows. Similarly, these are heterogeneous with respect to the languages in which content is produced: Table I.3 shows that content is uploaded in 22 languages. The website also requires radios to categorize the content uploaded. Table ?? shows the categories and subcategories of uploaded content. The table shows that health, education, inclusion and equity, and cultural development are the categories with the most radios uploading content. 100 shows by 32 radios are explicitly uploaded to the “Inclusion and Equity: Women” subcategory. However, other categories may also contain women specific content, in particular within the “Education” and “Health” categories.

To obtain a better idea of the shows’ content, I next draw on the audio files of uploads to edaa.in to transcribe the shows. More specifically, I use *Google’s Speech-to-Text API* to transcribe shows in supported languages. Supported languages account for 92% of shows uploaded and cover 105 of 114 radios.³³ I transcribe up to 586 shows per radio. Table I.1 shows that only four radios upload more content. For these, I randomly choose 586 shows. Next, *Google Translate* is used to translate transcripts into English. A total of 6,509 shows are transcribed and translated. The average show has a length of 12:30 min. Some of the shows are uploaded twice. After removing duplicate transcripts (597 shows), non-English ones, i.e. where translation or transcription failed - 68 shows), and exceptionally long (>10k tokens - 28 shows) or short (<20 tokens - 59) transcripts, I end up with a total of 5,806 shows produced by 93 stations (85% of stations that uploaded content).

Next, the transcripts are pre-processed by removing punctuation, non-English characters, and stop words; changing characters to lower case ones and stemming words. Terms that appear in less than 10 documents or less than 0.1% of transcripts are removed. Next, I calculate the Term Frequency-Inverse Document Frequency (tf-idf) matrix. This adjusts the Term Frequency (i.e., the number of times a term appears in a document) by the logarithm of the inverse of the share of documents a term appears in. In effect, this gives more weight to terms unique to specific types of documents, i.e., potentially informative about their topic. At the same time, it punishes terms that appear across most documents. Figure I.1 shows the 150 terms with the highest tf-idf. As shown, the term ‘women’ has the highest weight, i.e., appearing both often but only in specific documents. Following [Grün and Hornik \(2011\)](#), I use the tf-idf to reduce the Document Frequency Matrix (dfm) to terms that are relevant. In particular, I rank the terms by tf-idf and remove those with a rank below 8,000.

³³Available: Telugu: te-IN; English: en-IN; Hindi: hi-IN; Urdu: ur-IN; Malayalam: ml-IN; Gujarati: gu-IN; Kannada: kn-IN; Punjabi: pa-Guru-IN; Marathi: mr-IN; Tamil: ta-IN. Missing Languages: Assamese, Bangala, Bhojpuri, Khasi, Bundeli, Surgujiha, Mev, Maithili, Oriya, Rajasthani, Garhwali.

| Radio | Shows Uploaded | Radio.1 | Shows Uploaded |
|--|----------------|-----------------------------------|----------------|
| Aap Ki Awaaz | 4 | Periyar CR | 1 |
| Aapno Radio | 4 | PGP Radio | 1 |
| AGN CRS | 87 | PSG CR | 4 |
| Agra Ki Awaaz | 1 | Puduvai Vani | 49 |
| Alfaz-e-Mewat | 422 | Radio 7 | 2 |
| Alwar ki Awaz 90.8MHz | 64 | Radio Active CR 90.4 | 94 |
| Anna Community Radio | 201 | Radio Adan | 2 |
| Apna Radio | 50 | Radio Ala 90.8 | 8 |
| BBD 90.8 FM | 4 | Radio Azad Hind | 128 |
| Bol Hyderabad | 5 | Radio Benziger | 2,658 |
| Brahmaputra Community Radio Station | 1 | Radio Bundelkhand | 4 |
| Chanderi Ki Awaaz | 106 | Radio Dhadkan 107.8 MHz | 32 |
| Chitkara | 23 | Radio Eminent | 1 |
| CMS Radio Lucknow | 25 | Radio FTII | 46 |
| CMS RADIO LUCKNOW | 39 | RADIO JAGRITI | 1 |
| Deccan Radio | 37 | Radio Jamia | 2 |
| Divya Vani Neladani | 1 | Radio JU | 134 |
| ENTE RADIO | 2 | Radio Khushi | 44 |
| GNGC CR | 1 | Radio Luit | 494 |
| Green Radio | 61 | Radio Macfast | 1 |
| Gurgaon Ki Awaaz Samudayik Radio Station | 79 | Radio Madhuban | 154 |
| Guruvani | 23 | Radio Mahananda 98.8 FM | 10 |
| Hello Doon | 101 | Radio Manav Rachna | 78 |
| Hello Haldwani | 6 | Radio Mangalam | 26 |
| Himgiri ki awaaz | 7 | Radio Manipal | 1 |
| HINT CR | 2 | Radio Mattoli | 586 |
| Holy Cross CR | 6 | Radio Media Village | 1,538 |
| Honey CR | 6 | Radio Mewat | 278 |
| IIT CR | 114 | Radio Nagar 90.4 FM - Awaj Tumcha | 2 |
| Janadhwani | 3 | Radio Namaskar | 351 |
| JIMS Radio | 2 | Radio Popcorn | 1 |
| Jnan Taranga | 21 | Radio Rimjhim | 3,787 |
| Jyotirgamaya CR | 8 | Radio Sirsa | 1 |
| Kalanjiam Samuga | 9 | Radio Snehi | 90 |
| Kalpakkam CRS | 25 | Radio SRFTI | 3 |
| Kamalvani | 44 | Radio Vishwas 90.8 | 1 |
| Kisan Vani | 23 | Rudi No Radio | 37 |
| KMIT Tarang | 1 | Samudayik Radio Henvallvani | 2 |
| Kongu CR | 45 | Sanjha Radio 90.8 MHz | 1 |
| Krishi CRS | 49 | Sarang CR | 1 |
| KSR Community Radio | 5 | sarathi jhalak | 66 |
| Kumaon Vani | 6 | Sharda Krishi Vahini | 1 |
| KVK Pravara CR | 1 | Shyamalavani | 352 |
| Lalit Lokvani | 38 | SSM CR | 1 |
| Manndeshi Tarang Vahini | 8 | Styavani | 4 |
| MOP CR | 1 | Suno Sharda | 1 |
| MSPICM CR | 278 | Thendral CR | 1 |
| Mukta Vidya Vani | 93 | Tilonia Radio | 36 |
| MUST Radio | 101 | Vasundhara Krishi Vahini | 56 |
| Muthucharam CR | 77 | Vayalaga vanoli | 123 |
| Namma Dhwani | 4 | VENUDHWANI KLE KANASU 90.4 | 2 |
| NAV JAGRITI YUVA MANDAL | 1 | Vidyavani Community Radio | 62 |
| Neotech CR | 23 | VIT Community Radio 90.8 | 60 |
| Nila CR | 1 | Vivek CR | 1 |
| Pantnagar Janvani | 181 | Voice of SOA Community | 2 |
| PARD Vanoli | 199 | Y-FM | 24 |
| pasumaifm | 2 | Yeralavani | 2 |

Table I.1: Number of shows uploaded by radio station

Note: The above table describes the number of shows uploaded by each radio station to edaa.in.

| Format | Num. Shows | Num. Radios |
|--------------|------------|-------------|
| Discussion | 832 | 46 |
| Documentary | 1135 | 28 |
| Drama | 761 | 46 |
| Feature | 636 | 47 |
| Interview | 1702 | 61 |
| Jingle | 420 | 30 |
| Magazine | 2236 | 60 |
| Music | 805 | 49 |
| News | 13 | 9 |
| Phone in/out | 1482 | 18 |
| Radio Spot | 247 | 28 |
| Talk | 3747 | 58 |
| Vox-Populi | 163 | 13 |

Table I.2: Number of shows uploaded by type of radio show

Note: The above table describes the number of shows uploaded under in respective format on edaa.in. It further shows the number of radios that uploaded any show to in the respective format.

| Language | Num. Shows | Num. Radios |
|------------|------------|-------------|
| Assamese | 469 | 3 |
| Bangala | 187 | 6 |
| Bhojpuri | 871 | 2 |
| Bundeli | 35 | 4 |
| English | 228 | 20 |
| Garhwali | 2 | 1 |
| Gujarati | 64 | 3 |
| Hindi | 5359 | 63 |
| Kannada | 216 | 11 |
| Khasi | 3 | 1 |
| Kumaoni | 1 | 1 |
| Maithili | 2 | 2 |
| Malayalam | 4811 | 8 |
| Marathi | 233 | 12 |
| Mev | 32 | 2 |
| Oriya | 353 | 4 |
| Punjabi | 4 | 3 |
| Rajasthani | 36 | 3 |
| Surgujiha | 2 | 1 |
| Tamil | 1224 | 22 |
| Telugu | 17 | 5 |
| Urdu | 30 | 3 |

Table I.3: Number of shows uploaded by language of radio show

Note: The above table describes the number of shows uploaded under in respective language on edaa.in. It further shows the number of radios that uploaded any show to in the respective language. Available languages on Google's Speech-to-Text API: Telugu, English, Hindi, Urdu, Malayalam, Gujarati, Kannada, Punjabi, Marathi, Tamil. Missing Languages: Assamese, Bangala, Bhojpuri, Khasi, Bundeli, Surgujiha, Mev, Maithili, Oriya, Rajasthani, Garhwali.

| | | | | | | |
|--------------------|-------------------------|-------------------------|----------------------|----------------------|----------------------|----------------------|
| agriculture | communityfamily | edu_general1 | edu_general2 | edu_general3 | edu_general4 | edu_math1 |
| farmer | brother | children | work | know | yes | equal |
| crop | hous | school | today | tell | school | x |
| plant | mother | teacher | peopl | like | tell | squar |
| agricultur | know | child | educ | look | time | triangl |
| soil | yes | time | good | answer | today | angl |
| water | take | parent | student | yes | answer | b |
| farm | tell | studi | india | time | number | point |
| seed | work | educ | develop | good | good | geometri |
| cow | happen | father | govern | everyon | know | minus |
| product | son | tell | train | work | two | line |
| fertil | today | mother | import | long | equal | one |
| land | day | friend | institut | learn | take | area |
| cultiv | daughter | thing | person | ali | question | take |
| day | look | want | countri | new | just | mathemat |
| kg | right | read | area | find | one | y |
| edu_math2 | edu_math3 | entertainment_festivals | entertainment_india1 | entertainment_india2 | entertainment_music1 | entertainment_music2 |
| good | mathemat | day | swamiji | india | song | re |
| day | number | countri | time | year | love | raga |
| peopl | book | india | vivekananda | first | heart | sa |
| littl | one | name | swami | team | friend | ga |
| lot | scienc | celebr | peopl | indian | listen | music |
| one | video | gandhi | india | world | life | ma |
| mani | like | peopl | day | time | film | ra |
| know | comput | holi | ji | film | beauti | song |
| time | mathematician | prophet | religion | countri | eye | pa |
| next | interest | king | countri | run | like | tell |
| rupe | program | british | even | minist | voic | jai |
| two | technolog | peac | shri | new | name | program |
| question | call | world | start | cricket | world | dha |
| ask | differ | allah | mani | last | color | nana |
| thing | read | histori | god | second | happi | na |
| entertainment_quiz | entertainment_spiritual | environment | govt_banking | govt_programs1 | health_general1 | health_lung |
| question | life | water | bank | villag | eye | tv |
| answer | mind | environ | inform | group | bodi | diseas |
| start | world | tree | money | panchayat | blood | cancer |
| first | live | clean | govern | program | breath | hiv |
| option | think | pollut | give | work | donat | peopl |
| time | good | earth | given | gram | place | know |
| call | man | rain | road | sabha | yoga | patient |
| second | person | plant | take | sister | peopl | treatment |
| next | make | garbag | interest | sarpanch | nose | lung |
| name | god | save | peopl | meet | way | doctor |
| studi | one | place | land | hous | food | medicin |
| contest | happi | peopl | account | raj | gayatri | spread |
| readi | peopl | river | number | govern | diseas | smoke |
| correct | thing | drink | problem | everi | exercis | person |
| bihar | way | citi | offic | panchayati | hand | tuberculosi |

Table I.4: Top 15 most predictive words by topic of LDA topic model (Part 1)

| | | | | | | |
|---------|---------|-------|--------|------------|-------|----------|
| eat | diseas | hai | thing | ji | abl | ji |
| food | doctor | ki | tell | speak | good | peopl |
| veget | blood | mein | like | peopl | make | like |
| make | problem | ke | time | good | time | sudhakar |
| bodi | bodi | ka | much | rimjhim | know | tell |
| vitamin | medicin | aur | talk | issu | case | nowaday |
| milk | pain | se | peopl | thank | first | thing |
| diet | time | hain | one | call | day | time |
| good | patient | kya | take | thing | lot | one |
| fruit | due | math | mani | much | way | mani |
| take | caus | nahin | want | today | take | day |
| drink | take | ko | good | welcom | learn | start |
| green | reason | bhi | know | keep | peopl | year |
| women | like | liy | happen | understand | media | vinita |
| protein | stomach | per | lot | talk | world | lot |

| | | | | | | |
|-----------|-----------|--------------|---------------|---------------|----------------|-----------------|
| rights | women_edu | women_health | women_health1 | women_health2 | women_marriage | women_maternity |
| right | health | eat | women | health | girl | child |
| constitut | scienc | bodi | program | diseas | famili | mother |
| court | sister | blood | healthi | council | women | children |
| countri | technolog | iron | talk | nation | child | month |
| law | water | anemia | time | bodi | marriag | babi |
| peopl | diseas | girl | tell | scienc | woman | milk |
| talk | program | problem | like | abl | children | time |
| live | women | food | health | life | marri | day |
| program | hand | new | problem | technolog | year | care |
| think | talk | talk | take | treatment | daughter | take |
| govern | keep | mani | know | project | societi | give |
| life | take | increas | woman | like | age | pregnanc |
| ji | depart | hous | mani | women | boy | deliveri |
| work | tell | hemoglobin | much | make | husband | pregnant |
| thing | clean | tea | care | blood | program | vaccin |

Table I.5: Top 15 most predictive words by topic of LDA topic model (Part 2)

I.2 GPT-Based Content Analysis

Here, I provide additional details on the content analysis of transcripts. Unless otherwise specified, the temperature of the GPT request is set to 0. This makes GPT more likely to choose words with the highest probability, meaning that the results better replicate and reduced risk of ‘halucination’. Further, I always set the model’s role to “You are a helpful research assistant”. This guides how the model will behave. In [Rusche \(2024\)](#), I provide a short summary on how LLMs can be called using R.

Starting with the preparation of transcripts, I first send all articles to ChatGPT-3.5 to restore grammatical structure while aiming to leave the content intact and without adding additional information. I choose GPT-3.5 because it has a substantially higher output response length than GPT-4o. The prompt is as follows:³⁵

³⁵Whenever the text was longer than the allowed context window for GPT-3.5, it was split in equal parts which were send separately.

Prompt: Text Restauration

The following text is a translated transcript of an Indian radio show, which has lost its grammatical structure in translation. Please reconstruct the text to restore its original coherence and readability without adding any new content. Return only the revised text without any additional comments or preface: ``[text]"

Next, I ask GPT-4 to return a vector for whether the respective show covers one of four topics of interest.

Prompt: Topic of Text

'The following text is a translated transcript of an Indian radio show. Please answer the following four questions only with yes or no. The questions are:

1. Does this program cover the topic of child or early marriage?
2. Does this program cover the topic of education of girls?
3. Does this program cover any of the following topics: fertility, contraception, or family planning?
4. Does this program cover the topic of domestic violence or violence against women?
5. Describe the underlying topic of the program in at most 5 words.

The answer should only contain a vector with the answers: c("yes or no", "yes or no", "yes or no", "yes or no", "description") without any additional comments or preface. The text is: '

``[text]"

This returns a vector with four binary variables indicating whether a given topic was covered. In total, I send up to three requests per text. If the first two agree, i.e. return the same vector, I take this result; otherwise I send a third request and define the final vector via majority rule. Given that I, hence, want some diversity in the answers, I set the temperature to 0.1.³⁶

Next, I additionally identify articles on the issues of interest via simple keyword search. Specifically, I define an article as covering a specific topic if it contains any of the following words:

- child marriage: “child marriage”, “early marriage”
- girls’ education: (“girl” or “girls” or “female”) AND (“education” or “school”)
- fertility: “sterilization”, “condom”, “condoms”, “ovulation”, “contraception”, “contraceptive”, “birth control”, “family planning”, “reproductive rights”
- violence against women: “violence”, “intimate partner violence”, “domestic abuse”, “spousal abuse”, “partner abuse”, “family violence”, “marital abuse”, “intimate violence”, “domestic conflict”, “domestic maltreatment”

³⁶I also build in quality checks. Following every request, these check whether the answer returned is a vector. If not, the request is send again.

Finally, I then send the text to ChatGPT-4 again, this time asking it to return a list of answers. The first answer is about whether or not the respective topic is covered (a single request is sent for every topic covered by the article). This is particularly relevant for shows identified as covering a topic via keywords. In case this question is answered with “yes”, I ask two additional questions. The first is about whether the text is in favor, neutral or against a specific issue (e.g. child marriage). The final question then asks which arguments are put forward if a ‘progressive’ stance is taken.

Prompt: Position/Stance Taken by Radio Show

```
"The following text is a transcript of an Indian radio show. Fill the following list. In case the question does not apply, simply enter NA into the list:
```

```
'list("Does this program cover the topic of child or early marriage?" =
```

```
"Yes or No",
```

```
  "If yes, is the programs message or plot in favor or against or neutral towards child/early marriage?" = "in favor/neutral/against",
```

```
  "If against, briefly summarize up to three arguments (may be less if less than 3 are mentioned) in bullet points that the program explicitly makes against child/early marriages." = c("Argument1",
```

```
  "Argument2", "Argument3"))'
```

```
Return only the full list without any additional comments or preface.
```

```
Here is the transcript:
```

```
"[text]"
```

The result is a list that can be parsed into R. In rare cases where parsing the returned object fails, the request is sent again.

J Results Using Clustered Standard Errors

Panel A: years of education

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|--------------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|--------------------|
| is female = 1 x exposure | 0.070 (0.046) | 0.245** (0.098) | 0.392*** (0.146) | 0.282 (0.200) | 0.493** (0.241) | 0.309** (0.143) |
| is female = 0 x exposure | 0.051 (0.046) | 0.223** (0.099) | 0.139 (0.147) | 0.121 (0.187) | 0.195 (0.246) | 0.178 (0.146) |
| Num.Obs. | 91 341 | 62 587 | 31 705 | 45 395 | 174 402 | 392 353 |
| R2 Adj. | 0.637 | 0.345 | 0.195 | 0.186 | 0.233 | 0.534 |
| Mean Y | 1.68 | 5.941 | 8.345 | 9.66 | 9.458 | 6.996 |
| SD Y | 1.635 | 2.116 | 2.584 | 3.406 | 4.912 | 4.855 |

Panel B: degree obtained

| | Primary | Secondary | Higher |
|--------------------------|--------------------|-------------------|------------------|
| is female = 1 x exposure | 0.034** (0.017) | 0.037* (0.022) | 0.027 (0.018) |
| is female = 0 x exposure | 0.010 (0.017) | 0.017 (0.023) | 0.015 (0.019) |
| Num.Obs. | 191 899 | 191 899 | 191 899 |
| R2 Adj. | 0.166 | 0.160 | 0.134 |
| Mean Y | 0.788 | 0.41 | 0.255 |
| SD Y | 0.409 | 0.492 | 0.436 |

Panel C: is married

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|--------------------------|---------------------|----------------------|---------------------|-------------------|-------------------|
| is female = 1 x exposure | -0.015** (0.007) | -0.051*** (0.018) | -0.025 (0.016) | 0.009 (0.011) | 0.005 (0.006) |
| is female = 0 x exposure | 0.009 (0.006) | -0.015 (0.018) | -0.042** (0.019) | -0.017 (0.013) | -0.004 (0.008) |
| Num.Obs. | 95 359 | 87 467 | 68 256 | 57 081 | 46 469 |
| R2 Adj. | 0.060 | 0.284 | 0.193 | 0.069 | 0.019 |
| Mean Y | 0.038 | 0.388 | 0.76 | 0.924 | 0.968 |
| SD Y | 0.192 | 0.487 | 0.427 | 0.265 | 0.175 |

Panel D: number of children

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|----------|--------------------|---------------------|---------------------|----------------------|--------------------|--------------------|
| exposure | -0.001 (0.003) | -0.079** (0.031) | -0.138** (0.063) | -0.210*** (0.077) | -0.033 (0.074) | -0.012 (0.082) |
| Num.Obs. | 20 747 | 56 848 | 32 510 | 26 469 | 24 899 | 35 064 |
| R2 Adj. | 0.011 | 0.306 | 0.198 | 0.232 | 0.254 | 0.282 |
| Mean Y | 0.006 | 0.624 | 1.882 | 2.429 | 2.735 | 2.993 |
| SD Y | 0.084 | 0.899 | 1.199 | 1.295 | 1.43 | 1.633 |

Panel E: autonomy of women

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-54) |
|----------|------------------|---------------------|------------------|-------------------|------------------|
| exposure | 0.037 (0.023) | 0.120*** (0.041) | 0.009 (0.030) | -0.001 (0.029) | 0.068 (0.053) |
| Num.Obs. | 24 411 | 5484 | 9572 | 7212 | 2143 |
| R2 Adj. | 0.147 | 0.138 | 0.097 | 0.091 | 0.106 |
| Mean Y | 0.635 | 0.505 | 0.639 | 0.704 | 0.718 |
| SD Y | 0.329 | 0.336 | 0.322 | 0.309 | 0.308 |

Table J.1: Main results with linear treatment effect over time: observations at a distance of 50km from a radio station

Note: The tables repeat the paper's main regressions using clustered standard errors. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Heteroscedasticity robust standard errors clustered at the subdistrict level reported in parentheses.

Panel A: years of education

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|---------------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|---------------------|
| is female = 1 x exposure2 | 0.062 (0.049) | 0.252** (0.110) | 0.494*** (0.152) | 0.522** (0.235) | 0.770*** (0.265) | 0.461*** (0.157) |
| is female = 0 x exposure2 | 0.053 (0.046) | 0.259** (0.108) | 0.137 (0.159) | 0.418** (0.213) | 0.552** (0.277) | 0.370** (0.166) |
| Num.Obs. | 91 341 | 62 587 | 31 705 | 45 395 | 174 402 | 392 353 |
| R2 Adj. | 0.637 | 0.345 | 0.195 | 0.186 | 0.233 | 0.534 |
| Mean Y | 1.68 | 5.941 | 8.345 | 9.66 | 9.458 | 6.996 |
| SD Y | 1.635 | 2.116 | 2.584 | 3.406 | 4.912 | 4.855 |

Panel B: degree obtained

| | Primary | Secondary | Higher |
|---------------------------|---------------------|---------------------|--------------------|
| is female = 1 x exposure2 | 0.054*** (0.018) | 0.063*** (0.024) | 0.044** (0.019) |
| is female = 0 x exposure2 | 0.029 (0.019) | 0.059** (0.025) | 0.052** (0.021) |
| Num.Obs. | 191 899 | 191 899 | 191 899 |
| R2 Adj. | 0.166 | 0.160 | 0.134 |
| Mean Y | 0.788 | 0.41 | 0.255 |
| SD Y | 0.409 | 0.492 | 0.436 |

Panel C: is married

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|---------------------------|----------------------|----------------------|----------------------|-------------------|-------------------|
| is female = 1 x exposure2 | -0.023*** (0.008) | -0.061*** (0.021) | -0.043** (0.017) | 0.010 (0.012) | -0.002 (0.007) |
| is female = 0 x exposure2 | 0.009 (0.007) | -0.019 (0.021) | -0.064*** (0.022) | -0.018 (0.015) | -0.008 (0.009) |
| Num.Obs. | 95 359 | 87 467 | 68 256 | 57 081 | 46 469 |
| R2 Adj. | 0.060 | 0.284 | 0.193 | 0.068 | 0.019 |
| Mean Y | 0.038 | 0.388 | 0.76 | 0.924 | 0.968 |
| SD Y | 0.192 | 0.487 | 0.427 | 0.265 | 0.175 |

Panel D: number of children

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|-----------|--------------------|----------------------|----------------------|----------------------|---------------------|--------------------|
| exposure2 | -0.001 (0.004) | -0.097*** (0.032) | -0.188*** (0.066) | -0.306*** (0.076) | -0.164** (0.079) | -0.141 (0.086) |
| Num.Obs. | 20 747 | 56 848 | 32 510 | 26 469 | 24 899 | 35 064 |
| R2 Adj. | 0.011 | 0.306 | 0.199 | 0.233 | 0.255 | 0.282 |
| Mean Y | 0.006 | 0.624 | 1.882 | 2.429 | 2.735 | 2.993 |
| SD Y | 0.084 | 0.899 | 1.199 | 1.295 | 1.43 | 1.633 |

Panel E: autonomy of women

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-54) |
|-----------|------------------|--------------------|-------------------|-------------------|------------------|
| exposure2 | 0.018 (0.026) | 0.104** (0.049) | -0.003 (0.034) | -0.028 (0.030) | 0.065 (0.057) |
| Num.Obs. | 24 411 | 5484 | 9572 | 7212 | 2143 |
| R2 Adj. | 0.147 | 0.137 | 0.097 | 0.091 | 0.106 |
| Mean Y | 0.635 | 0.505 | 0.639 | 0.704 | 0.718 |
| SD Y | 0.329 | 0.336 | 0.322 | 0.309 | 0.308 |

Table J.2: Main results with quadratic treatment effect over time: observations at a distance of 50km from a radio station

Note: The tables repeat the paper's main regressions using clustered standard errors. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Heteroscedasticity robust standard errors clustered at the subdistrict level reported in parentheses.

K Alternative Specifications

Panel A: years of education

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|--------------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|---------------------|
| is female = 1 x exposure | 0.106* (0.065) | 0.319*** (0.099) | 0.426** (0.172) | 0.266 (0.192) | 0.561** (0.239) | 0.372*** (0.135) |
| is female = 0 x exposure | 0.109* (0.057) | 0.261*** (0.084) | 0.195 (0.121) | 0.131 (0.214) | 0.205 (0.223) | 0.204 (0.132) |
| Num.Obs. | 69 057 | 47 426 | 24 042 | 34 802 | 135 928 | 301 132 |
| R2 Adj. | 0.644 | 0.350 | 0.195 | 0.192 | 0.234 | 0.540 |
| Mean Y | 1.69 | 5.988 | 8.408 | 9.724 | 9.608 | 7.118 |
| SD Y | 1.641 | 2.099 | 2.555 | 3.392 | 4.892 | 4.884 |

Panel B: degree obtained

| | Primary | Secondary | Higher |
|--------------------------|--------------------|------------------|------------------|
| is female = 1 x exposure | 0.040** (0.016) | 0.040 (0.026) | 0.028 (0.018) |
| is female = 0 x exposure | 0.019 (0.014) | 0.012 (0.025) | 0.011 (0.018) |
| Num.Obs. | 184 649 | 149 339 | 149 339 |
| R2 Adj. | 0.163 | 0.162 | 0.137 |
| Mean Y | 0.815 | 0.422 | 0.266 |
| SD Y | 0.389 | 0.494 | 0.442 |

Panel C: is married

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|--------------------------|---------------------|---------------------|--------------------|-------------------|-------------------|
| is female = 1 x exposure | -0.015** (0.007) | -0.054** (0.024) | -0.026 (0.027) | 0.006 (0.014) | 0.000 (0.009) |
| is female = 0 x exposure | 0.012** (0.005) | -0.015 (0.019) | -0.045* (0.024) | -0.016 (0.017) | -0.003 (0.011) |
| Num.Obs. | 72 505 | 67 785 | 53 550 | 44 601 | 36 159 |
| R2 Adj. | 0.058 | 0.281 | 0.194 | 0.069 | 0.021 |
| Mean Y | 0.037 | 0.378 | 0.753 | 0.921 | 0.967 |
| SD Y | 0.19 | 0.485 | 0.431 | 0.269 | 0.179 |

Panel D: number of children

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|----------|--------------------|--------------------|--------------------|---------------------|--------------------|--------------------|
| exposure | 0.000 (0.004) | -0.081* (0.043) | -0.153* (0.079) | -0.243** (0.108) | 0.018 (0.097) | -0.044 (0.114) |
| Num.Obs. | 15 668 | 43 661 | 25 299 | 20 403 | 19 369 | 27 033 |
| R2 Adj. | 0.010 | 0.301 | 0.204 | 0.235 | 0.257 | 0.286 |
| Mean Y | 0.006 | 0.612 | 1.852 | 2.39 | 2.683 | 2.937 |
| SD Y | 0.086 | 0.893 | 1.197 | 1.28 | 1.4 | 1.609 |

Panel E: autonomy of women

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-49) |
|----------|-------------------|---------------------|------------------|------------------|------------------|
| exposure | 0.040* (0.021) | 0.125*** (0.040) | 0.004 (0.023) | 0.009 (0.033) | 0.081 (0.072) |
| Num.Obs. | 18 583 | 4116 | 7315 | 5514 | 1638 |
| R2 Adj. | 0.156 | 0.142 | 0.107 | 0.096 | 0.109 |
| Mean Y | 0.64 | 0.505 | 0.643 | 0.711 | 0.722 |
| SD Y | 0.328 | 0.336 | 0.321 | 0.306 | 0.306 |

Table K.1: observations at a distance of 40km from a radio station

Note: The tables repeat the paper's main regressions reducing the sample distance to 40km. Unless otherwise specified, regressions include all applicable controls mentioned in Chapter 5. Standard errors in parentheses are adjusted for spatial correlation (Conley, 1999, 2010). Significance levels: *10%, **5%, ***1%.

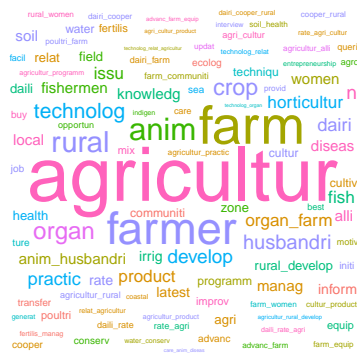
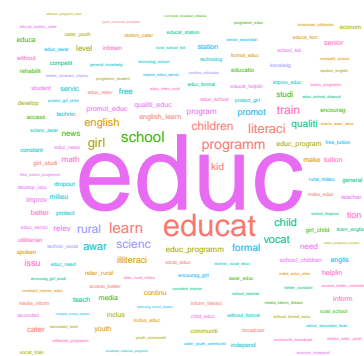
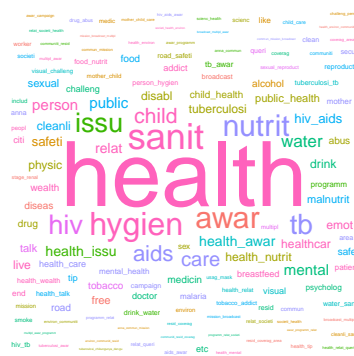
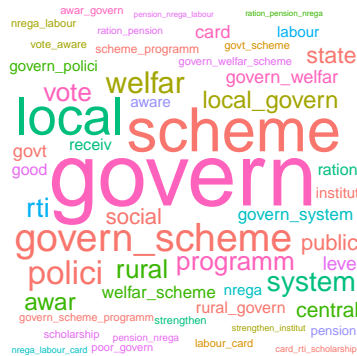


Figure H.2: Word Clouds by Topic of Radio Stations

Note: The wordcloud is created by pooling all words or sentences that were manually coded to be related to the respective topic. These are pre-processed by removing stop words, changed to lower case letters, and stemmed. Next, 1, 2, and 3 grams are created and used to plot the wordcloud based on term frequencies. Words are scaled by the square root of their frequency as per default in the *ggwordcloud* package (Le Penneec and Slowikowski, 2023).

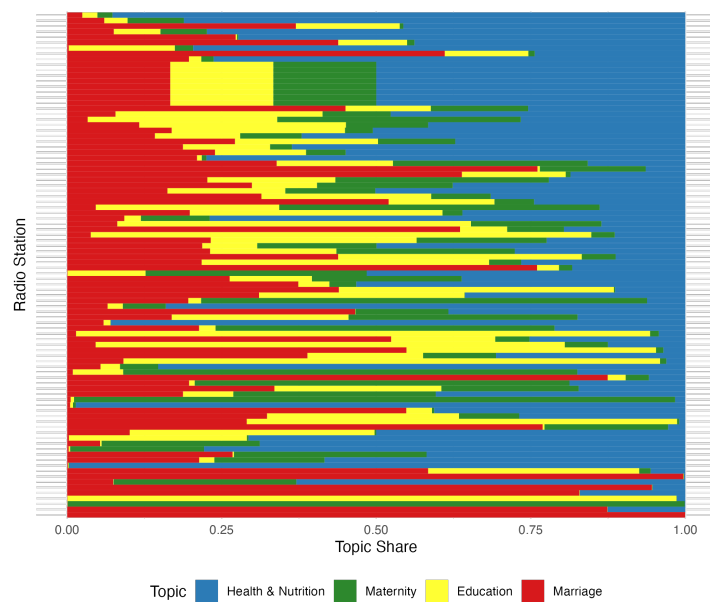


Figure I.2: Radios' Share of Content Across Women-Related Topics
 Note: The radios are in the same order as in Figure 2.