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Alex Armand, Marion Richard and Yannik Schenk

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Centre for Economic Policy Research
187 boulevard Saint-Germain, 75007 Paris, France
2 Coldbath Square, London EC1R 5HL
Tel: +44 (0)20 7183 8801
www.cepr.org

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Abstract

This paper shows that the narratives used by states to legitimize family ideals can causally influence fertility at scale. We study one of the clearest examples of a state undergoing a rapid ideological shift on the meaning of family—the mid-1990s democratic transition of Malawi—when the newly elected government abruptly replaced the long-standing pro-natalist stance of the previous regime with a modernization agenda built upon the expansion of contraceptive services and a narrative promoting the ideal of modern family as smaller, rational, and future-oriented. To isolate the effect of narratives, we combine the timing of the transition with plausibly exogenous spatial variation in individuals' exposure to state radio, the country's de facto monopoly over mass communication and the primary vehicle for disseminating modernization ideals. Using difference-in-differences designs applied to birth histories and census data, we find that higher exposure led to persistent fertility declines and delays in marriage and first birth. The evidence points to a shift in preferences and norms around reproduction, rather than changes in knowledge about family planning. The findings show that sustained fertility transitions require ideational change, even in the absence of economic development, and highlight the central role of the state in shaping reproductive preferences.

JEL Classification: D7, D83, J13, L82, Z18

Keywords: Family, Fertility, Modernization, Narratives

Alex Armand - alex.armand@novasbe.pt
Nova School of Business and Economics – Universidade Nova de Lisboa and CEPR

Marion Richard - marion.richard@novasbe.pt
Nova School of Business and Economics – Universidade Nova de Lisboa

Yannik Schenk - yannik.schenk@novasbe.pt
Nova School of Business and Economics – Universidade Nova de Lisboa

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States routinely intervene in reproductive decisions. They subsidize or restrict access to contraception, regulate abortion, and promote competing ideals of what constitutes an appropriate family size—tools that are typically deployed together as part of population policies (De Silva and Tenreyro, 2017). Yet, despite extensive evidence on the effects of access to contraception and legal abortion, we know substantially less about how governments can redefine the meaning of family to justify their intervention and influence fertility decisions. Narratives are one of the main channels through which states define and legitimize particular family ideals.[1] Their use is pervasive, including political speeches, mass-media content, educational and printed materials, and even the normative language embedded in laws and policies. The common goal is to link private reproductive decisions to broader social expectations, shaping norms around childbearing and thereby influencing individual behavior (Bursztyn and Jensen, 2017; Bertrand, 2020). However, identifying their effects is challenging because family ideals typically evolve alongside slow-moving cultural norms and structural transformations (Alesina et al., 2011; Doepke and Zilibotti, 2017; Spolaore and Wacziarg, 2022; Bau and Fernández, 2023), making it difficult to isolate the influence of narratives.

In this paper, we provide causal evidence that the narratives used by states to legitimize family ideals can shape fertility preferences and behaviors at scale. We focus on a central narrative in anti-natalist programs, promoting the idea that economic development requires the *modernization of the family*, i.e., the transition from large families—typical of kin-based agrarian structures—to individualized and labor-market-oriented families, therefore, smaller, rational, and future-oriented. This notion builds on classic accounts of the demographic transition (Notestein, 1952; Caldwell, 1982), arguing that economic development reduces fertility by reshaping norms, preferences, and family organization and ideals (Bongaarts and Watkins, 1996; Casterline, 2001), and it became deeply embedded in international development policy in the second half of the twentieth century (e.g., Easterly, 2006). Several interventions adopted these ideals not only by introducing constraints on higher fertility but also by actively promoting a narrative of modernization, which became central in large donor-funded family-planning programs in low- and middle-income countries (LMICs) and in major population policies such as India's mass sterilization campaigns and China's One-Child Policy (Connelly, 2008). We show that exposure to such narratives plays a causal role in fertility decline, beyond what can be explained by classic drivers such as shifts in contraceptive access, coercive enforcement, or underlying economic development.

We study one of the clearest examples of a state undergoing a rapid ideological shift in favor of modernization, the mid-1990s democratic transition of Malawi (see Section 1 for historical details). For three decades following independence in 1964, an autocratic regime opposed family planning and promoted large families as a moral duty, contributing to high fertility rates. Under sustained donor pressure, Malawi transitioned to democracy in 1994, and the new government adopted a modernization agenda built upon the expansion of contraceptive services and a narrative promoting the modernization of the

[1] We refer to *narratives* as the broad interpretive frames that ascribe meaning and value to childbearing. Narratives can be pro- or anti-natalist and may appeal to national goals (e.g., portraying population growth as key to preserving national values or, conversely, linking lower fertility to economic growth) or to individual motivations (e.g., framing childbearing as a source of social respect or highlighting the economic strain of raising many children). For historical accounts of anti- and pro-natalist narratives, see Gwatkin (1979); Teitelbaum and Winter (1985); Connelly (2008); Togman (2019).

family. Crucially, this shift was primarily donor-driven and occurred in the absence of major increases in aggregate income—consistent with the fact that Malawi's substantial fertility decline over the past half-century cannot be accounted for by income growth alone.

This episode offers a rare opportunity to study how the state can influence fertility through narratives rather than solely through supply-side interventions. We isolate the causal effect of modernization narratives from other changes associated with the democratic transition by exploiting a unique feature of the Malawian context. Although the transition unfolded simultaneously nationwide, exposure to the government's new narrative varied across space due to differences in the reach of state radio, thanks to the broadcaster holding a monopoly over mass communication both before and after the transition (US DoS, 1996). State radio remained the primary source of information for most Malawians well into the late 2000s and, throughout this period, served as the state's primary vehicle for shaping public discourse on the family. The old regime banned any content related to family planning from broadcasts (Lema et al., 2002), whereas the new government facilitated the diffusion of numerous programs that embedded a narrative of the modernization of families. This content was broadcast consistently for roughly 15 years and reached 70 to 90% of the adult population (Malawi NSO, 2001).

The empirical strategy exploits a central feature of the setting: while the content of state radio changed abruptly after the political transition, the physical broadcasting network had been fixed for decades. We leverage this contrast to identify the causal effect of increased exposure to the government's modernization narratives. Our design is a difference-in-differences (DiD) that interacts the nationwide timing of the transition with exogenous spatial variation in radio reception quality. Following the approach pioneered by Olken (2009), we use topography-driven differences in predicted signal strength—determined by transmitter characteristics and terrain—to generate plausibly exogenous variation in exposure. We show that predicted signal strength is orthogonal to pre-transition individual and community characteristics, including the presence of health and education infrastructure. Because the broadcast network did not expand or change around the transition, this approach allows us to compare areas with different reception of a constant platform before and after its programming shifted toward modernization narratives. Because these modernization ideals were largely unfamiliar in Malawi at the time, the shift can be interpreted as an abrupt exposure to new cultural norms surrounding family and fertility.

Data confirm that the political transition generated spatial heterogeneity in exposure to modernization narratives. Using survey data on the listenership of radio programs covering topics related to family planning—content that had been banned prior to the transition—we show that, in the post-transition period, stronger radio signals significantly increased women's listenership of these programs but had no effect on men, whose baseline listenership was already substantially higher. This pattern shows not only that modernization narratives reached more individuals in areas with better coverage of state radio, but also that exposure was asymmetric by gender, consistent with mechanisms operating through intra-household dynamics (Rasul, 2008; Doepke and Tertilt, 2018; Doepke and Kindermann, 2019).

The narratives promoted by the state significantly contributed to the fertility transition in Malawi. By applying the DiD design to panel data on fertility decisions among women of fertile age, which allows

us to control for women-specific fixed effects, we find that, following the transition, higher exposure significantly decreases the annual probability of giving birth. Results are stable across specifications and exclude other potential threats to identification, such as signal strength capturing the effects of other reforms. To examine the long-term effects, we use census data and a cohort design that exploits variation in individuals' ages at the time of the transition. Cohorts that were younger at the time of the transition, and thus more exposed during their reproductive years, end up with significantly fewer children by the end of their fertility period. These reductions arise from delayed marriage and first birth, as well as lower fertility within marriage, rather than from stopping behavior.

Our results are consistent with modernization narratives altering underlying social norms around family size—a key determinant of fertility and contraceptive behavior (e.g., Munshi and Myaux, 2006; Beach and Hanlon, 2023). Stronger exposure to state radio reduces the ideal number of children and lowers the desired share of sons, indicating a shift in preferences.[2] These changes translate into women being more likely to discuss family planning with their partners, use contraceptives, and experience broader attitudinal shifts toward greater female autonomy. By contrast, we find no detectable effects on beliefs about contraceptive methods or reproductive risks, despite their importance for fertility choices (Dupas, 2011; Bau et al., 2024; Miller et al., 2025). Taken together, these results point to a persuasion channel operating through shifts in norms and intra-household dynamics, rather than through knowledge.[3]

Our results provide novel evidence on why fertility rates differ across societies, a question that remains debated (Pritchett, 1994; Galor, 2012; Bongaarts and Casterline, 2018). We shed light on the long-standing contrast between two opposing lines of thought: the *family-planning gap* view, which stresses contraceptive supply, and the *desired-children* view, which emphasizes preferences shaped by cultural and economic factors. We show that the supply of contraceptives can affect fertility decisions only when accompanied by a reduction in the demand for children, highlighting that the two views are not alternatives but rather complements. This finding helps explain why population policies combining supply- and demand-side interventions have been more effective (De Silva and Tenreyro, 2017, 2020), and why evidence on the impact of expanding contraceptive access is mixed. Small or nil effects of free provision or increased contraceptive supply tend to arise in settings where fertility preferences remain high because the economic and social value of children is more stable, such as in poorer contexts (Miller, 2010; Desai and Tarozzi, 2011; Dupas et al., 2025). By contrast, large effects, such as the role of the contraceptive pill in accelerating the fertility transition in the United States (Goldin and Katz, 2002; Bailey, 2006, 2010), are recorded in contexts where the demand for children has already declined.

When contraceptive access is assured, policy interventions that target fertility preferences can be effective at shifting demographic patterns in the long run. Building on evidence of the role of narratives in shaping behavior (e.g., Shiller, 2017), we show that state-led narratives can serve as a policy lever for voluntary fertility reductions, contrasting with interventions that enforce childbearing limits (Ebenstein, 2010; Zhang, 2017), implement sterilization campaigns (León-Ciliotta et al., 2025), or prohibit abortion

[2] This pattern aligns with evidence that greater female empowerment reduces son preference (Jensen and Oster, 2009) and that fertility decline itself can shift desired sex ratios (Jayachandran, 2017).

[3] Bassi and Rasul (2017) shows that religious leaders can alter fertility preferences in the short run through persuasion.

and family planning altogether (Gruber et al., 1999; Pop-Eleches, 2006). We show that voluntary fertility interventions are mediated by intra-household dynamics, implying that these policies must consider how information reaches women versus men. In many contexts, including Malawi, men have near-universal access to mass media and hold greater decision-making power over fertility. Our results are consistent with greater exposure to modernization narratives increasing women's agency in fertility decisions. In contrast to Ashraf et al. (2014), this increased agency does not manifest through covert contraceptive use but rather through joint decision-making. Our results further contribute to the evidence showing that the partner who receives reproductive health information shapes fertility outcomes (Ashraf et al., 2022).

Finally, our findings contribute to the literature linking fertility transitions to the diffusion of modern family norms. Our results support the view that ideational change is an important component of sustained fertility decline (e.g., Marsh, 2014). Whereas existing research typically emphasizes the correlation between modernization and changes in education, income, or urbanization (e.g., Doepke et al., 2023), or shows that media exposure to entertainment and educational content can shift family and gender norms (Jensen and Oster, 2009; La Ferrara et al., 2012; Kearney and Levine, 2015; Banerjee et al., 2019), our setting allows us to identify the causal role of state narratives themselves. Our context is distinctive in two respects. First, the state broadcaster operated under a near-monopoly, and broadcasts were distributed irrespective of local preferences, so exposure reached an unusually large and non–self-selected audience, including rural and harder-to-reach groups. Second, while the physical broadcasting network had been fixed for decades, the content of state radio changed abruptly with the political transition, generating a content shock without a platform shock. This combination makes exposure more orthogonal to baseline demand and enables a cleaner test of persuasion than in settings where media access and content co-evolve. Whereas prior studies often estimate the joint effect of content and the platforms that carry it, we isolate the effect of narrative shifts within the same medium (see Armand et al., 2023 for a related exception). In the nature of the intervention, our study is closest to Glennerster et al. (2024), who experimentally varied both radio access and content in Burkina Faso, showing that information about contraception can affect short-run contraceptive use. In contrast, our setting allows us to identify the causal effects at a national scale and over much longer horizons, thereby speaking directly to the external validity and scalability of these interventions. By demonstrating that sustained exposure to state messaging can shift norms, preferences, and fertility behavior for an entire population, our results provide general insights into one of the core mechanisms driving fertility transitions at pivotal historical moments.

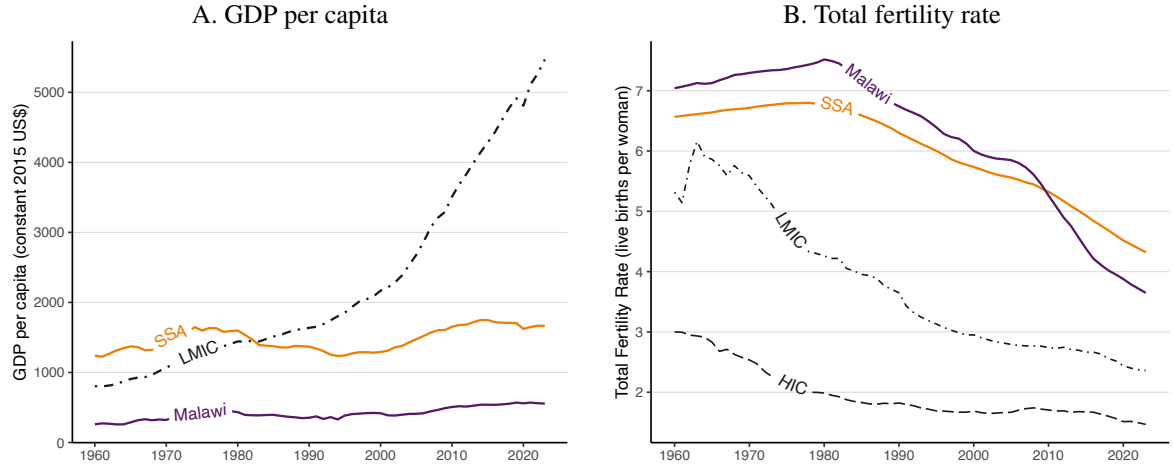
1 Historical background

Malawi, a landlocked country in southeastern Africa and among the world's poorest nations—ranked 172nd out of 193 in human development (UNDP, 2025)—has long exhibited demographic patterns that reflect its agrarian and kin-based organization of society. Fertility decisions are embedded in cultural and ethnic traditions that define gender roles and kinship systems, shaping who holds authority over reproduction (Forty et al., 2022). Across ethnic groups, men typically control household resources and

guide decisions regarding marriage, contraception, and fertility. In matrilineal groups, prevalent in the southern and central regions, inheritance and residence patterns often grant women some autonomy in reproductive decision-making, whereas in patrilineal areas, dominant in the north, fertility remains closely tied to lineage continuation and male authority. High fertility is traditionally associated with social prestige and economic security, while childlessness carries a stigma (Kishindo, 1995; Barden-O'Fallon, 2005).[4] As in many agrarian societies, these pro-natalist norms have deep economic roots: children serve as valuable contributors to household labor, sources of insurance and old-age support under conditions of high mortality, and symbols of lineage strength (Boserup, 1985).

Since its independence from Britain in 1964, Malawi evolved into a one-party state dominated by the nationalist Malawi Congress Party (MCP). Through its leader, Hastings Kamuzu Banda, the regime lasted for thirty years, remaining heavily dependent on smallholder agriculture while civil liberties were sharply curtailed. Information was controlled through pervasive censorship, and security organs reinforced the regime's control. Poverty remained widespread, and fertility rates above six births per woman during the 1970s and 1980s kept dependency ratios high and land fragmented. Figure 1 shows the evolution of GDP per capita (panel A) and total fertility rates (panel B) from the 1960s to today, comparing them with averages in sub-Saharan Africa and in LMICs.

Figure 1: Income and fertility rates



Note. Panel A depicts GDP per capita in 2015 US$. Panel B depicts the average number of children per woman by year. *SSA* refers to countries of Sub-Saharan Africa, *LMIC* and *HIC* stand for low and middle-income and for high-income countries, respectively. *HIC* is not represented in panel A for visualization purposes. Data stem from United Nations (2024); World Bank (2025).

Banda's regime put the preservation of traditional norms at the core of its politics, an approach that influenced its position on fertility. Backed by a narrative linking a large population to agricultural progress and to the defense of cultural traditions against "anti-African" and "Western" ideals of small families (Kaler, 2004; Chimbwete et al., 2005; Murunga et al., 2013), the regime adopted a staunchly pro-natalist stance, outlawing family planning in the late 1960s. These views contrasted sharply with the modernization narrative promoted by Western international donors, which had translated into the *Global Family Planning Movement* (Miller and Babiarz, 2016)—a series of initiatives that provided technical assistance

[4] "When you have a child you are respected and you are also recognized by people. But if you do not have a child you appear to be a fool in the presence of people, as if you are walking naked." (Barden-O'Fallon, 2005, p. 5).

and concessional funding to governments in LMICs in an effort to curb population growth.

Dependent on international aid, several governments responded to the mounting pressure by adopting family planning policies, while Malawi chose a middle path.[5] In 1982, it cautiously permitted modern contraception for birth spacing and emphasized the health benefits for mothers and children rather than the family limitation promoted by international donors. Access to contraceptives increased, and services were gradually rolled out in hospitals and health centers. Nevertheless, resistance to family planning remained substantial until 1994. Conservative social and religious norms, reinforced by community elders and often echoed by healthcare providers, inhibited contraceptive uptake (Tavrow et al., 1995; DFID, 2000). Moreover, regulations precluded mass-media campaigns on contraception, and public health communication was carefully sanitized of any explicit references to limiting family size (Mwakasungura and Miller, 2016).

International donors also played a significant role in the end of Banda's regime. In 1992, major bilateral donors froze most aid to Malawi, demanding substantive political reforms and respect for basic freedoms, which led Banda to accept a referendum on one-party rule. The 1993 referendum ended the regime, paving the way for the country's first multiparty elections in 1994 and bringing into power the United Democratic Front (UDF; The Washington Post, 1992; Power, 2019). The democratic transition brought about a modernization plan supported by international donors such as the World Bank and the IMF. The new government ratified a liberal constitution guaranteeing multiparty rights and civil liberties, introduced free primary education, launched donor-backed economic liberalization, including a formal privatization program, and strengthened accountability.

In terms of population policy, the discourse rapidly shifted from child spacing to family planning, embracing the donor-driven modernization narrative that rapid population growth being a barrier to social and economic development. For the first time since independence, the government explicitly acknowledged family planning, recognizing the "direct relationships between reducing population growth rates and reducing poverty levels" (Malewezi, 1994), and, with support from international donors, adopted the first National Population Policy. Guidelines for Malawi included the improvement of reproductive health services and the increase of the contraceptive prevalence rate using modern methods; the reduction of maternal, infant, and child mortality rates; and the reduction of the overall population growth rate (World Bank, 1997). Demographic objectives were to be reached by targeting both supply and demand. First, by making family planning services available to all men and women of reproductive age by increasing the number of service delivery points. This strategy had already expanded since 1982, with availability increasing throughout the period, without recording any jump at the time of the transition (Appendix B.6). The number of health facilities providing family planning services rose during the period 1983–1995 from 2 to 210 out of 742 clinics (28%) across the country (Solo et al., 2005), while in 2013–2014, 83% of the country's 977 health facilities offered these services (Ministry of Health of Malawi, 2014). Second, by promoting the advantages of a small family size using mass communication

[5] For instance, Kenya adopted a national population policy in 1967, Ghana followed in 1969, and Zimbabwe and Botswana both introduced national family planning programs in the early 1970s (Cleland et al., 2006). By the late 1990s, nearly every LMIC had enacted some form of state-sponsored family planning program (De Silva and Tenreyro, 2017).

channels, a goal that the government pursued primarily through its control of state radio. Importantly, both components of the strategy complemented one another in diffusing information about sexual and reproductive health, particularly aimed at reducing the extreme prevalence of HIV. Among individuals aged 15–49, the prevalence grew throughout the 1980s, reaching 9% in 1990 and peaking at 16% in 1998. It is currently estimated at 6% in 2024 (UNAIDS, 2025).

1.1 State radio and modernization

The state-owned *Malawi Broadcasting Corporation* (MBC) was established as Malawi's first national radio station when the country gained independence from Britain in 1964. From its inception, MBC was assigned an ideological role in mobilizing citizens for nation-building: on the one hand, by promoting a unified national identity through locally produced programs and the elevation of Chichewa as the sole national language; on the other hand, by broadcasting development-oriented content designed to fight poverty, illiteracy, and disease (Chikunkhuzeni, 1999). Notably, the network extension halted in 1972, and dominance in the media market remained stable until 2010 when private radio operators began to proliferate (see Section 2.1).

Under Banda, MBC served as the sole national broadcaster and the primary vehicle for controlling information, amplifying the leader's personality cult, suppressing dissent, and broadcasting exclusively government-approved material (Sturges, 1998). The regime promoted its narrative surrounding the family through censorship, with the Malawi Censorship Board reviewing content to align with the regime's conservative values and political objectives. The regime effectively prohibited discussions on topics such as family planning and discouraged citizens from engaging in conversations about reproductive health (Robinson, 2017a). Following the democratic transition, MBC remained the official voice of the government, as it had little to no competition in the media market in the 1990s and political interference continued after the democratic transition (Manyozo, 2004).[6]

After three decades of censorship surrounding family planning, the new government, supported by international donors, saw state radio as the main instrument for promoting the modernization narrative and reducing fertility rates. The post-transition period saw a dramatic increase in the scope and intensity of family planning messages disseminated through the state radio: the country was, in fact, "flooded with family planning messages" (Solo et al., 2005).

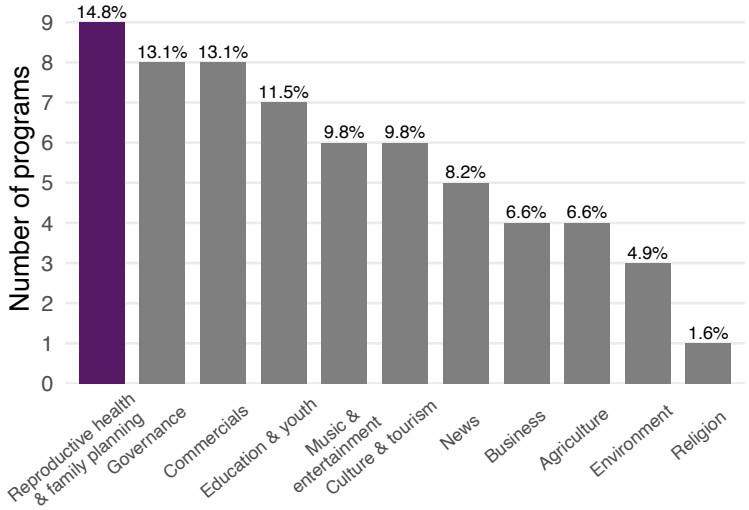
On state radio, the modernization narrative was promoted through a variety of content. First, a source of content was represented by news and coverage of governmental activities and government's members. State radio was the main mass communication medium for the government, and the major news gathering instrument for state radio, the Malawi News Agency, was also state-owned and lacked independence from the government (ICJ, 1994). While we do not have direct evidence of this channel, it is likely that the modernization narrative was promoted through this type of content, especially as the new

[6] In 1995, only one small private radio station operated, limited to religious content and barred from airing news (US DoS, 1996). From 1994 to 2000, the government issued just two private radio licenses (Cammack, 2000). Television broadcasting began in 1999 with limited reach, and print media circulated mainly in urban areas (MACRA, 2023).

government officially and openly acknowledged the importance of universal access to voluntary family planning for the first time since independence (United Nations, 1994), and evidence highlights that a message in support of family planning was reported in statements from political leaders throughout the post-transition period (FP2020, 2017).

In addition, the government facilitated the diffusion of numerous programs, mostly financed and designed by international donors, which promoted the modernization narrative. Between 2000 and 2010, DHS surveys recorded in their questionnaires up to 15 programs broadcast by state radio that promoted this narrative (Croft et al., 2018). According to Banja La Mtsogolo (Family of the Future), a leading Malawian NGO that designed several programs in the post-transition period, radio programs explicitly promoted families of two or three children (Ntaba, 2011). In Figure 2, we analyze information on new programs launched between 1995 and 1998, compiled using radio schedules and classified into 11 categories (see Appendix B.4 for details). The figure underscores the prominence of family planning and reproductive health in the years immediately following the transition: 14.8% of all new formats fell under this category, which represents the largest share.

Figure 2: Programs launched on state radio during 1995–1998 – by topic



Note. The figure shows the distribution of programs launched on MBC between 1995 and 1998 by topic. Bars show the number of new programs; labels indicate each topic's share (%) of all new programs. Appendix B.4 provides further details about the data source. Appendix B.3 provides further information on family planning content across the entire radio market.

These programs took multiple formats. First, narrative-driven radio dramas used relatable characters and everyday situations to humanize family planning themes. They conveyed a consistent message: smaller families ease land scarcity, reduce schooling costs, and improve household well-being. These dramas often blended storytelling with medical guidance to normalize discussions of contraception and encourage its adoption, and were frequently developed through community consultation to enhance local resonance (Ngaiyaye, 1993). Prominent examples are "Tinkanena", a USAID-funded Chichewa-language drama that follows the relationships of a young man to spark conversation about modern family planning and HIV/STD prevention, and "Tikuferanji", a drama depicting ordinary families confronting relationship pressures, HIV risk, and stigma (Robinson, 2017b). Second, educational programming provided direct

information on contraception, maternal health, and HIV prevention. This content appeared in the form of jingles, public service announcements, and talk shows designed to counter common myths and promote practical guidance on reproductive health and family planning. Notable examples include "Straight Talk", a UNICEF-sponsored program in which teens shared advice on sexuality and life skills (Reijer and Chalimba, 2000), and "Kulera" (Family Planning), developed by Marie Stopes International to offer actionable guidance on contraceptive use and reproductive care.

The narrative promoted on state radio was a fully fledged attempt to modernize families through two potentially complementary channels. The first channel operates by updating beliefs and knowledge through information provision and education, where exposure reduces uncertainty and corrects misconceptions by stimulating cognitive learning.[7] In our context, the educational content could alter beliefs about contraceptive efficacy, side effects, and availability, thereby lowering perceived risks and increasing adoption once supply constraints are relaxed. The second channel involves preference and value formation and operates through various psychological mechanisms. Most programs emphasized the benefits of small families or the costs of large ones without necessarily altering underlying beliefs; therefore, they stimulated persuasion through salience and/or framing, a mechanism that alters behavior mainly in the short run (DellaVigna and Gentzkow, 2010). MBC was widely perceived as the government's official voice, giving state messages high credibility and authority, which are key drivers of persuasion and compliance (Cialdini, 2007). In addition, radio dramas and talk shows provide repeated exposure to role models that normalize "modern" families, thereby stimulating preferences through social learning (Bandura and Walters, 1977). Finally, radio dramas often included fictional storytelling, a form of narrative that is known to stimulate emotional transportation, a more effective way to shift values and norms in the long run compared to salience by framing (Green and Brock, 2000). Overall, these mechanisms highlight that the modernization narratives could have influenced fertility not only by providing information but also by reshaping the social dimensions of reproductive choice. We test the relative importance of alternative channels in Section 5.2.

Such a radical shift in the government-backed narrative surrounding the family was unprecedented in Malawi. Contemporary qualitative accounts suggest that listeners increasingly came to view family size as a conscious and responsible decision made in light of household economic constraints, rather than as a moral or cultural duty (Ntaba, 2011)—some of the core principles of modernization. Government officials later attributed much of the fertility decline that followed the 1990s to these shifts in social norms, emphasizing that family planning had become widely accepted as a social responsibility (USAID, 2012). Indeed, while Malawi had one of the highest fertility rates in Africa in the 1980s, it experienced one of the region's fastest fertility declines, decreasing from over seven births per woman in the late 1980s to less than four by 2023 (panel B in Figure 1). This trend is reflected in a steep decline in the demand for children and an increase in the use of modern contraceptives (Appendix B.6).

Over the same period, income per capita remained largely stable, indicating that this demographic change was not driven solely by structural transformation or economic growth (panel A in Figure 1).

[7] This channel has proven effective in other settings through a combination of instruction and repetition, mainly among children (Gentzkow and Shapiro, 2008; Kearney and Levine, 2019).

This pattern is consistent with the limited aggregate effects of the other reforms enacted during the democratic transition, such as the introduction of free primary education in 1994. Similar to the expansion of contraceptive services, the educational reform relied primarily on extending services within existing infrastructure, with limited investment in new facilities or staff. Following the abolition of primary school fees, enrollment surged nationwide, but the rapid increase in pupils was not matched by a corresponding expansion in infrastructure or teacher training, leading to an overall decline in education quality. At the secondary level, capacity and access remained largely unchanged (Kadzamira and Rose, 2003; Al-Samarrai and Zaman, 2007).

2 Data

2.1 Exposure to state radio

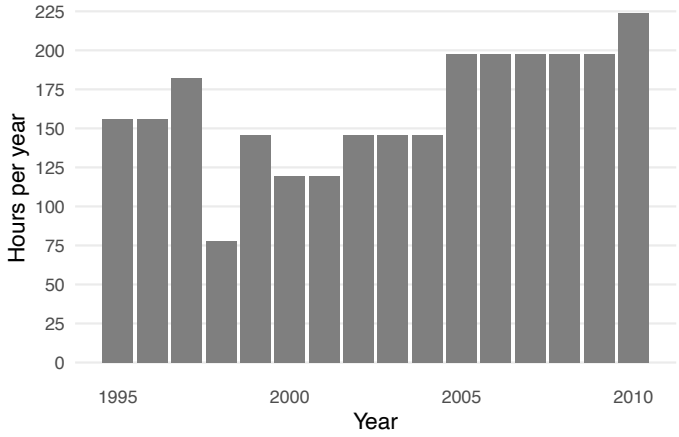
We designed a structured questionnaire targeted at radio station managers to capture retrospective information on programming related to family planning and reproductive health (including the volume, timing, and nature of broadcasts), as well as on the technical specifications of the radio network required to estimate network coverage over time. In collaboration with the Malawi Communications Regulatory Authority (MACRA) and Innovation for Policy Action (IPA), we administered the questionnaire to MBC representatives. We identified 16 radio antennas distributed throughout the country that consistently broadcast content between 1972 and 2010 (refer to panel A in Figure 5 for their locations). Figure 3 shows the annual hours of programming devoted to these topics on state radio. Consistent with the qualitative evidence presented in Section 1, the promotional effort of modernization narratives was substantial and remained relatively stable, averaging roughly half an hour of daily airtime over the period 1995–2010, with varying daily intensity.

To exclude the possibility of other stations operating simultaneously with the state radio, we also administered the same survey to additional radio stations, covering an exhaustive set of active stations in Malawi. For each transmitter, we collected the date of commissioning (i.e., when it began broadcasting), confirming the dominance of the state radio network until the late 2000s (Appendix B.3). From 2010, content related to family planning and reproductive health broadcast on radio stations began expanding nationwide, primarily driven by the steep rise of new private radio stations, which doubled between 2010 and 2015 and also broadcast this type of content.

2.2 Fertility, reproductive health and family planning

We obtain outcomes related to fertility, reproductive health, and family planning from survey data, using the 2000, 2004, and 2010 geo-referenced waves of the Demographic and Health Surveys (DHS; Croft et al., 2018). Individual surveys provide nationally representative data on health and population, with a particular focus on maternal and child health. The sample includes all women aged 15–49, with men aged 15–54 interviewed in a random subsample of households. The surveys collect detailed demo-

Figure 3: Family planning and reproductive health content on state radio



Note. The figure shows the annual hours of content related to family planning and reproductive health broadcast on state radio from 1995 to 2010. We sum the broadcast time of all formats. No such content aired before 1995 due to strict media censorship. The data are constructed from the authors' survey of radio stations (see Section 2.1). Appendix B.3 provides further information on family planning content across the entire radio market.

graphic information, including education and wealth. For women, complete birth histories are recorded, providing the year and month of each birth, sex, birth order, whether the child was part of a multiple birth, and, when relevant, the date of death. The primary sampling unit is a community (or cluster) representing a village or neighborhood (Appendix Figure B1 shows their spatial distribution). In the main analysis, we exclude the districts where the main language used by the state radio (i.e., Chichewa) was not the majority language at the time of the democratic transition.[8] Appendix Table B2 displays summary statistics for demographic characteristics and key variables.

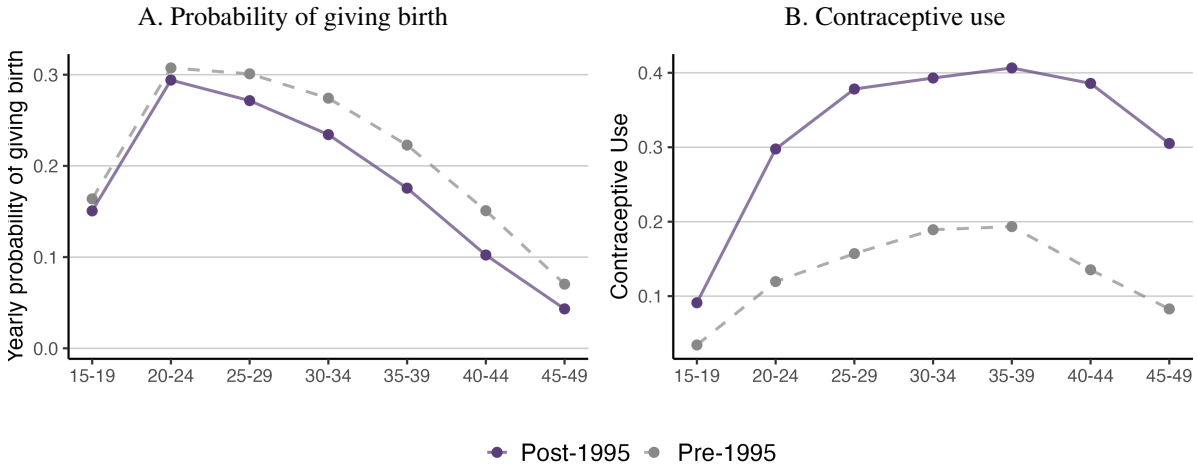
We build three sets of outcomes of interest. First, we capture the *listenership of programs promoting modernization narratives*, exploiting the fact that the Malawian DHS waves asked respondents whether they listened to each of several named programs covering family-planning topics. We use these data not as a treatment variable but to validate that stronger radio signal quality translates into higher actual exposure to the modernization narrative and to quantify the magnitude of the induced variation in narrative reach. In our sample, 61% of respondents own a radio, while 71% report having heard of these programs on state radio. A listenership share exceeding radio ownership indicates substantial sharing and collective listening. Malawi has a long-standing tradition of organized "listening clubs," where community members gather to listen to and discuss content (e.g., Mchakulu, 2007). In rural areas, such group listening likely expands effective exposure, especially among women without direct household access to a radio (AFRRI, 1992), and may amplify the impact of broadcasts through subsequent community discussions. Additional descriptive statistics on listenership patterns are provided in Section 4.1.

Second, we focus on *fertility*. Based on retrospective birth history, we create a yearly panel for women

[8]We provide results considering the full sample in Appendix B.9. Banda's regime promoted Chichewa as the national and official language as part of his broader nation-building and cultural consolidation strategy. In the 1966 Census, only about one third of Malawians reported Chichewa as their main language, and more than a quarter did not understand it at all (Kayambazinthu, 1998). In the 1998 Census, which asked only about the home language, just over half of the population reported speaking Chichewa at home, and in several districts, it remained a minority language. Using the 1998 Census, we, therefore, exclude the districts of Karonga, Rumphi, Mzimba (Mzuzu City), Mangochi, Machinga, Chitipa, and Nsanje.

aged 15 to 49. We exclude the year of the survey to address censoring and limit the retrospective panel of each woman to a maximum of 20 years before the survey to minimize recall bias, so that the panel, based on birth histories from the 2000, 2004, and 2010 surveys, spans the years 1980–2009. In our full sample, at the time of the interview, women have, on average, 3.1 children at an average age of 27.9. Figure 4 displays the age-specific probability of giving birth per year, by age group and period. In the main analysis, we use all surveyed women but restrict attention to the person-years in which they are between the ages of 15 and 35. These are the years with the highest probability of giving birth in a given year and, therefore, when fertility-related narratives are most salient. To examine within-marriage fertility, we also exploit information on the year of first marriage to analyze a subsample of person-years following marriage. We complement these data with census data, described in Section 5.1, to study decisions at the end of the reproductive age. Appendices B.9 and B.10 provide evidence for different recall periods and various selection criteria based on age.

Figure 4: Fertility and contraceptive use – by age



Note. The figure shows age-specific probability of giving birth in panel A. The age-specific probability of giving birth measures the average probability of giving birth based on retrospective birth history by age-group. *Pre-1995* include all years 1980-1995, and *post-1995* include years 1996-2009. In panel B, the figure shows the probability of using any contraceptive method, modern or traditional, in a given survey year by age-group. *Pre-1995* includes the 1992 DHS waves, and *post-1995* includes the 2000, 2004 and 2010 waves. Appendix B.6 replicates panel B, distinguishing by modern and traditional contraceptive methods.

Third, we capture outcomes related to *fertility preferences and family planning* from respondents' answers concerning desired fertility, as well as their knowledge and use of contraception. Self-reported answers have been widely used in the past to capture preferences and attitudes surrounding fertility (see, e.g., Bongaarts and Casterline, 2018). Panel B of Figure 4 displays the age-specific use of contraceptive methods as measured in the 1992, 2000, 2004, and 2010 survey waves.[9] The ideal number of children is, on average, 3.9; only 30% of women report using any contraceptive method (see Appendix B.6 for further descriptive statistics on contraceptive use); and 20% are classified as having an unmet need for family planning (i.e., they are fecund, sexually active, and do not want another child soon or at all but are not using contraception). When focusing on these outcomes, in addition to selecting women aged 15–35, we also restrict the sample to those who are married, co-residing with a partner, or sexually ac-

[9]The individual-level analysis is based on the post-transition waves (2000, 2004, and 2010). The 1992 survey wave cannot be used for individual-level analysis due to the lack of geo-spatial data.

tive at the time of the survey. For completeness, in Appendix B.9, we also focus on the full sample of women aged 15–49, regardless of marital or sexual activity status.

Measures of listenership, fertility preferences, and family planning lack retrospective histories and are therefore available only in a repeated cross-sectional form, observed at the time of the interview and only after the transition. By contrast, fertility can be analyzed in a panel format because birth histories collected at the time of the survey allow for the reconstruction of information for the same person both before and after 1995. Section 3 discusses how we exploit these properties for identification.

3 Empirical strategy

The primary objective of the study is to identify the effects of the shift in government-backed modernization narratives on fertility decisions. We begin by describing the sources of variation that underlie our empirical strategy. We then outline the estimation approaches, which vary by data structure: we use an event-study specification when panel data are available and a pooled cross-sectional specification for data observed only after the transition.

Sources of variation and properties. We combine two complementary sources of variation, one temporal and one spatial (cross-sectional). The first source of variation is the temporal variation that originated from the democratic transition of 1994 and the adoption of the modernization package, which includes the new position on family. Two features are important for our identification strategy. First, the move in favor of smaller families came after three decades of pro-natalist discourse that promoted fertility and the protection of traditional values under strict censorship, making the subsequent embrace of a modernization narrative a radical shift. Second, the push for modernization was, to a large extent, externally driven by international donors (see Section 1). With Malawi's growing dependence on foreign aid, donors became key sponsors of population policies in Malawi (e.g., World Bank, 1997). Therefore, the change was not only radical but also not primarily driven by internal demand; it was, therefore, unexpected for the vast majority of the population.

The second source of variation arises from the geographically heterogeneous exposure to state radio across locations in Malawi, as reception quality varies by geography. Importantly, the reach of state radio remained constant throughout our period of analysis and did not respond to the democratic transition. In fact, while the government-backed position on family shifted dramatically in 1994, state radio remained the mass medium used by the government to promote its official views, to the extent that the underlying radio network remained unchanged between 1972 and 2010 (see Section 1). Therefore, in any given location, individuals experienced a consistent level of access and sound quality throughout this period.

Concerning this second source of variation, we focus on random exposure to the radio signal, following a well-established methodology for identifying the causal effects of FM radio broadcasts (e.g., Olken, 2009; Enikolopov et al., 2011; Yanagizawa-Drott, 2014; Armand et al., 2020). FM broadcasts are highly sensitive to topographic obstacles, such as hills or mountains, so reception quality varies sharply across space. We exploit this property by computing spatial variation in signal strength—a measure of how

clearly individuals can receive state radio—using the Longley–Rice Irregular Terrain Model (ITM), the standard propagation model for FM radio (Crabtree and Kern, 2018). Using station parameters (Section 2.1) and high-resolution topography, we predict signal strength at a 300 m^2 resolution.[10] Panel A of Figure 5 shows the resulting distribution of signal strength for the period 1975–2010, together with transmitter locations.

We leverage the exogenous variation generated by topographic obstacles along the transmission path between a transmitter and a receiver. While the transmitters, together with their technical specifications, may have been placed strategically, the presence of topographic obstacles can block or diffract the signal, creating patterns of the radio signal that are exogenous to local socio-economic characteristics. In Malawi, the mountain chains of the East African Rift System, which traverse the country from north to south, create substantial and irregular obstacles to transmission (Appendix B.1). Following the literature, we assume that signal strength is as good as random once we condition on propagation controls, i.e., observable factors that predict both transmitter placement and potential reception. These controls are generally summarized by the *free-field signal strength* (i.e., the theoretical signal strength in the absence of any physical obstacles), which captures the component of signal strength that depends only on transmitter characteristics and distance, as well as other topographic characteristics in the point of reception, such as terrain ruggedness and elevation. After conditioning on these variables, any remaining variation in signal strength reflects only the interaction of radio signals with every obstacle that separates a transmitter from the person potentially listening to it through the radio and is therefore assumed to be random. Panel B of Figure 5 illustrates this property for the central Lilongwe region: at equidistant points from the antenna, signal strength varies substantially, confirming that topography induces quasi-random variation in the clarity of radio reception.

Using the geographical map of signal strength depicted in panel A of Figure 5, we define S_c as the signal strength in the geo-location of the respondent's community c. We indicate with S_c^f the free-field signal strength, computed as a function of antenna specifications and the distance between the transmitter and the community, corresponding to S_c.[11] Because the signal of the state radio covers almost all of the country (according to standard parameters), in the analysis, we rescaled signal strengths to be between 0 and 1, with 0 indicating the worst signal and 1 indicating the best signal.[12] S_c is therefore capturing variation in the quality of the radio signal across the country, highlighting areas where a person could listen very clearly to the broadcast and areas where it would be hard or impossible to understand the content. Variation in S_c^f captures the same, but it assumes a world without topographic obstacles.

Following Yanagizawa-Drott (2014), we verify whether S_c is random conditional on propagation controls, i.e, there is no remaining correlation between socio-demographic determinants of future fertility decisions and S_c once we control for propagation controls. We test the conditional exogeneity of S_c

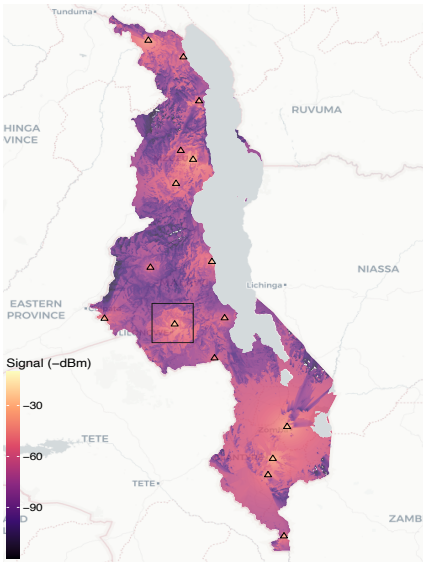
[10] Signal strength maps were obtained using the online provider CloudRF, whose proprietary software implements ITM predictions based on transmitter characteristics.

[11] Free-field signal strength predictions are generated using the standard version of the Friis transmission equation, which is commonly used to model signal propagation in free space (Rappaport, 2010).

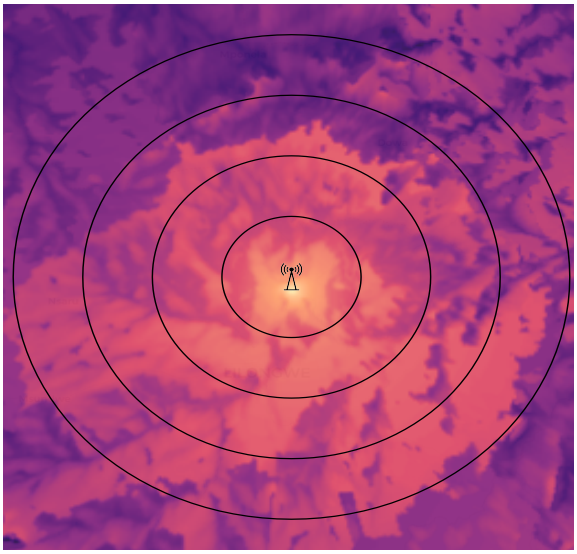
[12] A large coverage is not surprising because Banda's regime designed and used the state radio network as a primary means to control information in the country (Section 1). The alternative approach in the literature, which is not feasible in our setting, is to use a measure of radio coverage, comparing areas covered and not covered by the radio signal.

Figure 5: Signal strength of state radio across Malawi (1972–2010)

A. Transmitters location and signal strength



B. Example of coverage in the Lilongwe region



Note. Panel A illustrates the signal strength at $300m^2$-meter resolution, estimated using the Longley–Rice Irregular Terrain Model. In the figure, signal strength is represented using signal loss in dBm, with smaller (larger) negative values indicating stronger (weaker) signals. Brighter colors indicate areas of stronger signal strength, while darker colors denote weak signal strength. Triangles mark antenna locations. The rectangle highlights the area enlarged in panel B, which zooms into the central Lilongwe region, overlaid by concentric distance rings at 10, 20, 30, and 40 km intervals around the transmitter.

on a set of predetermined characteristics of individual i or community c, $y_{i(c)}$, through a series of OLS regressions of a set of individual or community characteristics on S_c, controlling for S_c^f, average terrain ruggedness, and elevation in the community, survey wave indicators, and district indicators.[13]

Table 1 presents the results. Columns (1)–(3) present the coefficient on S_c, its standard error, and the R^2 when excluding S_c^f. Columns (3)–(6) show the same statistics when including S_c^f in the regression. All models control for survey wave and district FEs. When excluding S_c^f, most estimates are significantly different from zero, highlighting the fact that signal strength alone captures the endogenous placement of antennas. However, including S_c^f drives coefficients consistently towards zero, highlighting that, conditional on propagation controls, S_c is exogenous to all these characteristics. For community-level characteristics, we find only a weakly significant coefficient for the total number of livestock in the community. Section 4.2 discusses other potential threats to the exogeneity of the signal strength.

[13]By *predetermined*, we indicate that the characteristic was not potentially affected by the change in government-backed narratives. For the measures of education, first marriage, first intercourse, and number of siblings, we limit the sample to women aged 18 and above at the time of the democratic transition to rule out any direct impacts of the treatment.

Table 1: Exogeneity check of signal strength

	Signal			*Signal and free field*			
	Coefficient	SE	R^2	Coefficient	SE	R^2	N
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Individual-level outcomes							
Respondent age	-1.624***	0.422	0.003	-0.449	0.63	0.003	34384
Catholic (dummy)	-0.034	0.045	0.036	-0.018	0.074	0.036	34384
Protestant (dummy)	-0.084*	0.045	0.044	0.051	0.072	0.045	34384
Muslim (dummy)	0.127***	0.027	0.108	-0.024	0.044	0.112	34384
Speaks chewa (dummy)	-0.007	0.071	0.232	-0.019	0.121	0.232	24949
Years of schooling	2.578***	0.548	0.1	0.181	0.695	0.104	15184
Highest educational attainment	0.706***	0.151	0.089	0.096	0.185	0.093	15184
Age at first marriage	0.397	0.317	0.012	0.649	0.455	0.012	15021
Age at first intercourse	-0.353	0.299	0.038	-0.452	0.466	0.038	15126
Years lived in current place	-2.064*	1.066	0.086	-0.721	1.697	0.086	7513
Number of Siblings	0.031	0.286	0.025	-0.072	0.416	0.025	15184
Cluster-level outcomes							
Log population (2000)	-0.359	0.217	0.294	-0.034	0.399	0.296	1403
Log under-5 population (2000)	2.488***	0.607	0.578	0.28	0.636	0.631	1403
Log population density (2000)	2.649***	0.619	0.604	0.386	0.66	0.651	1403
Share ethnic chewa	-0.217	0.128	0.782	-0.152	0.129	0.783	1404
Urban status (DHS)	0.968***	0.234	0.382	0.144	0.192	0.434	1404
Log distance to urban center	-3.341***	0.831	0.443	-0.866	1.027	0.492	1404
Built-up area share	0.184*	0.102	0.46	0.064	0.101	0.473	1403
Nightlights (1994)	0.114	0.071	0.503	0.045	0.067	0.51	1404
Nightlights (2010)	0.206*	0.1	0.58	0.061	0.09	0.595	1404
Share of land in agriculture	-0.555***	0.157	0.279	-0.105	0.169	0.303	1404
Log irrigated area	0.174	0.431	0.541	0.445	0.508	0.542	1402
Log livestock	-1.168*	0.595	0.183	-1.125*	0.623	0.183	1403
FLFP	-0.084	0.055	0.146	-0.036	0.078	0.146	1404
Length of growing season	-0.18	0.41	0.807	-0.253	0.461	0.807	1404
Number of droughts	0.022	0.388	0.659	0.404	0.326	0.661	1403

Note. This table shows the correlation between individual-level characteristics (top) and community-level characteristics (bottom) with exposure to the radio program. Column (1) reports the coefficients from ordinary least squares (OLS) regressions of each variable on actual signal strength. Column 4 adds controls for hypothetical signal strength in free space. All models include controls for elevation, terrain ruggedness, survey wave, and district FEs. The sample consists of women from the DHS survey waves of 2000, 2004, and 2010 (top), and, respectively, the surveyed clusters from these waves (bottom). For individual outcomes of education, first marriage, first intercourse and number of siblings we limit the sample to women aged 18 and above in 1995. Standard errors are clustered at the community level for individual outcomes and district level for community level outcomes. Significance levels are denoted as follows: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01.

Event study specification. By combining the temporal shift of the democratic transition with exogenous variation in signal strength, we apply a DiD design to identify the effect of promoting small families, comparing the fertility choices of the same women before and after the radical change in the government's position concerning family size, across those living in areas with stronger or weaker signals. Since identification relies on within-woman variation, our main sample is restricted to women who contribute observations both before and after the change in narrative—that is, women who were at least 15 years old at that time.

In detail, we focus on the probability of giving birth, measured at the mother-year level, utilizing quasi-panel data constructed from retrospective birth histories (see Section 2.2). The outcome variable $birth_{icw,t}$ is a dummy variable equal to one if a woman i, surveyed in community c, in survey wave w, gave birth in the year t, and zero otherwise. We estimate the effect of a change in government-backed

narratives using the following specification:

$$birth_{icw,t} = \sum_{\tau=-a}^{a} \gamma_\tau D_\tau \cdot S_c + \sum_{\tau=-a}^{a} \gamma_\tau^f D_\tau \cdot S_c^f + \mu_i + X'_{icw,t}\lambda + \mu_t + \mu_w + \epsilon_{icw,t} \quad (1)$$

where the DiD estimates are given by γ_τ, which capture the interaction effect of S_c with D_τ, a set of year indicator variables (excluding the period during which the narrative changed). These interactions allow for capturing the varying effects of S_c on a yearly basis to assess the dynamic impact of being exposed to state radio over time, while expecting no effect in the pre-change period. While the (conditional) exogeneity of the signal strength tested in Table 1 reinforces our identification strategy, equation (1) does not rely on such a property but on parallel trends, i.e., women in areas with stronger or weaker signals would have had the same fertility patterns in the absence of a change in family size narratives.

The remaining terms in the equation aim to capture potential differences arising from non-parallel trends. First, we include interaction terms between S_c^f and D_τ, which capture trends in fertility in areas that would have been exposed to stronger or weaker signals in the absence of any topographic obstacles. This term, similar to the prevalent cross-sectional approach in the literature, captures trends in fertility in areas that would have been targeted by policymakers for radio coverage, such as those with larger populations, greater urbanization, or areas that demanded tighter information control. Second, we control for individual characteristics by conditioning on woman fixed effects (FEs), μ_i, capturing potential time-invariant sources of unobserved heterogeneity across women, and on time-varying women's characteristics, $X'_{icw,t}$, including age and age squared, as well as flexible controls for women's year of birth (grouped in four-year bins) interacted with district indicators and year t. In Section 4.2, we also consider less restrictive specifications that replace woman FEs with community FEs or district FEs. In this case, $X'_{icw,t}$ includes time-invariant individual and community characteristics.[14] Importantly, woman or community FEs capture all cross-sectional determinants of signal strength, including those presented in Table 1. Finally, we control for time effects by conditioning on year FEs, μ_t, and survey-wave FEs, μ_t, thus capturing unobserved determinants of fertility that are specific to a year or a survey wave. The error term $\epsilon_{i,t}$ is assumed to be clustered at the community level.[15]

In the tables, we pool the post-transition observations and provide a single estimate that captures the overall effect during this period. In this case, we estimate a version of equation (1) that includes baseline signal strength S_c and free-field coverage S_c^f, as well as their interactions with an indicator variable $post_t$ for whether the period t is after the transition (i.e., $S_c \times post_t$ and $S_c^f \times post_t$).

As standard in the media literature, estimates are interpreted as intention-to-treat (ITT) effects since S_c captures the probability of listening to radio broadcasts rather than whether the respondent actually listened to the show, which depends on radio ownership and the ability and willingness to listen to the

[14] Individual-level controls include years of education, number of siblings, and indicator variables for the ethnic group and religion. Community controls include an indicator variable for the urban/rural status of the community, as well as the average elevation and terrain ruggedness of the community.

[15] Appendix B.10 shows the robustness of the main estimates to estimating equation (1) using survey weights. DHS sampling weights are normalized within each survey wave to restore representativeness for that wave's target population (USAID, 2012). Consistent with Solon et al. (2015), we rely on unweighted regressions in our baseline specification because our focus is on causal identification rather than descriptive inference.

specific programs. In our setting, radio ownership was particularly high at that time, and listenership was even higher, indicating that people would either share radios or listen to the radio in groups (Section 2.2). Thanks to data on the listenership of specific programs (see Section 2.2), we provide direct evidence on the relationship between S_c and listenership in Section 4.1.

Pooled cross-section. For the outcomes that are observed only after the democratic transition, such as listenership, fertility preferences, and family planning (see Section 2.2), we cannot estimate equation (1) because we lack pre-intervention observations. Instead, we investigate the effects on these outcomes using a pooled cross-section of surveyed women. In this case, we follow the media literature more directly and achieve causal identification solely from the cross-sectional randomness (conditional on propagation controls) of S_c, rather than combining it with temporal variation, as in equation (1). We estimate the following specification:

$$Y_{icw} = \gamma S_c + \gamma^F S_c^f + X'_{it(c)}\lambda + \mu_w + \epsilon_{icw} \tag{2}$$

where the variables are the same as in equation (1). In this case, the parameter of interest γ captures the effect of being exposed to state radio during the period when modernization narratives are prevalent in radio broadcasts. By comparing this equation with equation (1), we can highlight the main interpretative differences of their respective estimates. Equation (1), being longitudinal in nature, allows for the estimation of the effect of the change in national radio content between the periods before and after the democratic transition. By contrast, equation (2) estimates the effect of being quasi-randomly exposed to the new modernization narratives in the post-transition period, without explicitly netting out any pre-transition differences.

4 Results

We proceed in two steps. First, in Section 4.1, we establish the relationship between the signal quality of state radio and the listenership of content related to family planning. Second, in Section 4.2, using the event study specification described in Section 3, we show how exposure leads to changes in birth probability. We discuss the mechanisms behind our results in Section 5.

4.1 Actual exposure to modernization narratives

We begin by studying the relationship between exposure to state radio and actual exposure to the modernization narrative. We proxy the latter using listenership of programs promoting this narrative and broadcast on state radio. As discussed in Section 2.2, the survey records whether respondents listened to these specific programs, a unique advantage relative to most of the media literature, which typically lacks realized program-level listenership. Examining this relationship clarifies how variation in signal quality translates into differences in narrative exposure. These listenership regressions should not be interpreted as a first stage in a LATE framework, but rather as validation that stronger radio signals increased the

reach and intensity of narrative dissemination. As is standard in the media literature, listenership measures capture only part of true exposure because they omit frequency, attention, group listening, and indirect diffusion, thus providing lower bounds on narrative reach. Accordingly, the estimates presented in the following sections represent reduced-form ITT effects of living in areas where the modernization narrative was more widely and reliably broadcast.

In Table 2, we analyze different indicators of listenership using information on whether a woman reported having listened to at least 1 of the 15 specific programs broadcast on state radio and included in the selected survey waves. Panel A focuses on the sample of women, while panel B analyzes men. Because women are the main focus of the survey, the sample of men is significantly smaller, and only one third of households are randomly selected for interviews of male members. In addition, because programs are broadcast only after the 1994 transition, we can estimate the effect of signal strength only in the repeated cross-sectional sample using equation (2). As discussed in Section 3, this approach allows for estimating the effect of exposure to stronger signal strength during the post-transition period.

Columns (1)–(3) focus on individual-level responses, using an indicator variable for whether the respondent listened to at least one of the programs as the outcome variable. Column (1) includes all respondents, while columns (2) and (3) restrict the sample to respondents in early reproductive age (15–35 years old) and in later reproductive age (36–49 years old), respectively. In column (4), we aggregate this variable at the community level, focusing on the share of respondents in a community who listened to at least one of the programs. Columns (5)–(7) focus instead on indicator variables for whether more than 70%, 80% or 90% of the respondents in the community listened to at least one of the programs. This indicator is informative given the prevalence of group listening among women (see Section 2.2), even if group listening is not directly observed.

On average, 72.0% of women listened to at least one of the programs throughout the three survey waves. In addition, we observe that in 56.3% of communities, more than 70% of women listened to at least one of the programs, and in 14.3%, more than 90% of women listened. Listenership among men is higher compared to that of women, with 90.1% of all men reporting having listened to at least one of the programs. Similar results apply to community-level indicators, with 63.5% of communities where more than 90% of male respondents reported having listened to at least one of the programs. A higher listenership among men is unsurprising, as they typically exercise greater control over household assets and media access. In many Malawian households, ownership and use of the radio, as well as decisions about listening time, are male prerogatives (UNESCO, 2012). Nevertheless, these statistics alone highlight the uniqueness of the Malawian setting, as the reach of these programs was extremely large, whereas listenership tends to be lower in the media literature.[16]

Among women, exposure to higher quality broadcasts significantly impacts all the listening dimensions. Going from weak to strong signals increases the probability of a woman listening to at least one of the programs by 10.0 percentage points across all women, by 9.5 percentage points among women aged 15-35, and by 11.9 percentage points for women aged 36-49. These effects correspond to increases

[16]Data on the listenership of specific programs is rare in the media literature. Other studies focus instead on radio ownership or subscriptions as proxies for listenership (e.g., Yanagizawa-Drott, 2014; Adena et al., 2015).

of 13.9%, 13.1%, and 17.0%, respectively. In addition, we find significant effects of 11.0 percentage points in the share of women in the community who listened to the program, 35.2 percentage points in the probability that more than 80% of women in a community listened, and 29.9 percentage points in the probability that more than 90% of women in a community listened. These patterns indicate that exposure to state radio is highly clustered within villages, consistent with mechanisms operating through community-level norm change in addition to individual-level effects. The results also suggest that group listening may represent an important channel for program exposure, potentially magnifying the impact of broadcasts by stimulating discussions within communities.

Among men, we observe only a very small and statistically insignificant effect of exposure, suggesting that exposure to higher quality broadcasts has no effect on the probability of men listening to content related to family planning. This finding can be explained by several interacting mechanisms. First, men's baseline listenership is already high, leaving limited room for variation across areas (i.e., a ceiling effect). Second, women are more likely to listen in groups or organized listening clubs, where the collective experience depends critically on signal clarity and audibility. Poor reception can disrupt group meetings and discourage attendance, whereas strong signal quality enhances both the listening experience and the perceived social value of such gatherings. Third, lower spatial mobility among women, due to domestic responsibilities and social norms (Kishindo, 1995), makes their exposure more dependent on signal quality at their home location, while men's higher mobility may buffer them against local reception constraints. Finally, gender differences in time use and media preferences could make women more responsive to variations in program audibility and accessibility. For instance, women's listening might occur while multitasking, making higher-quality signals a stronger determinant of attention compared to men, whose listening could be more deliberate.

Overall, these results indicate that after the transition, random variation in the signal strength of state radio is indeed an important determinant of female exposure to modernization narratives, both at the individual and community levels, in a context where men's exposure is nearly universal. An asymmetry in radio listenership between women and men is an important feature of any intervention aimed at influencing fertility decisions, particularly in a context like Malawi, where decision-making power within households is strongly imbalanced in favor of men (see Section 1). As highlighted in the literature (e.g., Doepke and Kindermann, 2019), contraceptive and reproductive choices often emerge from negotiation between partners, with outcomes reflecting both relative bargaining power and the information each partner brings to that process. Although women's ability to act on their preferences is constrained because men typically control household resources and decisions regarding marriage, contraception, and childbearing, information targeted at women can still be pivotal. By shifting women's beliefs about the costs and benefits of childbearing and strengthening support for smaller families within their peer networks, greater female exposure to modernization messages can alter the bargaining environment inside the household. In such settings, interventions that disproportionately reach women can be consequential, as they target the partner who bears most of the costs of childbearing. As a result, increased female exposure raises the likelihood that these preferences are reflected in realized fertility choices.

Table 2: Exposure to state radio and actual exposure to modernization narratives

	Individual-level listenership			Community-level listenership			
Dependent variable:	Respondent listened to any FP program			Listenership share	Share $> 70\%$	Share $> 80\%$	Share $> 90\%$
Sample:	All respondents	Early reproductive age (15–35)	Later reproductive age (36–49)	All respondents	All respondents	All respondents	All respondents
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. Women (15–49 years old)							
Exposure	0.100**	0.095**	0.119*	0.111**	0.210	0.352**	0.299***
	(0.043)	(0.044)	(0.069)	(0.044)	(0.148)	(0.137)	(0.096)
Sample mean	0.7196	0.7257	0.6991	0.7199	0.5634	0.3397	0.1425
R^2	0.0846	0.0861	0.0914	0.3380	0.2278	0.2155	0.1664
Communities	1,404	1,404	1,383	1,404	1,404	1,404	1,404
Observations	34,384	26,528	7,856	1,404	1,404	1,404	1,404
B. Men (15–49 years old)							
Exposure	0.031	0.031	0.035	0.020	-0.054	-0.048	0.006
	(0.044)	(0.048)	(0.081)	(0.052)	(0.093)	(0.123)	(0.158)
Sample mean	0.9050	0.9027	0.9134	0.9045	0.9012	0.7881	0.6349
R^2	0.0819	0.0758	0.1300	0.1232	0.1024	0.1010	0.0944
Communities	1,397	1,375	1,101	1,397	1,397	1,397	1,397
Observations	9,960	7,257	2,193	1,397	1,397	1,397	1,397

Note. Estimates are based on equation 2. Panel A includes all female respondents, while panel B focuses on male respondents. *All respondents* includes respondents aged 15–49 from three DHS waves (2000, 2004, and 2010). *Early reproductive age* refers to respondents aged 15–35, and *later reproductive age* to respondents aged 36–49. All columns include wave FEs, free-field coverage, and individual- and community-level controls. The full list of controls is provided in Section 3. The dependent variables are: (1)–(3) an indicator for whether the respondent reported having listened to any of the 15 family planning programs broadcast on MBC in recent months; (4) the community-level average of the same indicator; (5)–(7) indicator variables equal to one if the community-level share exceeds 70%, 80%, or 90%, respectively. Standard errors, clustered at the community level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Appendix A provides additional details about the variables.

4.2 Fertility decisions

Having established a direct link between exposure and listenership, we focus on the effects of fertility decisions. As discussed in Section 3, we rely on equation 1 applied to pseudo-panel data.

Table 3 displays the estimates from equation 1, where we consider two periods (i.e., before and after the change in narratives). The coefficient on the interaction term between exposure and the indicator variable for the periods after the change identifies the effect of changing government-backed narratives in favor of smaller families on the annual probability of giving birth. Columns (1)–(3) consider all women-years, while columns (4)–(6) restrict the sample to only those years following a woman's marriage. Restricting the panel to years following a woman's first marriage allows for mitigating concerns about marital migration, since many women in Malawi move residence at marriage under patrilocal arrangements, and to analyze effects that could operate through the postponement of marriage and the first birth. In addition to survey wave and year FEs, common across specifications, we present alternative combinations of controls that capture individual and community characteristics. Columns (1) and (4) include controls for individual characteristics and community characteristics, columns (2) and (5) include controls for individual characteristics and community FEs, and columns (3) and (6), our preferred specification, include woman FEs, thus controlling for any time-invariant differences between women residing in areas with stronger or weaker signals.

Focusing on our preferred specification for all women, column (3), we find that, after the shift in family size narratives, women in their early reproductive years exposed to stronger signals were 6.7 percentage points less likely to give birth in a given year. This effect is substantial relative to the average probability of 24.1% and corresponds to 1.34 fewer children over a 20-year period.[17] The coefficient is stable across specifications with less demanding FEs, indicating that controlling for free-field radio propagation is sufficient to address potential bias. In addition, estimates are also robust to alternative sample restrictions concerning the recall period and the use of survey weights (Appendix B.10). The estimated effects are stable when including the non–Chichewa-speaking districts (Appendix B7), though slightly attenuated in magnitude. When restricting the analysis to those districts alone (Appendix B7), the effects are small and statistically insignificant, which is consistent with the limited take-up of Chichewa-language broadcasts in those areas.

Restricting the sample to women-year observations after marriage, the effect size is smaller, equal to a 3.5–percentage-point reduction in the annual probability of giving birth. This result implies that roughly half of the overall effect operates through delays in marriage and the first birth, consistent with findings based on census data that we present in Section 5.1. Appendix Table B7 extends the analysis to include later reproductive years. When the full sample of woman–year observations is considered, the estimated effect remains detectable but is smaller in magnitude. Once the analysis is restricted to years after the first marriage, however, the effect becomes statistically insignificant. Taken together, these results indicate that fertility reductions are concentrated among younger women and that a substantial part of

[17] Over 25 years, the reduction corresponds to 1.73 children. For comparison, Rossi and Godard (2022) find that a pension reform in Namibia reduced the annual probability of giving birth by an amount equivalent to 3 fewer children over 25 years.

the effect is driven by delayed entry into marriage and motherhood.

Table 3: The effect on fertility decisions

	Dependent variable: gave birth at time t					
	All women-years			Restricted to post-marriage years		
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure × post	-0.068***	-0.051***	-0.067***	-0.036**	-0.033**	-0.035**
	(0.013)	(0.016)	(0.014)	(0.015)	(0.015)	(0.016)
Sample mean	0.2412	0.2412	0.2412	0.2845	0.2845	0.2845
R^2	0.0326	0.0407	0.0900	0.0161	0.0230	0.0719
Communities	1,403	1,403	1,403	1,402	1,402	1,402
Observations	242,982	242,982	242,982	172,397	172,397	172,397
Community controls	✓			✓		
Community FEs		✓			✓	
Woman FEs			✓			✓

Note. The dependent variable is a binary indicator equal to one if the respondent gave birth at time t, and zero otherwise. Estimates are based on equation 1. All specifications include survey wave and year (t) FEs and individual controls. In columns (3) and (6), the woman FEs absorb time-invariant controls. The full list of controls is provided in Section 3. The variable *post* indicates years after 1995. All specifications control for the interaction between free-field coverage and the post-1995 period; free-field coverage itself is also included directly in columns (1) and (3), where it is not absorbed by FEs. The sample includes women aged 15–35 at time t, and is further restricted to years after first marriage in columns (4)–(6). Data span up to 20 years of retrospective birth histories from the 2000, 2004, and 2010 DHS waves, covering the period 1980–2009. The year of data collection is excluded from the sample in each wave. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Appendix A provides additional details about the variables.

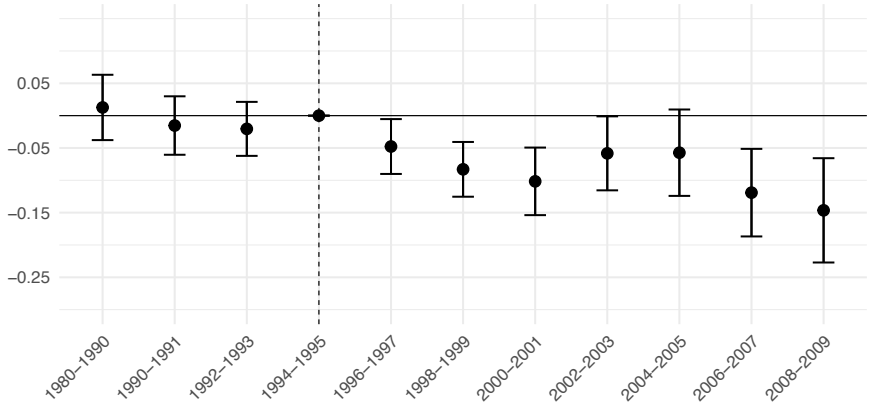
The estimated reduction of 6.7 percentage points in the annual probability of giving birth associated with stronger exposure to the state radio may appear large at first glance, but it is consistent with the scale, persistence, and social diffusion of the modernization narrative. As discussed in Section 3, this magnitude should be interpreted as an ITT effect of living in areas where the narrative was more intensively disseminated, rather than as a per-listener treatment effect. Reported female listenership of these programs rose by about 9–10 percentage points at the individual level between weak- and strong-signal areas, with large increases in the upper tail as the share of communities in which more than 80 percent of women listened rose by 35 percentage points (see Section 4.1). These figures confirm that exposure was highly concentrated and locally clustered, reinforcing the spread of the new norms. However, listenership is a noisy and incomplete measure of true exposure: it captures neither frequency nor attention, omits group listening and community discussions, and excludes indirect spillovers through non-listeners who internalize the same narratives. Moreover, the average listenership rate among women was already high, so the realistic variation induced by radio coverage reflects a shift from moderately to nearly universal exposure, not from zero to one. Consequently, the estimated reduction in annual birth probability represents the cumulative impact of a substantial, long-term increase in narrative intensity in a near-saturated media environment, amplified by social learning and intra-household diffusion. Interpreting the estimate as an area-level effect of narrative saturation rather than an individual-level response reconciles its apparent size with plausible behavioral mechanisms and aligns it with existing evidence.[18]

Figure 6 presents estimates and 95% confidence intervals using equation (1), thus showing the time

[18] Sizeable effects are not rare in the literature. For instance, Jensen and Oster (2009) find that the introduction of cable television reduced the annual increase in the number of children by 0.09 (out of a mean of 0.14), and by 0.14 among women aged 35 or younger (out of a mean of 0.21), corresponding to effects of roughly 64–67 percent over the mean.

structure of effects. We pool cohorts into groups of two years due to sample size limitations. The omitted category is the indicator for the years 1994-1995. First, we observe no evidence of a pre-trend, as conditional birth probabilities before the narrative change do not significantly differ across areas with stronger or weaker signals. In the years following the narrative change, we find that stronger signals lead to significant decreases in the annual probability of giving birth. The effect becomes more pronounced over time, reaching -9.4 in 2000–2001, before stabilizing. These dynamics suggest a short delay between exposure and behavioral change, even accounting for a 9-month pregnancy lag. The gradual buildup of the effect over several years is consistent with the diffusion of new family norms, whereby initial exposure to the state narrative progressively altered shared beliefs and expectations about fertility.[19]

Figure 6: The effect on fertility decisions over time



Note. The dependent variable is a binary indicator equal to one if the respondent gave birth at time t, and zero otherwise. Estimates and 95% confidence intervals are based on equation 1, where interactions are defined for each period, pooling years t and $t-1$ to increase precision. The omitted category is 1994–1995, the last period before MBC began broadcasting family planning programs. All specifications include the interaction between free-field coverage and period dummies. The sample and set of controls correspond to column (3) of Table 3. Controls include survey-wave and year FEs, woman FEs, and individual-level controls. Individual controls not absorbed by woman FEs include age squared and flexible controls for woman's year of birth (grouped in four-year bins) interacted with year t. The full list of controls is provided in Section 3. The sample includes women aged 15–35 at time t. Data span up to 20 years of retrospective birth histories from the 2000, 2004, and 2010 DHS waves, covering the period 1980–2009. The year of data collection is excluded in each wave. Standard errors are clustered at the community level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Additional details on variable definitions are provided in Appendix A.

Narratives versus other reforms. Although it is reasonable to believe that exogenous exposure to stronger or weaker signals of the state radio is unrelated to other nationwide reforms that characterized the democratic transition, in principle, exposure may be correlated with access to formal health or education infrastructure. For example, areas with better (or steeper growth) of facility access might also be more likely to receive improved radio coverage, potentially confounding the estimated effects.

In our identification strategy, as discussed in detail in Section 3, controlling for community or women FEs should capture this possibility. Nevertheless, we provide evidence supporting the role of a changing narrative about the family as the main driver of the effects on fertility, excluding increased access to education and contraceptive services as alternative channels. We compiled additional data on the location and establishment year of health facilities from Ministry of Health of Malawi (2025), as well as on educational facilities from HOTOSM (2025). As data on educational facilities are only available as of 2020,

[19] Appendix Figure B.10 replicates Figure 6 by restricting the panel to 10 years of retrospective data, uncovering a similar pattern of effects.

we also build a proxy for pre-transition access to education by computing the share of women above 15 years old at that time who completed primary school. A similar proxy for access to health care is constructed from the share of institutional deliveries. However, because this information is only recorded for births in the five years preceding each survey, it cannot be used to recover community-specific levels prior to the transition. We, therefore, use the average share of institutional deliveries observed in the DHS waves as a proxy for general access to healthcare.

Columns (1)–(3) in Table 4 provide estimates of the effect on fertility decisions, analogous to those in Table 3, but additionally include interaction terms between pre-transition access measures and a post-transition binary indicator. These estimates can, therefore, be interpreted as DiD estimates of the effect of supply-side reforms targeting education and health.

In all cases, the coefficient on exposure to state radio is unaffected, suggesting that the estimated impact of radio campaigns does not simply reflect contemporaneous improvements in contraceptive and educational supply, even though these reforms could have played a role in shaping fertility decisions. Column (1) shows that areas with better access to education before the transition experienced larger fertility declines, which is consistent with the education reform lowering the cost of education and thereby altering the incentives to give birth. This result is consistent with access increasing in areas where schools already existed before the school reform took effect, as the reform did not involve any major school construction plans. Likewise, pre-transition health supply matters. In column (2), we show that in the post-transition period, a greater distance to facilities leads to higher fertility, whereas, in column (3), a higher share of institutional deliveries reduces fertility. The latter result should be interpreted with caution because the location of births might have been influenced by the radio programs. Additional evidence also points to no effect of state radio on the presence and expansion of health and education infrastructure, suggesting that radio coverage, conditional on the set of propagation controls and FEs, is not systematically related to infrastructure access, reinforcing the plausibility of our exogeneity assumption.[20]

We provide additional evidence that excludes the role of reforms in confounding our estimates. First, urban areas might have benefited from increased access to services or from the liberalization reforms. In this case, our results might be confounded by fertility changes specific to urban areas after the transition. Although all baseline specifications in Table 3 control for urban status and free-field coverage, in columns (4)–(6) of Table 4, we estimate equation 1 on three samples that progressively exclude urban areas. In column (4), we exclude communities classified as urban by the Malawi National Statistics Office. In column (5), we restrict the sample to communities located more than 10 km from a city with at least 10,000 inhabitants as of 1990. Finally, in column (6), we restrict the sample to communities located at least 25 km away. Across these rural sub-samples, we continue to observe a significant effect on the probability of giving birth, ruling out the possibility that the results are urban-specific.

[20] In Appendix B.7, we estimate models in which the dependent variable is either the distance to the nearest health facility or school, or a binary indicator of whether a facility is located within 5 km of a community. For health access, we can also estimate a panel version to assess whether radio coverage is linked to the expansion of formal infrastructure over time. In none of these cases does exposure to state radio predict either the presence or the expansion of infrastructure.

Table 4: The effect on fertility decisions – excluding the influence of reforms and supply-side factors

	Dependent variable: gave birth at time t							
	Controlling for access to services			Exclude urban areas			Exclude targeted areas near radio antennas	
	Education	Health services		Rural	Distance from city		Distance from antenna	
					≥10km	≥25km	≥10km	≥25km
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure × post	-0.062***	-0.057***	-0.061***	-0.059***	-0.064***	-0.058***	-0.063***	-0.064***
	(0.014)	(0.014)	(0.014)	(0.015)	(0.016)	(0.020)	(0.015)	(0.017)
Share completed primary school × post	-0.018**							
	(0.007)							
Distance to health facility × post		0.009***						
		(0.002)						
Share institutional deliveries × post			-0.027***					
			(0.008)					
Sample mean	0.2412	0.2412	0.2412	0.2485	0.2483	0.2509	0.2457	0.2498
R^2	0.0867	0.0868	0.0868	0.0838	0.0834	0.0817	0.0849	0.0834
Communities	1,398	1,403	1,403	1,159	962	632	1,192	805
Observations	242,399	242,982	242,982	207,465	170,973	111,901	210,058	140,853

Note. The dependent variable is a binary indicator equal to one if the respondent gave birth in year t, and zero otherwise. Estimates are based on equation 1. *Share completed primary school* refers to the share of women in the community above age 15 in 1995 who had completed primary education. *Distance to health facility* is log-transformed, refers to health facilities existing in 1995, measured using the registry described in Section B.7. Institutional deliveries are measured for each birth in the five years preceding each survey and averaged at the community level. The sample and set of controls correspond to column (3) of Table 3. Controls include survey-wave and year FEs, woman FEs, and individual-level covariates. Individual covariates not absorbed by woman FEs include age squared and flexible controls for woman's year of birth (grouped in four-year bins) interacted with year t. The full list of controls is provided in Section 3. The sample includes women aged 15–35 at time t, with restrictions applied in specific columns: column (4) excludes communities classified as urban by the National Statistical Office; column (5) excludes communities within 10 km of a city of at least 10,000 inhabitants; column (6) excludes communities within 25 km of such cities; column (7) excludes communities within 10 km of an MBC antenna; and column (8) excludes communities within 25 km of an MBC antenna. Data span up to 20 years of retrospective birth histories from the 2000, 2004, and 2010 DHS waves, covering the period 1980–2009. The year of data collection is excluded in each wave. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Second, another concern relates to the fact that the transmitters of the state radio might have been strategically located in areas of particular interest to the government, which could have also developed post-transition effects independently of exposure to state radio. Our preferred specification includes woman-specific FEs, which absorb time-invariant characteristics that could have influenced transmitter placement. Nevertheless, in columns (7)–(8), we further address this concern by estimating equation 1 after excluding communities located within 10 or 25 km of a transmitter. Restricting identification to variation in exposure farther from transmitters still yields statistically significant estimates, suggesting that the results are not driven by the strategic placement of radio antennas.

Additional robustness check. In Appendix B.8, we provide evidence from a placebo permutation test that the effect on fertility decisions is unlikely to be observed under random assignment. In this procedure, we randomly assign the treatment across the sample over 100 iterations, each time estimating the model to generate a distribution of treatment effects under the null hypothesis of no true effect. The p-value associated with our estimate is 0.038, indicating that the probability of obtaining an effect at least as extreme as the observed one under the null hypothesis is below 5%.

5 Mechanisms

5.1 Completed fertility and timing of birth

We have shown that exposure to modernization narratives on state radio reduced the probability of giving birth at early reproductive ages. We now examine the different margins of fertility adjustments and the ultimate effect on completed fertility, i.e., the total number of children ever born. This serves two goals. First, to test whether the early-age decline in fertility cumulates in a lower total number of children over the life course. Second, to assess timing adjustments by estimating the effects on the age at first birth and the age at first marriage.

While DHS data provide full birth histories, they are less suited to measuring completed fertility. Studying completed fertility requires data on fertility outcomes for women who have reached the end of their reproductive years, both before and after the transition.[21] We, therefore, construct completed fertility outcomes from population censuses (1987, 1998, 2008, 2018), using the 10% IPUMS-International samples for each wave (Ruggles et al., 2025), restricting the analysis to women who report having ever been married. Appendix Figure B5 illustrates the age structure across each wave.

We implement a cohort version of equation (1) that leverages the cohort-varying exposure created by the narrative shift following the democratic transition. Because women were at different points in their reproductive lives when small family narratives emerged on state radio, cohorts accumulated varying amounts of exposure during their fertile years. For illustration, a woman born in 1960 (age 35 in 1995) experiences roughly 15 of her approximately 35 reproductive years under the new regime, whereas a woman born in 1980 (age 15 in 1995) would experience virtually her entire reproductive span. In this

[21] The sampling criteria in DHS target women of reproductive age (15–49), with few observed at the end of the reproductive period. Furthermore, the first geo-referenced survey wave for Malawi is only available from the year 2000.

specification, the time indicator is the birth cohort, defined by women's age at the beginning of the campaign in 1995 and binned into 4-year intervals (equivalently, by year-of-birth bins). We consider women aged 43–46 in 1995 as the reference category, for whom fertility is plausibly complete. Similar to equation (1), we control for location- and age-specific effects and estimate a separate coefficient for each cohort group in a dynamic DiD setting. Importantly, for census-based outcomes, exposure and controls are measured at the administrative level 2 (Traditional Authorities) rather than at the exact geolocation of the community, limiting the variation to 198 points. This coarser spatial aggregation reduces cross-sectional variation in exposure to signal strength relative to the previous analysis, a property that should be taken into consideration when comparing estimates across the two sources.

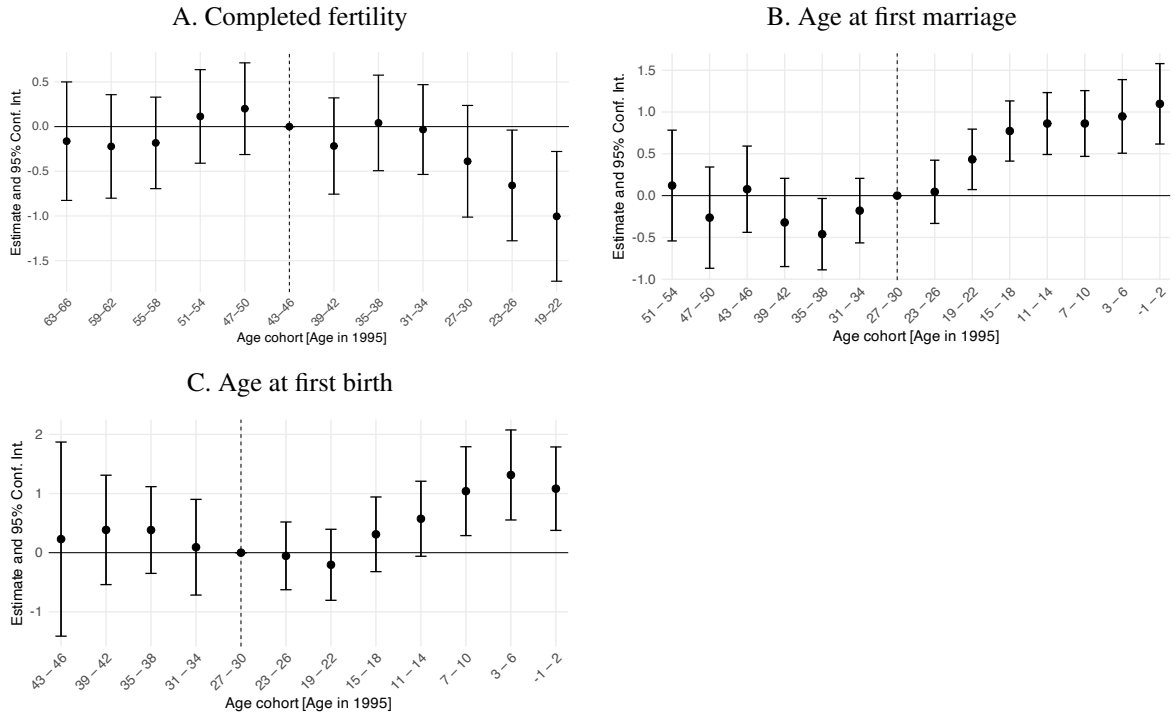
Figure 7 summarizes the results, with panel A focusing on completed fertility, panel B on age at first marriage, and panel C on age at first birth. Panel A shows that annual reductions in birth probabilities accumulate into lower completed fertility. We restrict the sample to women aged 45 and older at the time of the census interview, i.e., at the end of their fertile period, to ensure completed fertility. Results indicate that cohorts exposed to the modernization narratives during their early reproductive years have fewer children by the end of childbearing. Women who were 19–22 have about one fewer child, significant at the 1% level. For the 23–26 group, lifetime fertility falls by 0.66, significant at the 5% level. We find no systematic differences in completed fertility by exposure among older cohorts; the non-significant estimates for the 31–42 cohorts suggest that effects are concentrated earlier in the reproductive window and are not driven by early stopping of childbearing.

We then consider the timing of family formation in panels B and C. In Malawi, the cumulative probability of marriage approaches unity by age 25 (Appendix Figure B5). Therefore, we restrict our analysis to women aged 25 and older, as marriage is nearly universal. Age at first marriage is observed only in the 2008 and 2018 census waves. For all four waves, we proxy age at first birth as a woman's age minus the age of her oldest co-resident child. To limit measurement error from children who have left the household, analyzes using this proxy further restrict the sample to women aged 25–35, who are old enough to have formed families but are still likely to live with their oldest child.

Panels B and C in Figure 7 reveal that cohorts who were adolescents or young adults at the time of the narrative change (i.e., those exposed before forming unions) show delays in both the age at first marriage and the age at first birth. Estimates for age at first marriage are positive and significant for cohorts aged younger than 23 in 1995, ranging from roughly half a year for the age group 19-22 to around a year for age groups younger than 19 years in 1995. Similarly, we observe an increase in the age at first birth of roughly a year for cohorts younger than 10 years old in 1995.

The pattern of results is consistent with the findings reported in Table 3, which highlights that the effects are driven by women in their early reproductive years. Together, these results suggest that delaying marriage and, hence, the first birth is a mechanism through which the reduction in fertility is achieved.

Figure 7: Effects on completed fertility, and age at first marriage and first birth



Note. Each panel reports estimates from a cohort version of equation (1), which exploits variation in exposure across cohorts who were at different stages of their reproductive lives when the state began promoting modernization through radio broadcasts. Estimates include location and age fixed effects and exposure is computed using census-based geographical indicators at the level of 198 Traditional Authorities (administrative level 2). Data and estimation procedure are detailed in Section 5.1. The vertical line marks the reference group of women close to completed fertility at treatment time in panel A, and women after family formation in panels B and C. Appendix A provides additional details about the variables.

5.2 Preferences versus beliefs

We investigate the channels through which the state-led content promoted on national radio may have contributed to a reduction in fertility. In line with Section 1, we consider two complementary channels. First, a preference-based channel in which the state radio altered preferences regarding family size and planning, even while holding knowledge constant. Because many of the modernization messages aimed to redefine what was socially acceptable or desirable within the family, this channel also encompasses shifts in family norms, not only in individual preferences. Second, a belief-based channel in which exposure to state radio corrected information frictions, such as misperceptions about contraceptive methods, uncertainty about where to obtain them, or exaggerated fears of side effects that could have prevented individuals from achieving their preferred family size.[22]

We provide evidence on these mechanisms by examining self-reported behaviors and attitudes related to fertility and family planning to infer which channels were more likely to have driven the documented reductions in fertility. To evaluate these channels in turn, we exploit cross-sectional variation in radio signal strength, together with repeated cross-sectional measures of attitudes and beliefs, as specified in equation (2). In line with Section 4.1, identification comes from exogenous variation in radio signal strength in post-1995 repeated cross-sections.

Preference-based channel. Table 5 focuses on fertility preferences and behaviors related to family planning. Columns (1)–(2) analyze the self-reported ideal number of children and the share of boys, respectively. Column (3) analyzes whether the respondent is sexually active, whether she has discussed family planning with her partner, and whether she uses any contraceptive methods.

We begin by focusing on preferences. On average, women reported an ideal number of children as 3.9 (lower than the actual fertility rate; Section 2.2), and did not exhibit a strong son preference, as they reported wanting 45% of their children to be boys, with the remainder preferring girls or not having any sex preference. Results reveal meaningful shifts in preferences and family planning behavior. Going from low to high exposure leads to a reduction of 0.32 in the ideal number of children. Interestingly, this decrease in desired fertility is primarily driven by a decline in the preferred number of sons, suggesting that the change in narrative may not only have influenced overall fertility preferences but also preferences regarding the sex composition of children.

The changes in fertility preferences appear to have translated into concrete changes in family planning behavior. On average, 78.2% of respondents were sexually active, but only 12.1% discussed family planning with their partners, and only 37.0% utilized any contraceptive methods. While we do not observe any effect on the probability of being sexually active, we find significant effects on the probability of discussing family planning with a partner and on the probability of using contraception. Going from weak to strong signal strength leads to an increase of 7.9 percentage points in the probability of discussing family planning (an increase of 65.3% over the sample mean) and an increase of 8.8 percentage points

[22] While programs varied in their relative informational and persuasive content, we cannot separately identify the causal effect of listenership to each program because they were all broadcast on the same radio station. Our results should therefore be interpreted as the overall effect of modernization narratives, as portrayed in a composite of multiple programs and content.

in the probability of using any contraceptive method (an increase of 23.8% over the sample mean).

In Appendix B.6, we show results on contraceptive use by type of contraception. The increase in contraceptive use is mostly driven by modern methods. The use of traditional methods also rises slightly, but it is not statistically significant. In addition, the effect is not driven by concealable methods (i.e, those that can be used by an individual without their partner's knowledge or consent), suggesting that women are not hiding their contraceptive decisions but are rather implementing their reduction in desired family size through discussion and negotiation with their partners. This interpretation is consistent with evidence on the effects of exposure on preferences and behavior among men (Appendix B.11). In this sample, we also observe an increase in reported contraceptive use, but it is slightly smaller compared to the estimate for women and is not statistically significant due to the smaller sample. We do not detect any changes in men's fertility preferences or behavior, consistent with the near-universal listenership among men and the limited association between signal strength and listenership in this group.

Relaxing the marital or sexual activity restriction yields similar patterns, with somewhat larger reductions in ideal fertility and son preference, but weaker effects on contraceptive use and family planning discussions (Appendix Table B6). This result suggests that the strongest changes occurred among women exposed within a partnership. Extending the analysis beyond early reproductive ages shows that the effects become weaker once women in later reproductive years are included (Appendix Table B6). For the full sample of women, exposure is still associated with significant but smaller reductions in desired fertility and son preference. When focusing on women in unions or those who are sexually active, the reduction in son preference remains robust, and we also find a positive and significant effect on contraceptive use. However, the effect on the ideal number of children becomes insignificant. These results indicate that the effects documented for women in their early reproductive years are partly offset when older women, who are closer to completed fertility, are included in the analysis.

Table 5: Fertility preferences and family planning

	Preferences		Family planning		
Dependent variables:	Ideal number of children	Ideal share of boys	Discussed FP with partner	Contraceptive use	Sexually active
	(1)	(2)	(3)	(4)	(5)
Exposure	-0.317**	-0.037**	0.079*	0.093**	0.021
	(0.124)	(0.018)	(0.047)	(0.045)	(0.037)
Sample mean	3.928	0.4495	0.1209	0.3699	0.7828
R^2	0.1776	0.0233	0.0266	0.0803	0.0409
Communities	1,404	1,404	786	1,404	1,404
Observations	17,974	17,882	9,924	18,253	18,253

Note. Estimates are based on equation 2. The sample is restricted to women in union or sexually active. All columns include wave FEs, free-field coverage, and individual- and community-level controls. The full list of controls is provided in Section 3. The sample includes women aged 15–35 from three DHS waves (2000, 2004, and 2010) who were reported as married, cohabiting with a partner, or sexually active in the past 30 days. The dependent variables are: (1) the respondent's ideal number of children; (2) the respondent's ideal share of sons, calculated as the ideal number of sons divided by the total ideal number of children; (3) a dummy equal to one if the respondent reports being sexually active in the past 30 days; (4) a dummy equal to one if the respondent reports having discussed family planning with her partner (not collected in 2010); and (5) a dummy equal to one if the respondent is currently using any modern contraceptive method. Appendix A provides additional details about the variables. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Some of these results indicate that exposure could also have influenced female agency. For instance, dramas often portrayed female characters with smaller families, potentially shifting gender norms and fertility choices through role models, as in La Ferrara et al. (2012). Sociological literature analyzing Malawian newspapers over the same period has found that international donors promoted progressive gender norms as part of their modernization agenda (Swindle, 2023). Greater empowerment can translate into lower fertility when women are better able to act on their own preferences. At the same time, the reverse channel is also possible: reduced fertility itself may increase empowerment, as smaller families ease time and financial constraints, enabling women to pursue schooling or work. Therefore, we examine whether exposure to the modernization narratives is associated with changes in women's autonomy and economic empowerment.

Table 6 presents the effects of exposure on women's autonomy and economic empowerment outcomes, disaggregated by age groups. Concerning women's autonomy, we focus on norms related to the rejection of intimate partner violence (IPV) and self-reported autonomy in household decision-making. Concerning economic empowerment, we focus on women's schooling and labor force participation. Panel A examines the effects on our main sample, which is the group most directly affected by reduced fertility, but is no longer of primary schooling age at the time of the transition. To further explore whether education played a role in empowerment gains, panel B focuses on women who were younger than 15 at the time of the transition and were therefore still of school age.

For the main sample (panel A), we find a significant increase of 0.27 standard deviations in the rejection of IPV and of 0.36 standard deviations in decision-making. We do not observe significant effects on primary education completion and on labor market indicators. For the group of younger women (panel B), we observe a significant effect on decision making by 0.56 standard deviations, while the effect on IPV rejection is smaller in magnitude and not statistically significant. We also find no effect on the probability of completing primary education—in line with the limited effects of the schooling reform (see Section 1)—and small labor market improvements, with a 12.7-percentage-point increase in paid employment and an 11.2-percentage-point increase in the probability of working outside agriculture. These results suggest that fertility reductions may have enabled young women to engage in non-agricultural labor, consistent with a decline in the opportunity costs of childbearing.

Taken together, these findings are consistent with a shift in family norms that altered both the meaning of fertility and the distribution of agency within households. The effects on normative and attitudinal outcomes indicate that exposure changed what women perceive as acceptable and legitimate within the family, even in the absence of large gains in schooling or employment. At the same time, the limited effects on economic empowerment suggest that changes in norms can precede or occur independently of improvements in economic opportunities. For younger cohorts, modest labor market gains point to a complementary mechanism: lower fertility can reduce time and resource constraints, enabling women to take up non-agricultural work and reinforcing their bargaining position at home. Overall, the pattern of results is most consistent with a narrative-driven shift in family norms that enhanced women's perceived agency and household voice. Additional empowerment gains appear to arise indirectly through reduced fertility, rather than through broad changes in education or labor markets.

Table 6: Female autonomy and economic empowerment outcomes

	Female autonomy		Economic empowerment			
	IPV rejection score	Decision making score	Completed primary	Currently working	Wage Employment	Non-Farm Employment
	(1)	(2)	(3)	(4)	(5)	(6)
A. Selected women						
Exposure	0.273**	0.362***	-0.024	0.027	0.059	0.023
	(0.109)	(0.085)	(0.044)	(0.021)	(0.058)	(0.052)
Sample mean	-0.0381	-0.2194	0.2312	0.0542	0.3123	0.2513
R^2	0.1178	0.1280	0.1130	0.0949	0.0948	0.0725
Communities	1,404	1,404	1,404	1,404	1,404	1,404
Observations	18,248	17,895	18,253	18,253	18,225	18,252
B. Selected women (aged < 15 in 1995)						
Exposure	0.191	0.559***	0.021	0.035	0.127*	0.122*
	(0.129)	(0.121)	(0.060)	(0.032)	(0.075)	(0.065)
Sample mean	0.0544	-0.1870	0.2712	0.0529	0.3163	0.2425
R^2	0.1285	0.1488	0.0903	0.0966	0.1115	0.0633
Communities	1,324	1,324	1,324	1,324	1,324	1,324
Observations	8,750	8,451	8,751	8,751	8,733	8,750

Note. Selected women includes all women in early reproductive age, sexually active or in union. Estimates are based on equation 2. All columns include wave FEs, free-field coverage, and individual- and community-level controls. The full list of controls is provided in Section 3. The sample in panel A includes women aged 15–35 from three DHS waves (2000, 2004, and 2010) who were reported as married, cohabiting with a partner, or sexually active in the past 30 days. Panel B restricts the sample to women who were younger than 15 years old in 1995 (thus directly exposed to the change in family size narratives during adolescence), with the same restrictions on marital, cohabitation, or sexual activity status. The dependent variables are: (1) *IPV rejection score* (mean $= 0$, s.d. $= 1$), a standardized index built from five DHS items, where higher values reflect the belief that wife-beating is not justified across the following scenarios: going out without telling the husband, neglecting children, arguing with him, refusing sex, or burning food; (2) *Decision-making score*, a standardized index of women's participation in decisions regarding their own health care, large household purchases, and visits to relatives; (3) a dummy equal to one if the respondent completed primary education; (4) an indicator variable equal to one if the respondent is currently working; (5) an indicator variable equal to one if the respondent has been in paid employment over the past 12 months; and (6) an indicator variable equal to one if the respondent has worked outside agriculture over the past 12 months. Additional details about variable definitions are presented in Appendix A. Standard errors are in parentheses and clustered at the community level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Belief-based channel. Even though informational content about reproductive health circulated in mass media during the old regime, broadcasts during the post-transition period also included educational content. As discussed in Section 1, programs disseminated information not only about family planning but also about sexual and reproductive health.

Table 7 shows the results for different outcomes related to knowledge about contraception and family planning. Columns (1)–(2) examine whether the respondents know about modern and traditional contraceptive methods, respectively. Column (3) focuses on whether the respondent can identify the fertile period within the menstrual cycle, while column (4) analyzes whether the respondent knows where to obtain condoms. Columns (5)–(6) analyze common misconceptions about contraceptive methods, such as whether a respondent who is not using any modern method reports being concerned about side effects, and whether the respondent believes that condoms are safe.

Overall, the levels of knowledge of family planning are relatively high, as 61.4% of the sample is aware of modern contraceptive methods, while only 29.2% are aware of traditional methods. At the same time, 79.7% know where to obtain condoms, and 66.0% believe they are safe, while only 9.6% of those not using modern methods do so for fear of side effects. On the contrary, women have relatively low knowledge about their fertility periods, as only 16.9% can identify the fertile days within the menstrual cycle. Results indicate that exposure had no statistically significant effect on any of these variables. These findings suggest that information provision alone may have been insufficient to substantially improve knowledge, especially in light of the relatively high knowledge levels among the target population.

Table 7: Knowledge and beliefs about contraceptive methods and family planning

	Knowledge of contraceptives		Other knowledge indicators			
Dependent variables:	Modern methods	Traditional methods	Identifies fertile period	Can obtain condoms	Side effect concerns	Believes condoms are safe
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure	0.017	-0.014	-0.011	0.041	0.046	-0.033
	(0.024)	(0.030)	(0.039)	(0.048)	(0.031)	(0.068)
Sample mean	0.6137	0.2927	0.1692	0.7965	0.0960	0.6598
R^2	0.1858	0.1285	0.0491	0.0490	0.0314	0.1637
Communities	1,404	1,404	1,404	1,402	1,404	786
Observations	18,253	18,253	18,243	15,575	13,974	9,815

Note. Estimates are based on equation 2. The sample is restricted to women in union or sexually active. All columns include wave FEs, free-field coverage, and individual- and community-level controls. The full list of controls is provided in Section 3. The sample includes women aged 15–35 from three DHS waves (2000, 2004, and 2010) who were reported as married, cohabiting with a partner, or sexually active in the past 30 days. The dependent variables are: (1) the share of 10 modern contraceptive methods (explicitly listed by DHS enumerators) that the respondent reports knowing; (2) the share of 3 traditional contraceptive methods (explicitly listed by DHS enumerators) that the respondent reports knowing; (3) a dummy variable equal to one if the respondent correctly identifies the fertile days within the menstrual cycle, and zero otherwise; (4) a dummy variable equal to one if the respondent reports knowing where to obtain condoms, and zero otherwise; (5) a dummy variable equal to one if a respondent reports fear of side effects as a reason for non-use, and zero otherwise (the sample is restricted to respondents who are not currently using a modern contraceptive method); and (6) a dummy variable equal to one if the respondent believes that condoms are safe, and zero otherwise. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Appendix A provides additional details about the variables.

Because an important component of the programs centered around the prevention of STDs, in Table 8, we focus on knowledge about STDs, as well as risky sexual behavior. Column (1) focuses on knowledge

about HIV transmission, while column (2) analyzes knowledge of other STDs. In addition, columns (3)–(4) focus instead on risky behavior by analyzing the number of partners reported by the respondent (in addition to the husband), and the age of the respondent's most recent partner. Knowledge about HIV transmission and other STDs is particularly high in the sample, with 79.7% and 91.8% reporting correct answers. In terms of risky behavior, respondents have, on average, 0.05 partners in addition to their husbands, and their last partner was 31.4 years old.

In line with the absence of an informational channel, we find no change in knowledge about the transmission of STDs, nor in safe sex practices, such as limiting the number of sexual partners or avoiding older partners. This suggests not only that the avoidance of HIV transmission is not a likely channel for fertility reduction but, together with the results in Table 7, highlights the absence of an effect on knowledge, which remained relatively homogeneous across the country and at high levels of understanding. It is likely that the adoption of birth spacing initiatives centered around maternal and reproductive health in the period after 1982 (see Section 1) could have driven knowledge to a level that was unaffected by the efforts delivered in the post-transition period.

Table 8: Knowledge about STDs and risky behavior

	Knowledge		Risky behavior	
Dependent variables:	HIV	Other STDs	Non-spousal partners	Partner's age
	(1)	(2)	(3)	(4)
Exposure	-0.003	0.023	0.003	0.165
	(0.024)	(0.037)	(0.019)	(0.553)
Sample mean	0.7968	0.9179	0.0461	31.44
R^2	0.1144	0.0719	0.0991	0.4254
Communities	1,404	1,404	1,404	1,404
Observations	18,126	18,250	18,252	17,422

Note. Estimates are based on equation 2. The sample is restricted to women in union or sexually active. All columns include wave FEs, free-field coverage, and individual- and community-level controls. The full list of controls is provided in Section 3. The sample includes women aged 15–35 from three DHS waves (2000, 2004, and 2010) who were reported as married, cohabiting with a partner, or sexually active in the past 30 days. The dependent variables are: (1) the share of correct beliefs about HIV transmission, measured across nine items: three common misconceptions (e.g. mosquito bites, supernatural causes, or sharing food), two accurate modes of sexual or blood-related transmission, and four correct routes of mother-to-child transmission; (2) a dummy equal to one if the respondent reports knowing at least one sexually transmitted disease other than HIV; (3) the number of sexual partners the respondent reports having had in the past 12 months, excluding her husband or cohabiting partner; (4) the age of the respondent's most recent sexual partner. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Appendix A provides additional details about the variables.

6 Conclusion

This paper provides novel causal evidence on the impact of state narratives on fertility behavior. Exploiting exogenous variation in radio signal strength induced by topography and a sudden shift in the state's discourse surrounding the family, we show that exposure to modernization narratives significantly reduces fertility rates among women of reproductive age, particularly in their early reproductive years. Our results provide direct empirical support for modernization theories emphasizing the role of norms and aspirations in demographic transitions. They also highlight that fertility policy operates not only

through the supply of contraceptives but also through demand-side channels that influence preferences and social expectations regarding the family.

From a policy perspective, these results imply that in contexts where basic knowledge of contraception is already widespread, information campaigns yield limited marginal returns. In contrast, sustained narrative-based interventions that normalize specific family ideals and foster partner communication can meaningfully shift preferences and fertility outcomes. Consistent with the United Nations' 2030 Agenda for Sustainable Development, the most effective policy packages combine norm-shifting content with reliable local service provision, ensuring that changed preferences translate into actual uptake.

Our findings have implications beyond low-income settings. Many high- and middle-income countries are now facing the opposite demographic challenge—persistently low fertility and population aging (Bloom et al., 2024). Just as modernization narratives have proven effective in a low income setting, contemporary governments seeking to counter declining fertility must recognize that rebuilding family aspirations or revaluing parenthood requires comparable narrative effort and social legitimacy. Understanding the persuasive power of narratives thus remains central to designing effective and sustainable demographic policies.

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ONLINE APPENDIX

The Family According to the State: Modernization Ideals and Fertility Decline

Alex Armand, Marion Richard and Yannik Schenk

A Variables and data sources **2**

B Supplementary results **4**

B.1 Topography 4

B.2 Sample distribution of signal strength 5

B.3 Expansion of radio market in Malawi 5

B.4 Content on state radio in the post-transition period 6

B.5 Descriptive statistics 7

B.6 Contraceptive supply and use 10

B.7 Access to health and education 12

B.8 Permutation-based inference 13

B.9 Alternative samples 14

B.10 Recall and survey weights 17

B.11 Effect on preferences and behavior among men 18

A Variables and data sources

Variable	Description
Age at first birth	Age at first birth. Constructed from Malawi's population censuses (2008, 2018), using the 10% IPUMS-International samples (Ruggles et al., 2025). Computed as the difference between a woman's age and the age of her oldest co-resident own child for women aged 25–35 at the time of the survey.
Age at marriage	Age at first marriage or union. Constructed from Malawi's population censuses (2008, 2018), using the 10% IPUMS-International samples (Ruggles et al., 2025).
Agriculture	We consider two variable. *land in agriculture* is the fraction of total community land area devoted to agricultural use. *Irrigated area* is the natural logarithm of irrigated land area within the cluster. Both variables are constructed from DHS geospatial data (ICF, 2010).
Believes condoms are safe	Dummy equal to one if the respondent believes that condoms are safe. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Built-up area share	Share of community area covered by built-up (constructed) land. Constructed from DHS geospatial data (ICF, 2010).
Can obtain condoms	Dummy variable equal to one if the respondent reports knowing where to obtain condoms, and zero otherwise. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Completed fertility	Total number of children ever born to a woman. Constructed from Malawi's population censuses (1987, 1998, 2008, 2018), using the 10% IPUMS-International samples (Ruggles et al., 2025). The measure is restricted to women aged 45 and above to capture completed fertility.
Completed primary	Dummy variable equal to one if the respondent has completed at least primary education. Based on the highest level of education attended and grade completed. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Contraceptive use	Dummy variable equal to one if the respondent is currently using any modern or traditional contraceptive method, and zero otherwise. Data are obtained from survey responses provided by DHS from the contraceptive use module (Croft et al., 2018). Additionally, the variable takes the value 1 if the respondent reports having used a condom during her last sexual intercourse, of if she gave birth less than 6 months ago, is still breastfeeding and her period has not returned.
Currently working	Dummy variable equal to one if the respondent worked in the 12 months prior to the survey. This includes seasonal, occasional, or part-time work. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Decision-making score	Standardized index (mean = 0, s.d. = 1) of women's participation in household decision-making, based on three domains: decisions about her own health care, large household purchases, and visits to family or relatives. The score takes value 1 if the woman reports making the decision alone or jointly with her partner. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Discussed FP with partner	Dummy variable equal to one if the respondent reports having discussed family planning with her partner, and zero otherwise. The variable was not collected in the 2010 DHS wave. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Distance to urban center	Natural logarithm of distance in kilometers from the communitycentroid to the nearest urban center. Location of urban centers stems from the Africapolis dataset (OECD/SWAC, 2018).
Ethnic Chewa	Share of individuals in the communityidentifying as Chewa. Constructed from DHS survey responses linked to DHS geospatial data (ICF, 2010).
Gave birth	Binary indicator equal to one if the respondent gave birth in year t, and zero otherwise. The variable is built using retrospective birth histories. Data are obtained from retrospective birth histories as provided by DHS (Croft et al., 2018).
Ideal share of boys	Respondent's ideal share of sons, calculated as the ideal number of sons divided by the total ideal number of children. The variable is self-reported. Data are self-reported from survey responses provided by DHS (Croft et al., 2018).
Ideal number of children	Respondent's ideal number of children. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Identifies fertile period	Dummy variable equal to one if the respondent correctly identifies the fertile days within the menstrual cycle. Data are self-reported from survey responses provided by DHS (Croft et al., 2018).
IPV rejection score	Standardized index (mean = 0, s.d. = 1) of attitudes toward intimate partner violence, based on five questions regarding whether wife-beating is justified if the woman: goes out without informing her husband, neglects the children, argues with him, refuses sex, or burns food. The index is built so that higher values reflect lower acceptance of IPV. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Knowledge of contraceptives	We consider two indicators. One for *modern methods*, defined as the share of 10 modern contraceptive methods (explicitly listed by DHS enumerators) that the respondent reports knowing. The other for *traditional methods*, defined as the share of 3 traditional contraceptive methods (explicitly listed by DHS enumerators) that the respondent reports knowing. Data are aggregated from survey responses provided by DHS (Croft et al., 2018).
Knowledge about STDs	We consider two indicators. The first is related to *HIV transmission* and is defined as the share of correct beliefs about HIV transmission, measured across 9 items: three common misconceptions (e.g. mosquito bites, supernatural causes, or sharing food), two accurate modes of sexual or blood-related transmission, and four correct routes of mother-to-child transmission. The second is related to *STDs* and is defined by an indicator variable equal to one if the respondent reports knowing at least one sexually transmitted disease other than HIV, and zero otherwise. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Livestock	Natural logarithm of the number of livestock units in the cluster. Constructed from DHS geospatial data (ICF, 2010).

(continued on next page)

Variable	Description
Length of growing season	Number of growing days in an average year within the cluster. Constructed from DHS geospatial data (ICF, 2010).
Nightlights	Average intensity of satellite-recorded nighttime lights in the communityin 1994 and 2010, based on DMSP-OLS (NOAA National Geophysical Data Center, 2013).
Non-farm employment	Dummy variable equal to one if the respondent's main occupation over the past 12 months is in a sector other than agriculture. Agricultural work includes farming, fishing, and livestock rearing. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Non-spousal partners	Number of sexual partners the respondent reports having had in the past 12 months, excluding her husband or cohabiting partner. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Number of droughts	Count of drought events experienced in the communityover the study period. Constructed from DHS geospatial data (ICF, 2010).
Number of siblings	Total number of biological siblings reported by the respondent. Data are obtained from DHS survey responses (Croft et al., 2018).
Paid employment	Dummy variable equal to one if the respondent has worked in the last 12 months and receives compensation in cash (either cash only or cash and in-kind) for this work. Unpaid family work and in-kind-only compensation are coded as zero. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Partner's age	Age of the respondent's most recent sexual partner. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Population (2000)	Natural logarithm of total population in the community in the year 2000. Constructed from DHS geospatial data (ICF, 2010).
Population density (2000)	Natural logarithm of population density (population per square kilometer) in the community in the year 2000. Constructed from DHS geospatial data (ICF, 2010).
Religion	We consider three indicator variables. *Catholic* is a dummy variable equal to one if the respondent self-identifies as Catholic. *Protestant* is a dummy variable equal to one if the respondent self-identifies as Protestant. *Muslim* is a dummy variable equal to one if the respondent self-identifies as Muslim. Data are obtained from DHS survey responses (Croft et al., 2018).
Respondent age	Age of the respondent at the time of the survey, measured in completed years. Data are obtained from DHS survey responses (Croft et al., 2018).
Schooling	Total number of completed years of formal education reported by the respondent. Data are obtained from DHS survey responses (Croft et al., 2018).
Sexually active	Dummy variable equal to one if the respondent reports being sexually active in the past 30 days, and zero otherwise. Data are obtained from survey responses provided by DHS (Croft et al., 2018).
Side effect concerns	Dummy equal to one if a respondent who is not currently using a modern method reports fear of side effects as a reason for non-use. Data are self-reported from survey responses provided by DHS (Croft et al., 2018).
Speaks Chewa	Dummy variable equal to one if the respondent reports Chewa as her primary language spoken at home. Data are obtained from DHS survey responses (Croft et al., 2018).
Under-5 population (2000)	Natural logarithm of the number of children under age 5 in the community in the year 2000. Constructed from DHS geospatial data (ICF, 2010).
Urban status	Dummy variable equal to one if the community is classified as urban in the DHS sampling design. Constructed from DHS geospatial data (ICF, 2010).

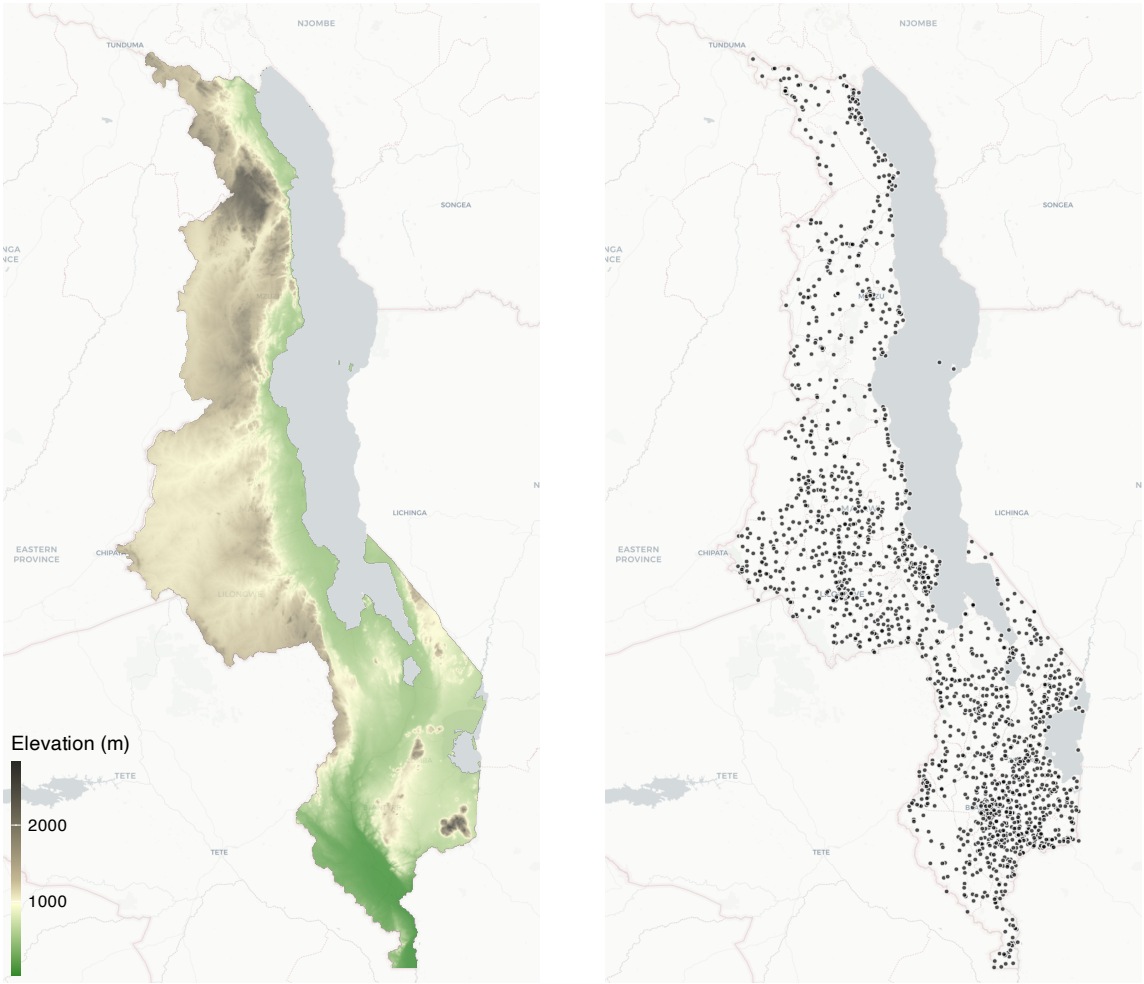
B Supplementary results

B.1 Topography

Malawi's landscape is shaped by the southern branch of the East African Rift, an active continental rift system where the African Plate is slowly splitting into two separate plates. The rift runs north to south through the country, forming a low-lying basin occupied by Lake Malawi and bordered by steep escarpments that rise to broad upland plateaus. This creates a compact terrain with strong local elevation differences between valley floors and surrounding highlands. The Rift Valley floor and steep slopes also produce areas where radio signals are blocked, posing natural challenges for radio coverage and network expansion. Panel A in Figure B1 illustrates the topographic variation across Malawi, while Panel B shows the geographical distribution of all DHS clusters included in the study waves.

Figure B1: Malawian topography and surveyed communities

A. Topography of Malawi B. DHS clusters

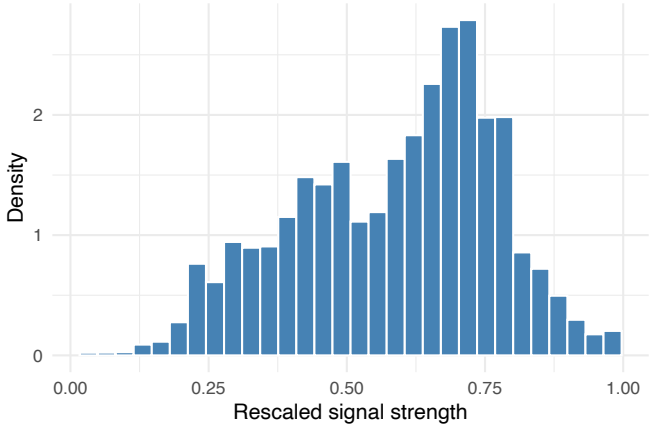


Note. Panel A indicates the elevation (in meters). Data stems from the OpenTopography API global datasets. Panel B shows the geographical distribution of the primary sampling units of DHS for the waves 2000, 2004, and 2010.

B.2 Sample distribution of signal strength

Figure B2 shows the distribution of the rescaled signal strength for our core sample (see Section 4.1). The variable has a mean of 0.588 and a standard deviation of 0.183.

Figure B2: In-sample distribution of the (rescaled) signal strength

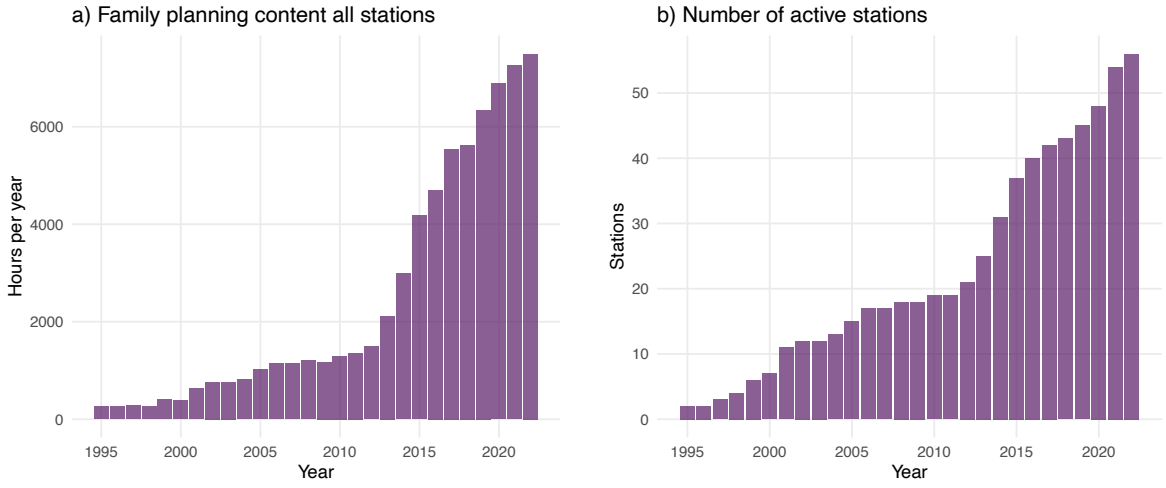


Note. The figure shows the in-sample distribution of signal strength, which is computed using the Longley–Rice Irregular Terrain Model and rescaled to be in between 0 and 1. See Section 2.1 for further details about the data source.

B.3 Expansion of radio market in Malawi

Figure B3 shows the number of hours per year broadcast by radio stations in Malawi covering topics related to reproductive health and family planning (panel A), and the number of radio stations that broadcast this type of content (panel B). Data originate from an original survey collected by the authors (see Section 2.1). Importantly, the number of radio stations does not account for the geographical coverage, with most radio stations maintining a local coverage.

Figure B3: Family planning content broadcast on radio



Note. Panel A shows the number of hours of content related to family planning and broadcast across all networks per year. We sum broadcast time of all formats. No such content was aired before 1995 due to strict media censorship. Panel B illustrates the number of active radio stations by year. Based on the authors' own survey of radio stations. See section 2.1.

B.4 Content on state radio in the post-transition period

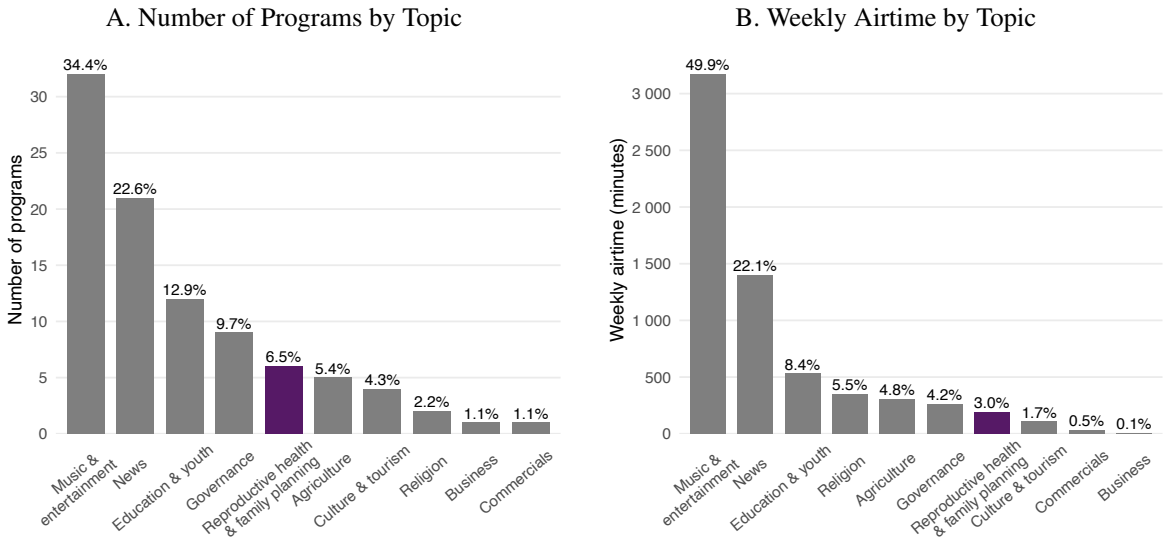
The data presented in this Section are transcribed from official program schedules and change-to-schedule notices for the state radio, as reported in Chikunkhuzeni (1999). Information is based on records from the MBC Programs and Finance Departments for 1995–1998, which provide a contemporaneous record of programming decisions, scheduling changes, and broadcast content. The following table presents program names, short descriptions, sponsorship, and categorization for each program introduced between 1995 and 1998. For the categorization, we applied rule-based topical coding to each program based on its title and description. Figure B4 presents the distribution of programming across topics in 1995. Panel A shows the number of programs aired, and panel B shows their total weekly airtime in minutes. Bar labels indicate the share of the total within each panel.

Program	Description	Sponsor	Topic
Bwezi la Alimi	Promotion of ADMARC trading facilities	ADMARC	Agriculture
Titukule Ulimi	Modern farming practices	Ministry of Agriculture	Agriculture
Ulimi Wa M'maestate	Estate farming, especially tobacco	ARET	Agriculture
Usodzi wa Lero	Deals with fisheries resources in Malawi	GTZ	Agriculture
Business Spectrum	Dealing with business issues	Commercial Bank of Malawi	Business
Business Zing'ono	Promotion of small-scale enterprises	NAHIBA	Business
Investment corner	Investment promotion in Malawi	Malawi Investment Promotion Agency	Business
Stock market update	News from stock exchange	Stock brokers	Business
Knowledge for Development	Promotion of consultancy services	Think Tank NGO	Commercials
Level's Golden Show	Promotion of Level Brothers Products	Level Brothers Ltd	Commercials
MUSCCO Comedy	Promotion of co-operative banking	MUSCCO	Commercials
Moneymen corner	Promotion of banking facilities	National Bank of Malawi	Commercials
On the Powerline	Promotional program for ESCOM	ESCOM	Commercials
Stagecoach	Promotion of Stage Coach bus services	Stage Coach Ltd	Commercials
Telephoni yoyenda nayo	Promotion of cellular phones	–	Commercials
Universal's Choice	Promotion of company products	Universal Industries Ltd	Commercials
Aluso Ena	Discussion with little known artists	–	Culture & tourism
Kalondolondo	Traces history of places and issues of interest	–	Culture & tourism
Malawi: The Warm Heart of Africa	Awareness of Malawi's tourism potential	Ministry of Tourism	Culture & tourism
Mlakatuli	Poetry recitals	Population Services Intl.	Culture & tourism
Takulandirani	Awareness of Malawi's tourism potential	Ministry of Tourism	Culture & tourism
The Pride of Malawi	Awareness of Malawi's tourism potential	–	Culture & tourism
Frontline Training Assocs.	Promotion of training facilities	Frontline Training Assocs.	Education & youth
Joyce Banda Foundation	Promotion of a girls' secondary school	Joyce Banda Foundation	Education & youth
Khembo Private Secondary School	Promotion of a secondary school	Khembo Private Secondary School	Education & youth
Science in development	Research and science issues in Malawi	–	Education & youth
Sikadza konkha	–	–	Education & youth
Tsogolo La Atsikana	Promotion of girl education	Gable (project)	Education & youth
Tsogolo la Ana athu	Counseling on child care	–	Education & youth
Drama	Conservation of natural resources	Adventist Development Relief Agency	Environment
Inu ndi Chilengedwel/You and the Environment	Sensitization on environmental issues and solutions	Ministry of research and Environmental Affairs	Environment
Water Comedy	Water conservation	–	Environment
Constitution Comedy	Dramatization of constitutional rights	GTZ	Governance
Consumers' rights	Sensitization on the Rights of consumers	Consumer Association of Malawi	Governance
MASAF	Sensitization of self-help project funding facilities on any developmental projects	Malawi Social Action Fund	Governance
Ndife Anzanu	Sensitization on Police reform program	Malawi Police Force	Governance
Privatization/Zog ulitsa Makampani a Boma	Sensitization of the government privatization program	Privatization Commission	Governance
Solidarity/Mgwir izano	–	–	Governance

(continued on next page)

Program	Description	Sponsor	Topic
Tiri Pantchito	Labor issues	–	Governance
Vision 2020	Community participation in the formulation of the country's vision	Vision2020	Governance
Announcer's choice	Music	–	Music & entertainment
Candlex Comedy Corner	Commercially oriented comedy	Candlex Ltd	Music & entertainment
Kaimbani A Malawi	Contemporary local music	–	Music & entertainment
Kale Langa	Musical program on individual's favorites	–	Music & entertainment
Music parlour	Heavy rock music	–	Music & entertainment
Reggae Time	Music	–	Music & entertainment
Chatsitsa Dzaye	–	–	News
Focus on the Nation	Phone-in discussions on national issues	–	News
Kodi Mwamva?	Stories on the social and scientific world	–	News
News in Chitumbuka, Chilomwe, Chisena, Chitonga	News	–	News
Tiyankhuleni	Phone-in	–	News
Kulera	Family planning awareness campaign	Banja La Mtsogolo	Reproductive health & FP
Mdula Moyo	Musical program directed at AIDS issues	Project Hope	Reproductive health & FP
Moyo Saika pa Chiswe	Promotion of sexual/reproductive health	Ministry of Information	Reproductive health & FP
Samala Moyo	Promotion of reproductive health	Ministry of Information	Reproductive health & FP
Straight talk	Youth related issues	UNICEF	Reproductive health & FP
Tikambilane	Discussion on family planning	Banja La Mtsogolo	Reproductive health & FP
Tirele	Family planning messages	Banja La Mtsogolo	Reproductive health & FP
Window on Health	Deals with health issues	–	Reproductive health & FP
Zimachitika	AIDS Soap Opera	UNICEF	Reproductive health & FP
Titsitsimuke	Religious music	–	Religion

Figure B4: State radio programming in 1995



Note. Each bar represents one topic category on MBC in 1995. Panel A shows the number of programs aired, and panel B shows their total weekly airtime in minutes. Labels indicate the share of the total within each panel.

B.5 Descriptive statistics

Table B2 presents summary statistics for the sample of women included in the analysis across the three DHS survey waves. Figure B5 presents descriptive statistics from the census data, with panel A showing the age distribution of women, and panels B and C plotting the cumulative distributions of age at first marriage and age at first birth.

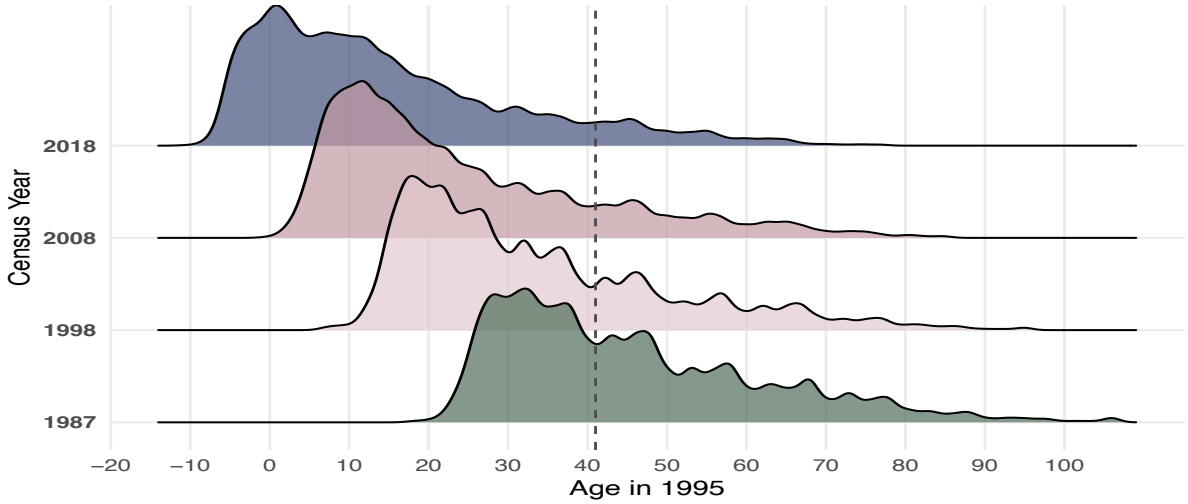
Table B2: Descriptive statistics from DHS surveys

Variable	Mean	SD	N
	(1)	(2)	(3)
DHS Wave			
DHS 2000	0.283	0.451	34959
DHS 2004	0.245	0.430	34959
DHS 2010	0.472	0.499	34959
Demographic characteristics			
Age 15–19	0.213	0.410	34959
Age 20–24	0.218	0.413	34959
Age 25–29	0.187	0.390	34959
Age 30–34	0.133	0.339	34959
Age 35–39	0.104	0.305	34959
Age 40–44	0.077	0.267	34959
Age 45–49	0.068	0.251	34959
Age	27.867	9.237	34959
Married	0.630	0.483	34959
Sexually active	0.564	0.496	34959
Coresiding	0.057	0.232	34959
Married or sexually active	0.711	0.453	34959
Number of siblings	5.919	2.678	34959
Urban	0.190	0.392	34959
Education years	4.793	3.748	34959
Completed primary	0.255	0.436	34959
Completed secondary	0.064	0.245	34959
Paid employment	0.332	0.471	34899
Family Planning and Fertility			
Children ever born	3.055	2.762	34959
Ideal number of children	3.976	1.675	34102
Uses any contraceptive method	0.305	0.460	34959
Age at first birth	18.449	3.009	27411
Unmet need FP	0.202	0.401	34956
Radio and Family Planning			
Owns a radio	0.611	0.488	34254
Listened FP program	0.714	0.452	34944
Number of FP program listened	4.577	3.842	34959
Number of FP program listened (if any)	6.414	2.985	25197

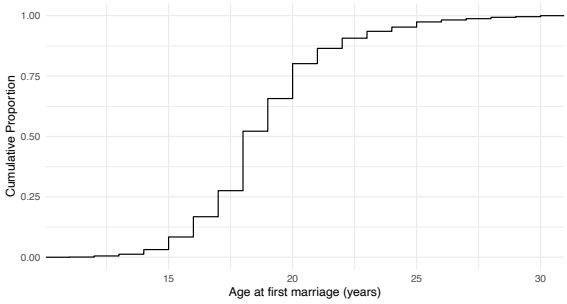
Note. The table displays the mean of key DHS variables for women aged 15-49 surveyed in 2000, 2004 and 2010. Variable definition is detailed in Table A; urban areas are defined by the Malawi National Statistics Office (NSO); Statistics are weighted using DHS survey weights.

Figure B5: Descriptive statistics from census data

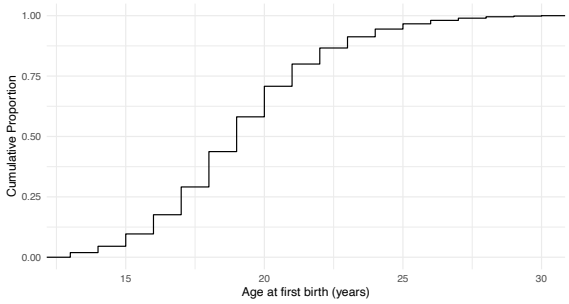
A. Age distribution by census wave



B. Cumulative distribution of age at first marriage



C. Cumulative distribution of age at first birth

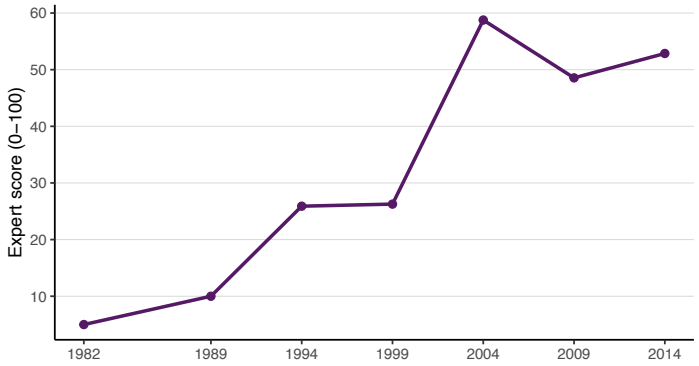


Note. Panel A shows the density plots of the age distribution of ever-married women in the 1987, 1998, 2008, and 2018 census waves. Panel B shows the cumulative distribution of age at first marriage. Panel C shows the cumulative distribution of age at first birth. Data stem from the 10% IPUMS census samples (Ruggles et al., 2025). See Section 5.1 for further details about the data source.

B.6 Contraceptive supply and use

Figure B6 shows changes in the supply of family-planning services within Malawi over time. The figure draws on the USAID Family Planning Effort (FPE) Index (FP2020, 2017), which reports expert ratings (0–100) of the availability of contraceptive methods in Malawi between 1982 and 2014. The composite access score is calculated as the average across all surveyed methods, which include IUD, male and female sterilization, condoms, contraceptive pills, and injectables. Since the partial introduction of contraceptive services in the 1980s, contraception has become increasingly accessible.

Figure B6: Supply of contraception in Malawi

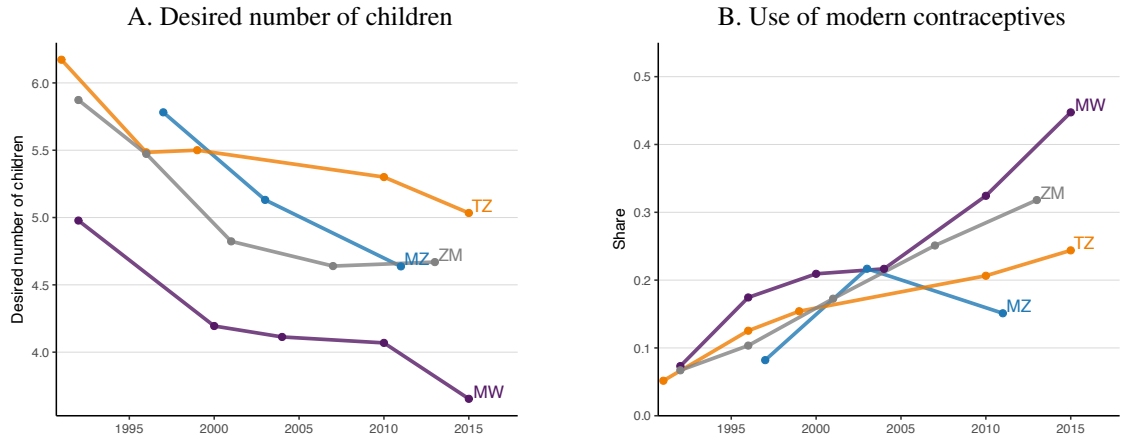


Note. Expert ratings (0–100) of availability to contraceptive methods in Malawi. The composite access score is calculated as the average across all surveyed methods—IUD, male and female sterilization, condoms, and contraceptive pills—excluding abortion. Beginning in 2004, injectables were introduced to the survey and are included in the index from that year onward. Higher scores indicate greater availability. Data source is FP2020 (2017).

The remaining figures instead focus on the take-up of contraception. Figure B7 documents long-run changes in fertility preferences and contraceptive use from the DHS data. Panel A shows a steady decline in the mean desired number of children across the region since the early 1990s, with Malawi exhibiting both the lowest fertility preferences and the fastest decline. Panel B illustrates the adoption of modern contraceptive methods among women ages 15–49, where Malawi again stands out with higher uptake compared to its direct neighbors Tanzania, Zambia, and Mozambique. Figure B8 shows, using data from DHS, the use of modern and tradition methods of contraception by age, in panels A and B, and by DHS survey wave, in panels C and D.

Table B3 presents estimates of the effect of exposure on contraceptive use, using the same specification as in Table 5 and distinguishing between types of contraceptives. In column (1), we consider the use of modern contraceptive methods, while in column (2), we examine the use of traditional methods. In column (3), we provide estimates for the effect of using concealable methods, i.e., methods that can typically be used without the partner's knowledge or direct cooperation. In our coding, these methods include the contraceptive pill, IUD, injections, emergency contraception, and herbal or string-based methods.

Figure B7: Fertility preferences and contraceptive use in Malawi and neighboring countries



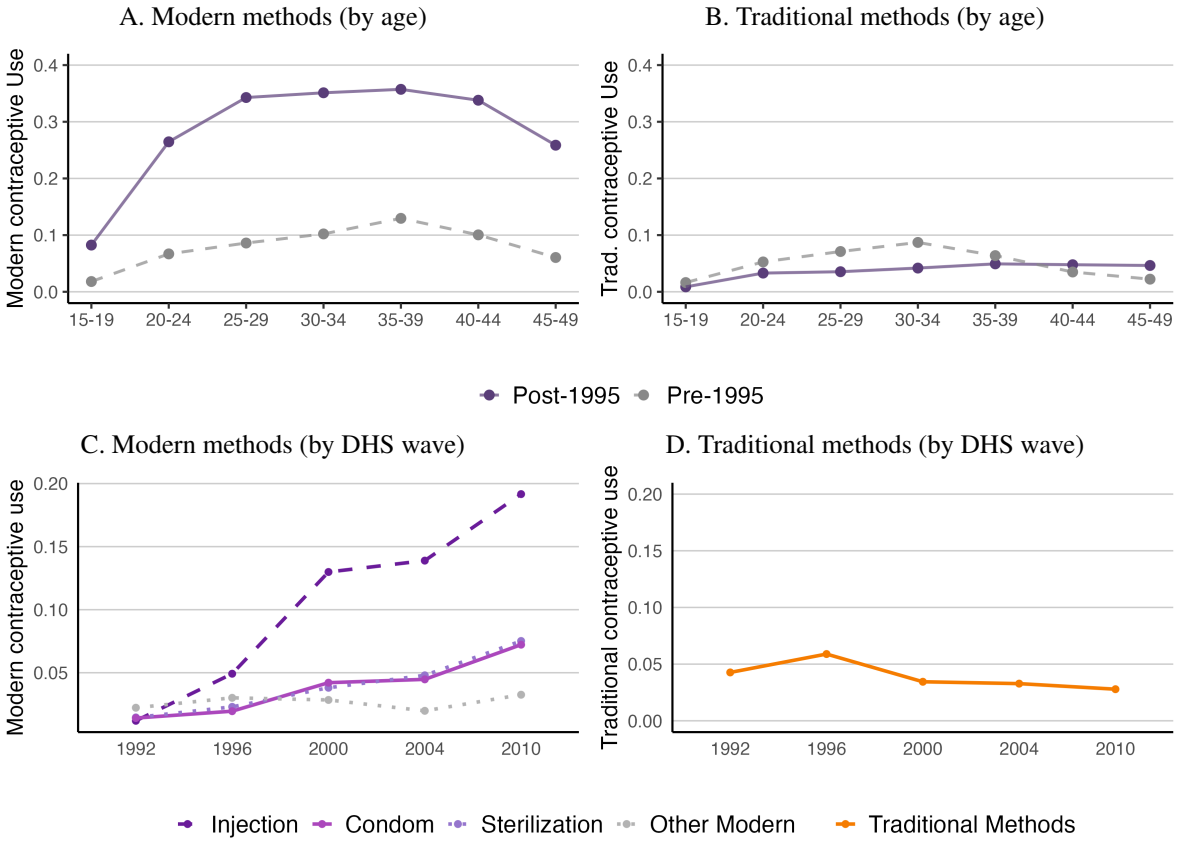
Note. Each line represents a country (MW = Malawi, TZ = Tanzania, ZM = Zambia, MZ = Mozambique). Points denote DHS survey years. Panel A plots the mean desired number of children; Panel B shows the share of women ages 15–49 using modern contraceptive methods. Country–year means are computed from DHS individual-level data using sampling weights. Labels on the right identify country codes.

Table B3: Effect on specific contraceptive methods

Dependent variables:	Any contraceptive method used		
	Modern	Traditional	Conceleable
	(1)	(2)	(3)
Exposure	0.081*	0.027	-0.001
	(0.047)	(0.018)	(0.045)
Sample mean	0.4513	0.0292	0.2533
R^2	0.0519	0.0214	0.0556
Communities	1,404	1,404	1,404
Observations	18,253	18,253	18,253

Note. Estimates are based on equation 2. All columns include wave FEs, free-field coverage, and individual- and community-level controls. The full list of controls is provided in Section 3. The variable number of siblings is not available and not included as control variable as for women. The sample includes men aged 15–54 from three DHS waves (2000, 2004, and 2010) matched with a woman from our DHS sample aged 15-35. *Concealable* is an indicator variable equal to one if the respondent reports using methods that can typically be used without the partner's knowledge or direct cooperation. Appendix A provides additional details about the variables. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure B8: Contraceptive use — by age and survey wave



Note. Panels A and B show the age-specific probability of using any contraceptive method by type. *Modern methods* include injectables, female and male sterilization, male and female condoms, implants, pills, intra-uterine devices (IUDs), emergency contraception, lactational amenorrhea method (LAM), diaphragm, spermicide (foam), contraceptive jelly, and other modern methods. *Traditional methods* include withdrawal, abstinence, and other traditional methods, such as herbal or string-based methods. *Pre-1995* includes the 1992 and 1996 DHS waves; *post-1995* includes the 2000, 2004, and 2010 waves. Panels C and D show the weighted distribution of contraceptive use among users in each DHS wave. Injection, female sterilization, and male condom use are shown separately. All variables are measured with self-reported current contraceptive use, except condom use that captures both current use of condom as a contraceptive methods and whether condom was used during last sexual intercourse.

B.7 Access to health and education

Table B4 presents estimates of models in which the dependent variable is either the distance to the nearest (health or educational) facility or a binary indicator of whether a facility is located within 5 km. For health access, we also estimate a panel version to assess whether radio coverage is linked to the expansion of formal infrastructure over time. Columns (1)–(2) show that, after controlling for free field signal coverage, neither the logarithm of distance nor the facility presence indicator is significantly associated with radio signal strength. Columns (3)–(4) report panel estimates, indicating that the post-1995 expansion of health facilities did not disproportionately target areas with higher residual radio coverage. Columns (5)–(6) show cross-sectional results for education access, where, again, signal strength is not statistically significant.

Table B4: Exposure to state radio and access to health and education facilities

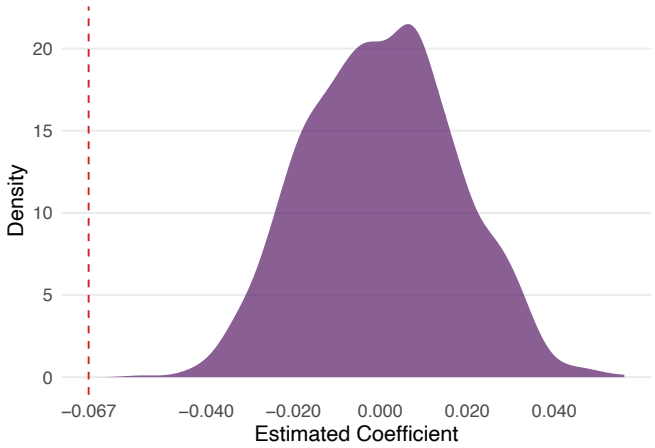
	Health facilities				Educational facilities	
	Distance	Within 5km	Distance	Within 5km	Distance	Within 5km
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure	0.097	-0.194			-0.293	0.041
	(0.373)	(0.124)			(0.693)	(0.289)
Exposure × post			-0.039	0.022		
			(0.033)	(0.027)		
Adjusted R^2	0.2297	0.0783	0.9882	0.9668	0.4703	0.2437
Observations	1,404	1,404	2,808	2,808	1,404	1,404
District FEs	✓	✓			✓	✓
DHS community FEs			✓	✓		
Period FEs			✓	✓		

Note. Estimates based on equation 2 for columns (1), (2), (5), and (6), and its panel version for columns (3) and (4). The sample includes clusters-level observations from three DHS waves of data collected in 2000, 2004 and 2010. Distances in columns (1), (3), (5) are reported in logarithms and measured between a community centroid and the closest health (education) facility (in km). Columns (2), (4), and (6) represent dummy variables taking the value 1 if a facility lies within 5 km of the community centroid. Standard errors clustered by district in columns (1), (2), (5), and (6), and by DHS community in (3) and (4), are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

B.8 Permutation-based inference

We implement a permutation test by randomly reassigning exposure across communities over 1,000 iterations, each time re-estimating equation (1) to generate a distribution of treatment effects under the null hypothesis of no true effect. The resulting distribution, shown in Figure B9, reflects the range of coefficients that arise from randomly assigned spatial variation in exposure. The actual estimated effect, indicated by the red dashed line, falls entirely outside the support of this placebo distribution, yielding a permutation p-value below 0.001.

Figure B9: Estimated effect on fertility decisions under random exposure assignment



Note. The figure shows the distribution of estimated coefficients under random exposure assignment using 1000 iterations. Estimates are based on equation 1. The red vertical line marks the true coefficient presented in Table 3.

B.9 Alternative samples

For fertility preferences and family planning, Table B6 reproduces Table 5 using alternative selection criteria. Panel A focuses on all women in early reproductive age without restricting the sample to women in union or sexually active. Panel B extends the analysis to the sample of women aged 15–49. Panel C focuses on the sample of women aged 15–49, but restricts the sample to women in unions or who are sexually active. Table B7 reproduces the main fertility results from Table 3 for the full DHS sample of women aged 15–49. Table B7 presents the main results on fertility decisions using alternative selection criteria based on the primary language spoken in the district. Panel A selects only districts where Chichewa is not the main language, while panel B selects all districts. In the main text, we select only districts where Chichewa is the primary language.

Table B5: The effect on fertility decisions – include all reproductive years

	Dependent variable: gave birth at time t					
	All women-years			Restricted to post-marriage years		
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure × post	-0.043***	-0.028*	-0.042***	-0.015	-0.013	-0.014
	(0.012)	(0.015)	(0.012)	(0.013)	(0.013)	(0.013)
Sample mean	0.2269	0.2269	0.2269	0.2542	0.2542	0.2542
R^2	0.0401	0.0473	0.0979	0.0372	0.0438	0.0936
Communities	1,404	1,404	1,404	1,404	1,404	1,404
Observations	313,824	313,824	313,824	241,742	241,742	241,742
Community controls	✓			✓		
Community FEs		✓			✓	
Woman FEs			✓			✓

Note. The dependent variable is a binary indicator equal to one if the respondent gave birth in year t, and zero otherwise. Estimates are based on equation 1. All specifications include survey wave and year (t) FEs and individual controls. In column 3 and 6, the woman FEs absorb time-invariant controls. The full list of controls is provided in Section 3. The variable *post* indicates years after 1995. All specifications control for the interaction between free-field coverage and the post-1995 period; free-field coverage itself is also included directly in columns (1) and (3), where it is not absorbed by FEs. The sample includes women aged 15–49 in year t, and is further restricted to years after first marriage in columns (4) to (6). Data span up to 20 years of retrospective birth histories from the 2000, 2004, and 2010 DHS waves, covering the period 1980–2009. The year of data collection is excluded from the sample in each wave. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Appendix A provides additional details about the variables.

Table B6: Fertility preferences and family planning – by selection criteria

Dependent variables:	Preferences		Family planning		
	Ideal number of children (1)	Ideal share of boys (2)	Discussed FP with partner (3)	Contraceptive use (4)	Sexually active (5)
A. Women aged 15–35					
Exposure	-0.302***	-0.031**	0.048	0.044	-0.040
	(0.114)	(0.015)	(0.035)	(0.034)	(0.037)
Sample mean	3.730	0.4487	0.0875	0.2805	0.5384
R^2	0.1888	0.0190	0.0317	0.1187	0.1917
Communities	1,404	1,404	786	1,404	1,404
Observations	26,107	25,852	13,880	26,539	26,539
B. Women aged 15–49					
Exposure	-0.214*	-0.027*	0.024	0.042	-0.012
	(0.119)	(0.015)	(0.031)	(0.031)	(0.033)
Sample mean	4.037	0.4486	0.0853	0.3010	0.5619
R^2	0.2431	0.0210	0.0320	0.1094	0.1615
Communities	1,404	1,404	786	1,404	1,404
Observations	33,553	33,179	17,849	34,398	34,398
C. Women aged 15–49 in union or sexually active					
Exposure	-0.197	-0.033**	0.041	0.071*	0.028
	(0.134)	(0.017)	(0.041)	(0.041)	(0.033)
Sample mean	4.235	0.4490	0.1147	0.3825	0.7892
R^2	0.2225	0.0248	0.0295	0.0811	0.0389
Communities	1,404	1,404	786	1,404	1,404
Observations	23,877	23,698	13,127	24,489	24,489

Note. Estimates are based on equation 2. All columns include wave FEs, free-field coverage, and individual- and community-level controls. The full list of controls is provided in Section 3. Panle A includes all women aged 15–35 from three DHS waves (2000, 2004, and 2010), irrespective of marital status, co-residence with a partner, or sexual activity. Panel B includes all women aged 15–49 from three DHS waves (2000, 2004, and 2010), irrespective of marital status, co-residence with a partner, or sexual activity. Panel C restricts the sample to women aged 15–49 who were reported as married, cohabiting with a partner, or sexually active in the past 30 days. The dependent variables are: (1) the respondent's ideal number of children; (2) the respondent's ideal share of sons, calculated as the ideal number of sons divided by the total ideal number of children; (3) a dummy equal to one if the respondent reports being sexually active in the past 30 days; (4) a dummy equal to one if the respondent reports having discussed family planning with her partner (not collected in 2010); and (5) a dummy equal to one if the respondent is currently using any modern contraceptive method. Appendix A provides additional details about the variables. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B7: The effect on fertility decisions – selection criteria based on language

	Dependent variable: gave birth at time t					
	All women-years			Restricted to post-marriage years		
	(1)	(2)	(3)	(4)	(5)	(6)
A. Non-Chichewa-speaking districts						
Exposure × post	-0.025	-0.027	-0.011	-0.018	-0.017	-0.011
	(0.018)	(0.022)	(0.018)	(0.019)	(0.020)	(0.020)
Sample mean	0.2428	0.2428	0.2428	0.2837	0.2837	0.2837
R^2	0.0294	0.0350	0.0822	0.0132	0.0195	0.0630
Communities	502	502	502	502	502	502
Observations	86,360	86,360	86,380	63,282	63,282	63,300
B. All districts (no selection)						
Exposure × post	-0.056***	-0.048***	-0.053***	-0.037***	-0.035***	-0.035***
	(0.010)	(0.013)	(0.011)	(0.011)	(0.012)	(0.012)
Sample mean	0.2416	0.2416	0.2416	0.2843	0.2843	0.2843
R^2	0.0313	0.0389	0.0875	0.0148	0.0215	0.0690
Communities	1,905	1,905	1,905	1,904	1,904	1,904
Observations	329,342	329,342	329,362	235,679	235,679	235,697

Note. The dependent variable is a binary indicator equal to one if the respondent gave birth at time t, and zero otherwise. Estimates are based on equation 1. All specifications include survey wave and year (t) FEs and individual controls. In column 3 and 6, the woman FEs absorb time-invariant controls. The full list of controls is provided in Section 3. The variable *post* indicates years after 1995. All specifications control for the interaction between free-field coverage and the post-1995 period; free-field coverage itself is also included directly in columns (1) and (3), where it is not absorbed by FEs. The sample includes women aged 15–35 at time t, and is further restricted to years after first marriage in columns (4) to (6). Panel A selects only districts where Chichewa is not the main language, while panel B selects all districts. See Section 2.2 for a definition of main language. Data span up to 20 years of retrospective birth histories from the 2000, 2004, and 2010 DHS waves, covering the period 1980–2009. The year of data collection is excluded from the sample in each wave. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Additional details about variables are presented in Appendix

B.10 Recall and survey weights

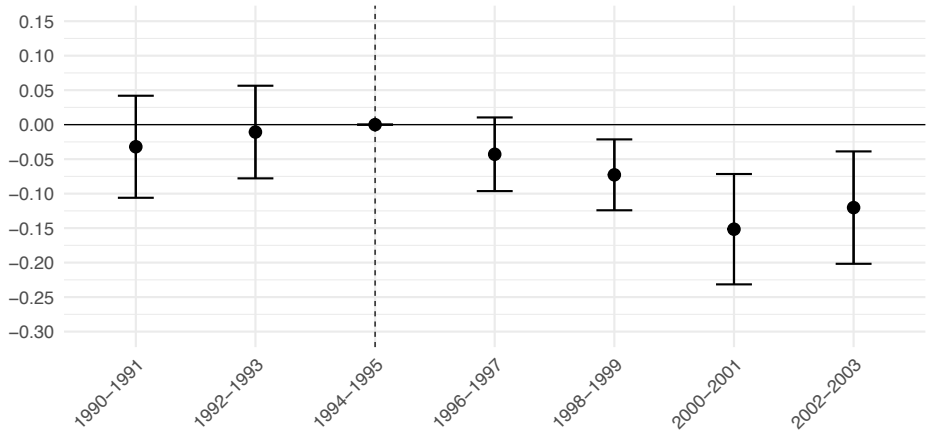
Figure B10 replicates the event-study estimates from Figure 6, restricting the recall window to a maximum of 10 years before the interview to reduce recall bias. Table B8 reports robustness checks for our preferred specification (Table 3, column 3) under alternative recall windows—10 years, no recall limit, and including non-switchers—as well as when applying alternative weighting schemes: DHS raw survey weights, survey weights normalized to sum to one within each wave, and weights normalized to one at the woman level. Across all specifications, the results remain stable.

Table B8: The effect on fertility decisions – robustness to alternative recall and weights

	Dependent variable: gave birth at time t					
	Recall window			Weights		
	10 years	No limit	Incl. non-switchers	DHS weights	Norm. by wave	Norm. by woman
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure × post	-0.060**	-0.073***	-0.053***	-0.053***	-0.059***	-0.056***
	(0.024)	(0.017)	(0.017)	(0.017)	(0.018)	(0.016)
Sample mean	0.2404	0.2377	0.2301	0.2412	0.2412	0.2412
R^2	0.1213	0.0865	0.1108	0.0918	0.0942	0.1116
Communities	785	1,403	1,404	1,403	1,403	1,403
Observations	92,257	275,548	351,184	242,982	242,982	242,982

Note. The dependent variable is a binary indicator equal to one if the respondent gave birth at time t, and zero otherwise. Estimates are based on equation 1. The specification corresponds to columns (3)–(6) of Table 3, including survey-wave and year FEs, woman FEs, and individual-level covariates. Individual covariates not absorbed by woman FEs include age squared and flexible controls for woman's year of birth (grouped in four-year bins) interacted with year t. The sample includes women aged 15–35 at time t. Column (1) restricts the retrospective fertility histories to at most 10 years before the survey interview, limiting the data to the 2000 and 2004 DHS waves and covering the period 1985–2003. Column (2) removes the recall limit, extending the panel back to 1966. In columns (3) to (6), the data span retrospective fertility histories from three DHS waves (2000, 2004, and 2010), covering 1980–2009. Column (3) includes women who contribute observations only before or only after 1995 (i.e., not both), who are excluded from the main specification. Columns (4)–(6) replicate the baseline specification using alternative weighting schemes: raw DHS survey weights, survey weights normalized to sum to one within each wave, and weights normalized to one within each woman. In all cases, the year of data collection is excluded from the sample in each wave. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure B10: The effect on fertility decisions – robustness using 10-year recall



Note. Estimates and 95 percent confidence intervals based on equation 1, controlling for mother and wave FEs. We pool together years t and $t-1$ to increase precision. The omitted category is 1994–1995, the last period in which fertility decisions were made before MBC started broadcasting family planning programs. The sample includes women aged 15 to 35 in year t, and uses retrospective data from three waves collected in 2000, 2004 and 2010. The year of data collection is excluded from the sample for each wave.

B.11 Effect on preferences and behavior among men

Appendix B9 reproduces the results of Table 5 on fertility preferences and family planning for men matched with women in our DHS main sample of women in their early reproductive years.

Table B9: Fertility preferences and family planning for men

Dependent variables:	Preferences		Family planning		
	Ideal number of children (1)	Ideal share of boys (2)	Discussed FP with partner (3)	Contraceptive use (4)	Sexually active (5)
Exposure	0.071	0.036	-0.234	0.068	0.074
	(0.273)	(0.038)	(0.158)	(0.103)	(0.051)
Sample mean	4.116	0.4836	0.3202	0.3693	0.4354
R^2	0.1921	0.0841	0.1364	0.1030	0.7575
Communities	1,301	1,298	712	1,308	1,308
Observations	3,934	3,905	1,958	4,016	4,017

Note. Estimates are based on equation 2. All columns include wave FEs, free-field coverage, and individual- and community-level controls. The full list of controls is provided in Section 3. The variable number of siblings is not available and not included as control variable as for women. The sample includes men aged 15–54 from three DHS waves (2000, 2004, and 2010) matched with a woman from our DHS sample aged 15-35. The dependent variables are: (1) the respondent's ideal number of children; (2) the respondent's ideal share of sons, calculated as the ideal number of sons divided by the total ideal number of children; (3) a dummy equal to one if the respondent reports being sexually active in the past 30 days; (4) a dummy equal to one if the respondent reports having discussed family planning with her partner (not collected in 2010); and (5) a dummy equal to one if the respondent is currently using any modern contraceptive method. Appendix A provides additional details about the variables. Standard errors, clustered at the community levels, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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