CAN SECULAR MEDIA CREATE RELIGIOUS BACKLASH? EVIDENCE FROM PAKISTAN'S MEDIA LIBERALIZATION

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Abstract

Islamic countries have increasingly been exposed to western culture, through the liberalization of their media markets and rise of transnational media networks. What is the consequence of this exposure on cultural and religious behavior, given potential clashes between western norms and traditional Islamic norms? We study this question in the context of Pakistan's dramatic 2002 media liberalization, which transitioned its media landscape from one government-owned radio station broadcasting culturally conservative content originating from Pakistan, to hundreds of private radio stations broadcasting culturally liberal content from the U.S., Europe and other countries around the world. Our empirical analysis employs a spatial discontinuity design, leveraging a unique radio licensing regulation that restricted private radio stations from broadcasting more than 50 km from their towers. Using fine-grained data from polling stations and villages, we find that people living just inside the 50 km boundary were more likely to vote for religious parties and more likely to enroll their children in religious Madrasas, relative to people living just outside of the boundary. Our findings suggest that the inux of liberal, western cultural norms provoked backlash, resulting in greater support for culturally conservative institutions.

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1   Introduction

Over the past three decades, the liberalization of media markets has increased the exposure of Islamic societies to western culture (Gentzkow and Shapiro, 2008). Many of the norms and practices depicted on western radio and television – such as the consumption of alcohol and sexual interactions – clash with traditional Islamic norms. For instance, a recent survey of six Islamic countries found that two thirds of respondents reported consuming media from non-Islamic countries, but over 70% also believed entertainment should be regulated for violence and romantic content, and whole programs banned if people find them offensive (Dennis, Martin, and Wood, 2014).

Given these differences in norms, what are the consequences of exposure to western culture on religious and cultural behavior in Islamic societies? Conceptually, two effects are possible. On the one hand, if exposure to diversified media leads individuals to emulate more liberal social norms (Chong and Ferrara, 2009; Jensen and Oster, 2009), this could lead to less cultural conservatism. On the other hand, if the norms depicted through media are perceived to be offensive and contradict prevailing cultural values, they may generate 'backlash,' causing people to demonstrate more culturally conservative behavior (Bisin and Verdier, 2001; Wheaton, 2020). But whether the emulation or backlash effect dominates is theoretically ambiguous.[1]

We study how exposure to western cultural norms shape cultural behavior in an Islamic context by studying the effect of Pakistan's sudden and rapid liberalization of broadcast radio. Prior to 2002, Pakistan contained a single state-owned radio station that broadcast uniformly conservative content. Radio liberalization was a surprise initiative of President Pervez Musharraf, who came to power through a coup and ruled through a military dictatorship. Musharraf's government began issuing licenses for private FM radio stations in 2002, and by 2013, there were over 100 such stations playing diverse content, including for-

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[1]A number of studies have documented both emulation and backlash in the context of gender. Pioneering studies on emulation found that the introduction of TV programs depicting women who marry later and have fewer children led to parallel effects on female autonomy and fertility within the viewing population in Brazil (Chong and Ferrara, 2009; La Ferrara, Chong, and Duryea, 2012) and India (Jensen and Oster, 2009). Recent work by Wheaton (2020) shows that Equal Rights Amendment (ERA) led to backlash effects against women in the United States, with men exhibiting more negative attitudes toward male/female equality in the wake of its passage.

eign content originating from the U.S., Europe and India, as well as other culturally liberal content from Pakistan.

Our empirical analysis exploits an unusual restriction on private radio licenses: private stations in Pakistan were only permitted to broadcast signal up to 50 km from the radio station, and the technical characteristics of the radio towers were regulated accordingly. As a result, locations within 50 km of a private radio station have access to both the government station and the private radio stations; while locations outside this 50 km boundary continue to have access only to the government radio station.

Using a spatial regression discontinuity (RD) design, we compare post-liberalization outcomes in locations just inside the 50 km boundary (which have access to private radio) to locations just outside the 50km boundary (which lack access to private radio), controlling for distance to the 50km boundary (the RD running variable) and other geographic variables. Our key identifying assumption, which we support with fine-grained data from several different sources, is that geographic, social and economic characteristics preceding radio liberalization do not change discontinuously at the boundary. In other words, it is quite arbitrary whether a locations falls just inside or just outside that border.

Our analysis highlights two main results. First, using spatially granular voting data from thousands of polling stations in Pakistan's 2018 general election, we find that religious party vote shares are higher in locations just inside the boundary than just outside.

Second, using nationwide household survey data collected in 2012-2014 from over 1,000 villages, we find that households just inside the boundary are more likely to enroll their children in madrasas — religious schools with unregulated curricula which focus on Quranic study. We observe larger effects on madrasa enrollment for male children than for female children. This heterogeneity may be an indication that the cultural response to the liberalized media environment is larger among poorer segments of society, as male madrasas are universally free and thus draw boys from poor families, while female madrasas also draw girls from middle class families.

Both of these findings suggest that backlash effects dominate emulation effects in how the Pakistani population responded to media liberalization and the associated influx of foreign cultural norms. The effect on religious party vote shares is consistent with the idea that

individuals may counter-respond to the liberal media environment by supporting religious parties that espouse traditional values as a form of expressive voting, or in the hopes that these parties, if elected, will enact policies to counter what voters see as an overly culturally permissive environment. The effect on madrasa enrollment is consistent with the idea that when parents perceive the cultural environment to be too liberal, they take steps to reinforce their children's exposure to traditional values by sending them to religious schools over state schools. These schooling effects also accord with the idea that some parents may send their children to madrasas to signal to hardliners that they are in fact maintaining traditional, Islamist values over liberal, secular values (Carvalho, 2013).

How we interpret our results is influenced by our institutional context, where the conservative religious culture and religious extremists strongly, and often violently, have opposed the liberal norms found in foreign media through directed attacks (Afaqi, 2020; Gannon, 2016; Oppel Jr. and Shah, 2009; Tsioulcas, 2016). The violent capacity of religious hardliners may also help contextualize our results relative to other studies of religious responses to media liberalization. For example, recent work shows that media liberalization has led to emulation in Brazil and Poland: Buccione and Mello (2020) show that exposure to a private Pentecostals-Church TV channel in Brazil leads to greater support for the Pentecostal movement, and Grosfeld et al. (2021) show that an independent Polish TV network reduces religious participation in the Catholic church, owing to its negative depictions of Church sexual abuse scandals. One interpretation of our results in the context of these studies is that religious responses may differ in environments where empowered religious conservatives have the ability to crack down on those who violate prescribed religious norms. From this angle, the effects of media liberalization may produce different effects in autocratic and democratic settings.

More broadly, our work contributes to a growing literature that documents the effects of media exposure on key societal outcomes, including risky behavior (Banerjee, La Ferrara, and Orozco Olvera, 2019); teen pregnancy (Kearney and Levine, 2016); consumption patterns (Bursztyn and Cantoni, 2014); violent crime (Dahl and DellaVigna, 2009); social capital (Olken, 2009); and inter-group prejudice (Paluck, 2009). Related papers show how media exposure shapes political outcomes, including voter turnout (Gentzkow, 2006; Gentzkow

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and Shapiro, 2010), support for autocrats (Chen and Yang, 2019; Enikolopov, Petrova, and Zhuravskaya, 2011) and other incumbents (Durante, Pinotti, and Tesei, 2019). This literature on political impacts includes a few studies that examine the effects of media on Muslim society (Gentzkow and Shapiro, 2004, 2008; Kocamaner, 2017) and in the context of the Arab Spring (Howard et al., 2011; Howard and Hussain, 2013). With respect to radio specifically, some studies demonstrate how exposure to radio can spur ethnic conflict (Adena et al., 2015; DellaVigna et al., 2014; Yanagizawa-Drott, 2014), while others show radio's capacity to promote cooperation (Sonin and Wright, 2021) and diminish hostilities (Armand, Atwell, and Gomes, 2020). We build on this literature in showing how exposure to radio can shape pro-religious behavior by precipitating a clash of cultural norms. To the best of our knowledge, our paper is the first to document backlash effects in response to changes in the media environment.

The remainder of the paper is organized as follows. Section 2 provides background on the institutional context including the 2002 media liberalization in Pakistan. Section 3 presents a brief conceptual overview. Section 4 details the data used in the analysis. Section 5 discusses the empirical strategy. Section 6 presents the results; and section 7 concludes.

2   Background

This section first provides an overview of the cultural and political climate in Pakistan and then discusses Pakistan's 2002 media liberalization and the role of radio in its cultural landscape.

2.1   Cultural and Political Climate in Pakistan

In the Islamic Republic of Pakistan, which has the world's second largest Muslim population, Islam is the official religion enshrined in the constitution and is practiced by roughly 96.5% of the population. As in other Islamic nations, there exist sharp divisions in religious views and cultural practices between the Sunni majority (estimated at 80%) and Shia minority (roughly 20%), which occasionally manifest in sectarian strife and violence (Rafiq, 2014).[2]

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[2]Also see Baloch and Ellis-Petersen (2020).

Pakistan in the post 9/11 period has also witnessed the rise of the religious right and deepening cultural conservatism among some segments of society. Overall, these shifts have gone hand-in-hand with rising cultural polarization in attitudes about what constitutes appropriate behavior and practices. Religious conservatives advocate for traditional practices rooted in Islam, and speak out against the cultural influence of the West and other non-Islamic societies. This division is manifest across society, ranging from matters of religious adherence to disagreements over what constitutes appropriate clothing, permissible male-female interactions, and, as we argue in section 2.2 below, acceptable forms of entertainment.

As one prominent example, in 2016, the Pakistani president urged citizens to stop celebrating Valentine's Day because many felt it was 'too Western.' In 2017, the governmental Pakistan Electronic Media Regulatory Authority (PEMRA), ordered all media outlets to stop promoting Valentine's Day (Ali, 2018). In 2018, the Islamabad High Court went further and asked for all signs of Valentine's Day to be removed from public spaces, which then led to scenes of police chasing balloon vendors around the city (Khalid, 2019). Conservative student groups on university campuses lauded these steps, starting an alternative "Chastity Day" (Hadid, 2018). Others, however, spoke out bitterly against the government crackdown, questioning how balloon vendors could pose a threat to Islam (Arab News, 2018). The clash over Valentine's Day is one among many examples of culture clash around religious conservatism.

The Electoral Sector

One domain in which this cultural polarization has played out is in party politics. When President Musharraf decided to support the U.S.-led war in Afghanistan, a coalition of conservative, religious and Islamist parties formed the Muttahida Majlis–e–Amal alliance (MMA) in opposition, and ran in the general elections of 2002 under this united banner. Though religious parties had exerted little influence in politics over the 1990s, the MMA went on to win 11% of the vote share in the 2002 elections.

Though the alliance itself experienced ups and downs (collapsing in 2008 before reconstituting itself in 2017), religious parties have continued to maintain their foothold in party politics, and have shifted toward greater religious conservatism over the past decade.

For instance, when the MMA was re-constituted, it called for the implementation of Sharia law. The 2018 election also saw the emergence of a new ultra-right religious party, the Tehrik-e-Labbaik Pakistan (TLP), which is even more extreme than the re-constituted MMA (Shah and Sareen, 2018). Despite the strife between Sunni and Shia parties, religious Islamist alliances such as the MMA have typically included a conservative Shia party alongside conservative Sunni parties. Usually, at least one or two other additional Shia parties also contest the general elections as stand-alone entities.

The Madrasa Sector

Another arena in which religious conservatism plays an important role is education, where parents must determine whether to educate their children in religious madrasas or more secular state-run schools. Madrasas teach a religious curriculum instead of the government curriculum prescribed by the Pakistan Federal Ministry of Education. The Madrasa curricula are unregulated; they emphasize Quranic study and memorization of the Quran, and need not teach other subjects such as Mathematics, English or Science.

In the post 9/11 period, Pakistani madrasas have garnered international attention for their potential ties to religious extremism — for example, violent jihadi groups have sometimes recruited from these institutions (International Crisis Group, 2007; National Commission on Terrorist Attacks Upon the United States, 2014). While there is an intense debate today about whether madrasas *writ large* are connected to extremism (PIPS, 2016), concerns around this question have spurred a long and continuing effort to reform the madrasa sector, with some Pakistani policymakers pushing to require their registration and restrict enrollment by foreign nationals (Iqbal and Raza, 2015). Parties such as the MMA have resisted these reforms fiercely, suggesting they are attempts by the U.S. to secularize religious institutions (Tribune, 2018). Indeed, some have pointed to ties between madrasas and the more extreme religious political parties, indicating that these parties also recruit from among the ranks of madrasa graduates (International Crisis Group, 2011).

It is also worth noting that there are separate male and female madrasas and these institutions differ along some dimensions. Like male madrasas, female madrasas also emphasize Quranic study. However, male madrasas are free and often draw boys from poorer segments

of the population, whereas some female madrasas charge fees and therefore tend to draw girls from middle class families (Conway, 2011).

2.2 Radio in Pakistan and the 2002 Media Liberalization

Radio is a popular media source throughout Pakistan, and the dominant form of media in rural areas where TV does not penetrate (International Media Support, 2009).[3] A Gallup survey from 2014 reported that one in six Pakistanis (16.5%) listen to the radio at least weekly (Gallup, 2014). However, radio ownership and listenership rates are higher in rural areas than urban areas, and vary from province to province. For example, a BBC audience survey found that radios were owned by more than half of all rural households in Sindh, Balochistan and Khyber Pakhtunkhwa (KPK), but owned by only one in five rural households in Punjab. In Sindh, only 32% of urban respondents but 52% of rural respondents said they listened to the radio regularly (Info as Aid, 2011).

The 2002 Media Liberalization

In 2002, Pakistan underwent a sudden and unexpected media liberalization. The liberalization was initiated by General Pervez Musharraf, who took over as president in 2001 following a coup in 1999. Whereas only one state-owned radio station existed in 2002, by 2013, 138 private radio stations were operating across the country. While both television and radio were affected, we focus on radio, since the nature of private radio licensing offers a unique opportunity to study the causal effects of radio exposure.

An important feature of private radio licensing is that stations were not permitted to broadcast their signal more than 50 km from the radio tower. Pakistan's Electronic Media Regulatory Authority (PEMRA) regulated the technical characteristics of the radio towers, prescribing restrictions on the height, transmission and power, to ensure that signal could only reach 50 km (Info as Aid, 2011). In contrast, the state-owned Pakistani Broadcasting Corporation (PBC), which today operates its own network of 49 FM stations, faces no such

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[3]This is due in part to costs of ownership and electricity in rural Pakistan. Radio also addresses local issues more effectively in the preferred language of its target audience; in contrast, most Pakistani TV channels target a nationwide audience (Info as Aid, 2011). Radio also is preferred by many to print and online media, given limited rates of literacy, particularly in rural areas.

restrictions. By operating more powerful transmitters, PBC is able to reach larger swaths of the rural population (Ghani, 2007) — which they currently claim includes 95% of the country's 95.5 million radio listeners (Info as Aid, 2011). The implication is that within the 50 km boundary of private radio stations, listeners have access to a large variety of channels, including private stations and PBC; while outside the 50 km boundary, listeners can primarily only access PBC.

Radio Station Content

The content of private radio differs from that of government radio in two key respects. First, private radio stations are primarily vehicles for entertainment. 70% of their airtime is devoted to playing music, and just 5% to news – which has earned them the nickname "Juke Box Radios" (Info as Aid, 2011). Consistent with the emphasis on entertainment, a survey of college youth in Khyber Pakhtunkhwa province found that 58.6% listen for entertainment purposes while 21.4% listen for information (Safi and Iqbal, 2015). Second, the music played on private radio is sourced globally, originating from the U.S., Europe, Turkey and India, as well as Pakistan, and encompasses a wide variety of genres ranging from rock to pop to hip-hop (Moini, 2017). As a result, the songs reference drugs and alcohol, sex and homosexuality, and espouse norms that are at odds with traditional Islamic values. In contrast, the music on the government radio stations must be of Pakistani origin, and feature songs that are typically either patriotic or religious.[4]

The influx of foreign music has served as a flashpoint in the cultural war. It has stoked a longstanding debate about the role of music in Islam, wherein religious conservatives argue that listening to music for entertainment is "haram" or entirely forbidden.[5] In 2012, the Punjab Assembly passed a bill that allowed concerts to be banned in both private and public universities on the grounds that they were immoral.

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[4]Foreign policy dynamics between India and Pakistan have also led PEMRA to intermittently and temporarily ban Indian songs from all radio stations, once over October 2016 (Sheikh, 2017) and again in October 2018 (Baloch, 2018)

[5]For example, concerts on university campuses have drawn the ire of conservatives – one such event at Abottabad University led religious student groups to flood social media with critiques that it was "anti-Islamic", "haram", and "an attack on the moral values of Islam". One tweet read "Concerts are not our culture." Another quoted a statement by Prime Minister Imran Khan who said "People think Western Culture is progressive but they don't see how family system is declining in West". (Amin, 2021)

Foreign music in particular has generated caustic resentment, with religious conservatives arguing that the norms depicted are corrosive to values espoused by Islam. Shows like "Pakistan Idol" (Pakistan's version of "American Idol") have been described as cultural pollution, and labeled forms of Western, Indian and Jewish "propaganda" (Ghosh, 2013). In fact, an Idol participant was murdered in 2012 because her performances were thought of as provocative (Gannon, 2016). Particularly in the western provinces adjacent to the Afghanistan border, militant extremists have explicitly targeted individuals for consuming western media and violating their decrees that these forms of entertainment are un-Islamic (Oppel Jr. and Shah, 2009). In addition, extremist groups like the Pakistani Taliban and The Islamic State Khorasan, ISIS' affiliate in Pakistan, have assassinated prominent musicians[6] and carried out suicide bombings at music events and concerts (Sanchez, Saifi, and Raja, 2017). These killings are part of the broader, and at times, deadly cultural war between religious conservatives and secularists in Pakistani society.

3   Conceptual Framework

What are potential cultural responses to the foreign content delivered by private radio stations? Two effects are possible. On the one hand, it may lead to less cultural conservatism if individuals emulate the liberal norms they are exposed to via private radio. This is the emulation effect.

On the other hand, it could generate backlash and more cultural conservatism if the norms represented are perceived to be offensive. This is the backlash effect.

Backlash could stem from two potential forces. First, if the media content clashes with individuals' cultural values and religious preferences, they could choose to increase conservative practices to counteract what they perceive to be an overly permissive environment.

Models of cultural transmission have examined this this idea for contexts where children are presumed to acquire preferences through either parental socialization or cultural adapta-

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[6]For example, one of Pakistan's best known singers, Amjad Saabri, was gunned down by the Pakistani Taliban in 2017. Sabri was a singer of Qawaali, music from the Sufism, the mystical branch of Islam that espouses peace and promotes pluralism and harmony with other religious groups (Afaqi, 2020; Tsioulcas, 2016).

tion to the social environment. In such an environment, where parents perceive their traits to be in the minority, they will double down and socialize their children more intensively, to ensure that the trait is passed on to their children (Bisin and Verdier, 2001). Analogously, where changes in the social environment (e.g., new laws) clash with a family's preferences, parents will move in the opposite direction to preserve values that are important to them (Wheaton, 2020). Otherwise, they risk their children moving in the direction of what they view as an undesirable change.

Second, if conservative hardliners respond to a liberalized environment by cracking down on those who they consider to be violating religious prescriptions, individuals may increase conservative behavior to signal religious compliance (Carvalho, 2013), even if they themselves do not view this content to be at odds with their preferences. They may do so simply to avoid being targeted themselves. This is highly germane to our institutional context — as discussed in the section above, religious conservatives in Pakistan violently targeted those who violated their entertainment edicts.

Whether backlash or emulation dominate imply opposite cultural responses in critical domains, such as how individuals respond politically and how they socialize their children.

In the political domain, if emulation dominates and people adapt liberal norms, they may prefer to steer away from religious political parties, and increase their support for secular parties. Under backlash, however, individuals would instead choose to vote more for religious parties over secular parties. They may do so either as a form of expressive voting, or with the expectation that these parties will then take policy steps to counteract the permissive environment.

In the child socialization domain, if emulation dominates, parents may choose to send their children to secular state schools instead of religious madrasas. On the other hand, under backlash, parents would instead prefer to send their child to madrasas. If backlash occurs because the norms under liberal media clash with their preferences, they may do so with the hope that the religious environment of the madrasa acts to counter the liberal environment of wrought by free media. Alternatively, if backlash occurs as a result of crackdowns, enrolling their child in a madrasa may be a way of signaling cultural compliance, to shield their families from being targeted by hardliners.

In summary, under the backlash effect, we would expect to observe more culturally conservative responses in areas with access to private radio. On the other hand, under the emulation effect, we would expect to observe less culturally conservative behavior in areas with private radio. Our empirical analysis sets out to adjudicate between these two possible effects in the context of Pakistan's media environment.

4 Data

To examine the cultural consequences of the radio liberalization, we utilize data from a number of different sources. In this section we describe the main data sources and provide an overview of key variables.

4.1 Radio Station Locations and Signal Strength

We attain data from PEMRA on 138 radio stations licensed through 2013. This data includes addresses of the station as well as the technical specifications of the tower – i.e., its height, frequency and power. We are unable to determine the accuracy of technical specifications in four towers, whose signal strength appears erratic and highly limited. Therefore, we examine the effect of 134 radio stations.

We use addresses to geo-locate stations. We use the technical specifications to estimate signal strength around each tower, using the Longley-Rice Irregular Terrain Model (ITM), an engineering model of radio propagation.[7] We measure signal strength in 1 km x 1 km grid cells, focusing on grid cells that lie within 10 kilometers of our units of analysis (polling stations and villages, both described in the subsections below). We home in on this area as most of the population that would potentially be listening to the radio resides within this 10 km radius.[8]

The top row of Appendix Table A.1 presents the descriptive statistics of this signal strength variable. According to the International Telecommunications Union (1998), the

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[7]Technical specifications are missing for three towers. While we cannot estimate signal strength around these towers, we are still able to include them in our spatial discontinuity regressions of key outcomes.

[8]For example, using population data from the Worldpop project, we find that 80% of the 2013 population resided in the 10 km radii around the centroids of the villages in our sample.

minimum signal strength needed for a FM radio receiver to clearly output received radio transmission in the absence of major signal attenuating interference is 34 decibel-microvolt / meter (dBuV/m). Major interference is typically caused by factors such as heavy industry and densely constructed buildings in major urban centers, atypical of the primarily rural areas that comprise the RDD sample in our setting. Thus, 34 dBuV/m can be considered a relevant threshold for radio receivers to function in our setting.

4.2   Vote Shares for Religious Parties

We develop religious party vote share measures using data from the Election Commission of Pakistan (ECP), which cover both provincial and national assembly elections in 2018. Data on both types of assemblies is available for Sindh, Punjab, Khyber Pakhtunkhwa, and Balochistan provinces.[9]

The ECP data contains votes cast for each candidate at the polling station level, as well as the political party of the candidate. We use this information together to calculate the share of votes going to candidates representing religious parties. We designated religious parties using the following approach: we first asked three Pakistani experts (political scientists at LUMS University), to code which of the 95 political parties in our data are considered religious parties, and used majority voting to aggregate their responses. Second, we cross-checked their coding against a religious party designation developed by Gallup Pakistan (2020) which included all but 17 parties in our sample. The expert coding aligned with Gallup's coding in all cases except one.[10] Overall, the alignment with Gallup provides reassurance in the accuracy of the religious party classification. In total, the experts designated 13 parties in the 2018 elections to be religious parties.

In order to examine if there is a sectarian divide in our effects, we separated out Sunni religious parties from those that are either Shia or formed an alliance with Shia parties. This

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[9]In 2017, the Federally Administered Tribal Areas (FATA) and Northwest Frontier Province (NWFP) were merged to form Khyber Pakhtunkhwa province. From the 2018 election files, we can separately observe data on national assemblies for FATA, but not provincial assemblies for FATA, since these latter elections were postponed and held as a separate by-election in 2019.

[10]The sole exception was Pakistan Sunni Tehreek, which the experts coded as a religious party. We retained their coding as this party's foundational identity is rooted in defending Sunni Barelvis, which makes the experts' designation an uncontroversial choice.

disaggregation is straightforward as there is one Shia party that ran candidates as a stand-alone party in 2018, the Majlis Wahdat-e-Muslimeen Pakistan (MWM); while a second Shia party was a part of the Mutahida Majlis-e-Amal Pakistan (MMA), the alliance comprised of 5 conservative religious parties discussed in the background section above. We examine the MWM and MMA alliance together as Shia parties and their coalition partners.

While the ECP's voting data contains the names of the polling stations with each of the constituencies, it does not contain their exact location. However, this information can be found on the ECP's website, which we scraped to obtain a list of every polling station and its corresponding latitude and longitude. We then performed string matching to incorporate the geolocation information into the voting outcomes data.

Given differences in how location names are spelled on the website and in the voting data, this entailed a large-scale fuzzy matching exercise, in which we endeavored to match 156,149 polling stations throughout the country.[11] We successfully matched 102,319 or 65% of these stations, using a 95% accuracy threshold for fuzzy matches, to ensure high quality matches.

The second panel of Appendix Table A.1 presents descriptive statistics on the religious party vote share variables used in the analysis.

Note that candidates run at the larger constituency level, while votes are cast and measured at the much finer-grained polling station level. National constituencies are typically twice as large as provincial assemblies: a typical provincial assembly constituency contains 142 polling stations while a typical national assembly constituency contains 313 polling stations. Thus, while vote shares for particular types of candidates vary at the polling station level, winners are determined at the more aggregate constituency level. Since our spatial RD design requires highly localized, fine-grained data, constituencies are too large to use under this approach. Therefore, we are able to examine effects on vote shares for religious parties, but not whether these candidates won elections.

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[11]This count considers all polling stations listed under each type of constituency – provincial and national – as a different polling station (although the same physical location can serve as a polling station for both provincial and national elections).

4.3 Religious and other Schooling Outcomes

To examine schooling outcomes, we use data from the Annual Status of Education Report (ASER) – a survey that tracks educational outcomes in rural and urban areas of Pakistan.

We utilize data over 2012-2014, which covers the provinces of Sindh, Punjab, Balochistan and Kashmir, as well as FATA and NWFP separately.[12]. The ASER survey samples different villages each year – thus some villages appear in our data multiple years while others appear only once. We take the average of the schooling outcomes over the years in which the village appears in the data.

The ASER household survey provides information on whether children are enrolled in school, and the type of school – private, government or madrasa. We use this to define the fraction of children enrolled in madrasa among all children enrolled in school. We also measure the fraction of children enrolled in school among all school-age children (i.e., the overall school enrollment rate). We disaggregate all of these measures by gender.

ASER contains information on the village name, as well as the province and district in which the village is located — but does not contain precise coordinates. To geo-locate these villages, we use a Geonames API to fuzzy match the names provided in ASER and Geonames. Using this approach, we geo-located 67% of the ASER villages.

Consistent with prior work by Andrabi et al. (2005), our data suggest madrasa enrollment is only 2.2% of all school enrollment (see Appendix Table A.1, panel C). Our estimation strategy seeks to examine if exposure to media alters this baseline enrollment rate.

4.4 Additional Covariates

We examine a number of additional covariates to validate our key identifying assumption, that other important characteristics do not vary across the 50 km boundary.

As with the ITM signal strength variable, we measure these covariates in 1 km x 1 km grid cells that lie within 10 km radii of the polling stations and villages in our sample. We use data on population and night time light from the Worldpop project and NOAA's National Geophysical Data Center, respectively. For both measures, we attain data from 2000 and

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[12]The latter two provinces appear separately as the time period of this ASER data precedes their 2017 merger into Khyber Pakhtunkwa province

2001, and construct averages over these two years.

Further, we use data on elevation from NASA and the US Geological Survey's Shuttle Radar Topography Mission. We also utilize land use variables from the ESA Climate Change Initiative's Land Cover Time Series for 2000 and 2001. The land cover metrics include the fraction of land that is barren, has sparse vegetation, is used for agriculture, and has mosaic agriculture (which reflects a mix of agricultural land and forestland).

Finally, we utilize data on soil suitability from the FAO. We focus on the suitability for low input agriculture, which is most germane to agricultural production in Pakistan. The FAO variables lie on a 8-point scale, yielding measures that range from the fraction of land highly suited to producing agriculture, to the fraction not at all suitable for agriculture. The descriptive statistics of these additional covariates are also reported in the top panel of Appendix Table A.1.

5 Empirical Strategy

We aim to estimate the effect of private radio exposure on cultural and political outcomes. Our empirical strategy exploits the discontinuity in access to private radio at the 50 km boundary. The main outcome variables include vote shares from the 2018 election data and schooling outcomes from the 2012-2014 ASER household data.

Since there are typically multiple private radio stations broadcasting out of each urban area, exposure to private radio is determined by whether a given location falls within 50 kilometers of any private radio station. Figure 1 depicts in blue, the boundary formed by the union of the 50 km radii around each of the private radio stations in our sample. We refer to this boundary interchangeably as the 50 km boundary or private radio boundary. The figure also delineates provincial boundaries (in green) and shows that the private radio boundary does not coincide with these administrative boundaries. The left panel of Figure 1 overlays the ASER villages and the right panel overlays the polling stations. We calculate the distance from each of these units to the 50 km boundary and perform a spatial RD regression, using this distance as the forcing variable.

We estimate:

$$y_{ip} = \alpha_1 Distance_{ip} + \alpha_2 Distance_{ip} PrivateRadio_{ip} + \alpha_3 PrivateRadio_{ip} + X_{ip}\beta + \delta p + \varepsilon_{ip} \quad (1)$$

where i, depending on specification, denotes either a polling station or a village, and p denotes a province. $PrivateRadio_{ip}$ is an indicator variable for whether the polling station or village lies within 50 km boundary of any private radio station, $Distance_{ip}$ represents the distance to the boundary, and X_{ip} are controls that vary at either the polling station or village level. δp are province fixed effects, and y_{ip} are the outcomes. α_2 is the coefficient of interest and captures the effect of exposure to private radio. Specifically, the coefficient captures whether the outcomes change discontinuously at the 50 km boundary.

We estimate optimal bandwidths for each outcome examined using equation (1), employing the approach of Cattaneo, Idrobo, and Titiunik (2019). This approach selects the bandwidth for which the linear specification is most appropriate. We adjust the standard errors to account for bandwidth selection, implementing RD-robust standard errors throughout the analysis. While the linear specification with optimal bandwidth corresponds to the most parsimonious, and recommended specification of Cattaneo, Idrobo, and Titiunik (2019), in the appendix we also examine robustness to using quadratic functions of distance as the forcing variable.

Our empirical strategy posits a discontinuous change in radio signal strength at the 50 km boundary. This is guided by the nature of radio wave propagation and the limited reach of FM signals. FM signals can travel only to receivers that lie within their line of sight (International Telephone and Telegraph Corporation, 1968). Line-of-sight transmission on the surface of the Earth is limited to a distance 15% past the visual horizon, which depends on the height of transmitting and receiving antennas (Bowditch, 2017; Hebert, 2013; International Telecommunication Union, 2019; Silver, 2016). Powerful transmitters can also boost radio signal, extending their reach. However, PEMRA set restrictions on both height and transmitter precisely to restrict the reach of private radio stations to 50 km. Below, we directly examine if estimated signal strength changes discontinuously at the 50 km boundary.

An additional factor that affects line-of-sight transmission is terrain: radio waves can be blocked by mountains and terrains. Thus, while private radio transmitters were designed to broadcast no more than 50 km, radio signal near the boundary may be fuzzy. This implies that some locations outside of the 50 km boundary may receive signal, while some locations inside of the boundary may not. While this does not invalidate the use of a sharp RD design, it implies that our results should be interpreted as 'Intent to Treat' effects. Note that while a fuzzy RD design may seem appropriate given the fuzzy nature of radio signal propagation, we do not directly observe which households actually receive signal and listen to the radio.

While we do not directly observe radio listenership, we examine the estimate signal strength from private radio stations based on the ITM model (see Section 4.1), using the technical characteristics of each radio tower. Using this measure, we first consider the average signal strength in various bandwidths around the 50 km private radio boundary. Table 1 shows that across various bandwidths, signal strength outside the boundary is consistently below 34 – the threshold of usable signal required for radio reception (International Telecommunications Union 1998)). In contrast, the average signal strength inside the boundary consistently exceeds 34. This suggests that individuals residing in locations inside the boundary, on average, have access to signal that enables them to listen to the radio clearly, while locations outside do not. This pattern corroborates that technical specifications imposed by PEMRA did in fact limit the reach of private radio stations.

Next, we examine whether there is a discontinuous change in signal strength at the 50 km boundary. We estimate equation (1) with the estimated signal strength as the outcome variable. The first column of Table 2 presents this estimate. The coefficient is statistically significant, verifying that signal strength for private radio increases discontinuously at the 50 km mark. Moreover, the remaining columns of Table 2 show that there is no analogous discontinuous change in signal across other constructed boundaries, including boundaries constructed by adjoining 40 km radii and 60 km radii around private radio stations. The coefficient at the 60 km boundary is both statistically insignificant and less than half as large as the coefficient at the 50 km boundary, while the coefficient at the 40 km boundary is in fact negative and insignificant. This provides further evidence that private radio stations are limited approximately to broadcast out to 50 km, specifically.

A critical identifying assumption of our empirical strategy is that other important characteristics do not not also change discontinuously across the private radio boundary. We examine this assumption in Table 3. This table presents estimates of equation (1) using data on a host of geographic and other socio-economic characteristics.

The table firstly shows that various functions of the 2000-2001 population as well as nighttime light (a measure of local economic development), do not differ significantly across the boundary. This suggests that areas on either side of the boundary were similar in the degree to which they were urbanized and developed in the years leading up to the radio liberalization.

The table also examines a variety of terrain, land type and soil suitability measures. Among the 16 covariates, three closely-related variables appear imbalanced, though the sign on the coefficients point in opposite directions. On the one hand, the fraction of soil highly suited to agriculture appears to be higher inside the boundary. On the other hand, the amount of soil considered good for agriculture appears to be lower inside the boundary, while the fraction of barren land also appears to be higher inside the boundary. These patterns suggest that agricultural potential was not systematically better on one side of the boundary over another. Indeed, Table 3 also shows that overall, the proportion of land used for agriculture and mosaic agriculture are both balanced around the boundary. Nonetheless, we also control for the three imbalanced covariates throughout our analysis to ensure that they do not confound our estimates. These are referenced as "Additional Controls" in the tables.

6 Results

6.1 The effect of private radio on support for religious parties

We examine effects on religious party vote shares in Table 4. The first three columns examine provincial elections. We see that access to private radio increases overall religious party vote shares. The magnitude is substantial. The mean vote share for religious parties is .097; thus the coefficient of .027 in column (1) implies a 28% increase. We present this effect visually

in the first panel of Figure 2, which shows a clear discontinuity in the religious party vote share at the 50 km boundary.

In columns (2)-(3) of Table 4 we disaggregate the effects into vote shares for Sunni parties and vote shares for Shia parties and their coalition partners. These coefficients are statistically indistinguishable from each other and we see similarly sized effects (of 27% and 35%, respectively). Thus, in provincial elections, we see increased vote shares for both types of religious parties.

The second three columns of Table 4 examine national elections. Here the pattern is different. We see increases in vote share for Sunni religious parties specifically, with substantial implied effects of 19%. In contrast, the coefficient for *Shia / Alliance* is both small and statistically insignificant.

This pattern for the national elections, with effects specifically for Sunni parties, may reflect two potential forces. First, it may reflect the hesitation of religious conservatives to support Shia parties and the MMA Alliance at the national level, because these entities hold foreign policy positions that may be unpalatable to many Paksitanis, including religious conservatives. For example, the Shia party Majlis Wahdat-e-Muslimeen Pakistan (MWM) strongly supports Iran in foreign policy matters, while MMA Alliance strongly supports Saudi Arabia, more vehemently than even other Sunni religious parties.

Second, it may also reflect the entry of TLP, the ultra-conservative Islamic party, into the 2018 elections. TLP competed extensively with the Alliance, successfully receiving vote shares in areas where the MMA faltered (Shah and Sareen, 2018). This new hardline religious party may have drawn away the support of conservative voters, including those responding adversely to the permissive cultural environment cultivated by private radio — concentrating effects on vote shares for Sunni religious parties in national elections.

Competition from TLP may not have exerted similar consequences in provincial elections, where politics are more localized. This is because provincial elections have substantially smaller constituencies, which enables each party to maintain separate strongholds. For example, the MMA retained its strong position in KPK and Balochistan, while TLP carved out strongholds in Sindh and Punjab.[13] Thus, at the provincial level, conservative supporters

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[13]https://www.dawn.com/news/1427356

may have continued to support different religious parties in different areas, as a part of local electoral dynamics. As a result, the response to the liberalized cultural environment manifested as support of both Sunni and Shia political parties in these elections.

Overall the results presented in Table 4 suggest that there are backlash effects from access to private radio, as reflected in larger vote shares going toward religious parties in both provincial and national elections. These results are consistent with the idea that religious conservatives counter-react to the liberal cultural norms stemming from private radio by voting for religious parties over secular parties. This may do so as a form of expressive voting, or because they expect religious politicians to take policy positions that will restore a more conservative cultural environment, for example, by banning undesirable media content.

6.2 The effect of private radio on religious schooling

In Table 5, we examine effects on schooling outcomes. In the first three columns, we consider the share of children enrolled in madrasas among children enrolled in school; in columns (4)-(6) we instead consider the share among all school-age children in the village.

These results show that access to private radio leads to an increase in the share of children enrolled in madrasas. The coefficient of .015 in column (1) suggests a large effect in percent terms (62%), from a small base enrollment of .024. The table also shows that this effect stems disproportionately from increases in male madrassa enrollment. For example, the coefficients in columns (2) and (5) suggest that male madrassa enrollments as a fraction of enrollment and school-age children were 77% and 76% higher, respectively, in areas inside the the 50 km boundary, where there was access to private radio. We visually present the results from columns (2) and (5) in Figure 2. In contrast, the equivalent coefficients on female madrassa enrollment in columns (3) and (6) are smaller in size and statistically significant.

The larger effects on male madrasa enrollment as compared to female madrasa enrollment suggest that this cultural response on school choice may be larger among impoverished families, as male madrasas are universally free, and thus draw boys from poor families. In contrast, some female madrasas charge fees, and thus draw girls from middle class families.

Finally, in columns (7)-(9) we show that the access to these more liberal and diverse forms of radio programming does not lead to broader effects on enrollment outcomes. The overall

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enrollment rate for boys and girls do not differ significantly across the 50 km boundary. This suggests that the changes we observe are more specific to a cultural response and the types of schools parents choose, rather than a broader change in school-related outcomes.

The results in Table 5 also suggest backlash effects: parents respond to the liberalized cultural environment stemming from private radio by sending their children to religious schools instead of state schools. Parents may respond in this way because they wish to inculcate traditional values into their children, and view madrasa enrollment as a means of counteracting the liberal, western norms introduced into the environment by private radio. Alternatively, some parents may be using school choice to signal that they are adhering to Islamic norms over secular norms Carvalho (2013), given crackdowns by religious conservatives on those perceived to be violating traditional religious prescriptions.

6.3 Robustness Checks

In this section, we present a number of different robustness checks on our results.

Bandwidth Selection. In our baseline specification, we estimate symmetric optimal bandwidths around the 50 km boundary. In Appendix Tables A.2-A.3 we instead estimate two different optimal bandwidths on either side of the boundary (Calonico, Cattaneo, and Titiunik, 2014). Our results are robust to this alternative specification. The provincial *Shia party / Alliance* variable becomes insignificant at conventional levels, but the coefficient changes from .014 in the baseline specification (Table 4) to .010 in Table A.2, and these effects are not statistically distinguishable from one another.

Polynomial Specification. In the main specification, the running variable is linear in distance. In Appendix Tables A.4-A.5, we show that all of our results are robust to instead using running variable that is quadratic in distance. The madrasa variables scaled by the school-age population weaken to become insignificant at conventional levels, as does the provincial *Shia party / Alliance* variable but the effects again are not significantly different from the baseline specifications in Tables 4 and 5.

Removing units within 1km of the boundary. Our analysis utilizes centroid locations for polling stations and villages to estimate if outcomes differ discontinuously between units whose centroids fall on one side of the boundary versus the other. However, some units may actually be straddling the boundary – meaning some parts of the units are exposed to private radio while other parts are not. To check the robustness of our results to potential spillovers, we perform a doughnut specification, removing all units with centroids within 1 km of the boundary. We present these specifications in Tables A.6-A.7. The results are again robust to this specification. In Table A.6, the vote share for Sunni parties in the national elections becomes statistically insignificant; however the coefficient here is .0056, and again statistically distinguishable from .0073, the baseline specification of Table 4.

Falsification tests at other boundaries. To address the possibility that we measure discontinuous effects between private radio and cultural outcomes by chance, we conduct falsification tests using other boundaries, constructed by adjoining radii of 40 and 60 km around the private radio stations. Recall that Table 2 demonstrated that there were no discontinuous jumps in private radio signal at these other boundaries. Table A.8 presents these falsifications for the religious vote share outcomes; while Table A.9 presents the equivalent tests for the schooling outcomes. In both tables, all coefficients are small in magnitude and statistically significant, with the exception of one – the Sunni vote share, which appears significant at the 10 % at the 60 km boundary. Note however, that this effect can arise by chance among the 30 coefficients estimated in the falsification tables. And, this same variable is statistically insignificant at the 40 km boundary.

In summary, these results indicate that we see no meaningful changes in the results by altering the way in which the bandwidth is estimated, using a quadratic polynomial or removing the units lying close to the private radio boundary where spillover effects are likely the largest. We also rule out spurious findings using placebo tests at other boundaries. Thus we find robust evidence of backlash effects stemming from access to private radio.

7 Conclusion

In this paper, we examine how support for Islamic institutions was shaped by exposure to liberal media and culture. We focus on Pakistan, whose radio landscape suddenly and unexpectedly shifted from a single government-owned radio station airing culturally conservative content to hundreds of private radio stations airing culturally liberal content sourced from around the world. The effect of this media liberalization is theoretically ambiguous: on the one hand, it could dampen adherence to religious norms if people seek to emulate liberal values; on the other, it could create a backlash effect, if this content is instead considered highly offensive to Islamic norms.

To adjudicate between these two effects, we assess the causal effect of exposure to private radio, exploiting a unique radio licensing regulation that prevented radio stations from broadcasting beyond 50 km of their tower. We implement a spatial RD design, using distance to the 50 km boundary around private radio stations as the running variable. We find evidence consistent with backlash effects. In the 2018 elections, the vote share for religious parties was 28% larger just inside the 50 km boundary, than just outside. Similarly, over 2012-2014, the fraction of children enrolled in religious Madrasas was 62% higher just inside of the boundary.

These results are consistent with the idea that individuals exposed to private radio reacted against the liberalized media environment and associated influx of liberal cultural norms. For instance, parents may have chosen madrasas over secular schools as a way of reinforcing traditional Islamic norms that they wished to instill in their children; and voters may have supported religious parties either to express their views favoring traditional norms, or with the expectation that elected religious officials would use policy to restore a more traditional cultural environment. Overall, our findings suggest that backlash effects predominated over potential emulation effects, precipitating greater support for Islamic religious institutions in response to the influx of liberal cultural norms.

These findings raise several additional questions. For backlash to arise, is it necessary to have empowered religious conservatives positioned to violently counter those who violate traditional norms? Or, can backlash arise even in the absence of this force? And, what is

the role of economic conditions? Does poverty intensify religious responses to changes in the cultural environment? Future work should aim to delve further into these areas of inquiry.

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Tables

Table 1: Mean Signal Strength by Bandwidth

	Mean Private Radio Signal	
	Inside Private Radio Boundary (1)	Outside Private Radio Boundary (2)
Bandwidths:		
50 KM	50.442	22.144
40 KM	46.779	23.709
30 KM	42.888	25.123
20 KM	39.077	26.793
10 KM	35.715	29.200

Notes. This table shows the mean private radio signal calculated using the ITM model, in various bandwidths around the 50 km boundary.

Table 2: Signal Strength across the Private Radio Boundary

	Actual Boundary:	Other Boundaries:	
	50 KM	40 KM	60 KM
	Signal Strength (1)	Signal Strength (2)	Signal Strength (3)
RD Estimate Inside Boundary	0.510***	-0.271	0.216
	(0.177)	(0.160)	(0.238)
Mean of dep. var.	32.546	39.858	26.425
Mean of dep var - inside boundary	35.078	42.200	27.921
Mean of dep var - outside boundary	29.633	37.346	24.794
Observations	75968	83337	46663
Optimal Bandwidth	7.960	7.017	6.198
Province FE?	Yes	Yes	Yes

Notes. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** p<.01, ** p<.05, *p<.1.

Table 3: Covariate Balance across the Private Radio Boundary

Dep. Var.	(1) Coef.	(2) Obs.	(3) Mean of dep. var.	(4) Optimal Bandwidth
Nighttime light	0.0283 (0.070)	37969	3.495	3.931
Population	0.0486 (0.044)	37786	1.095	3.913
Population (log)	0.00435 (0.023)	48894	-0.697	5.075
Elevation	6.843 (9.998)	50380	426.6	5.232
Agricultural land	-0.00410 (0.008)	59275	0.442	6.178
Mosaic agriculture (forest + agri)	0.00437 (0.003)	78690	0.0688	8.260
Sparse vegetation	-0.00557 (0.006)	67199	0.297	7.021
Barren area	0.00872** (0.005)	54795	0.138	5.696
Soil suitability: Very High	0.00221 (0.003)	59965	0.0385	6.255
Soil suitability: High	0.0128** (0.006)	76122	0.170	7.981
Soil suitability: Good	-0.0125* (0.007)	78140	0.311	8.205
Soil suitability: Medium	0.00217 (0.004)	88802	0.140	9.351
Soil suitability: Moderate	-0.00271 (0.007)	61426	0.244	6.404
Soil suitability: Marginal	-0.00200 (0.002)	84495	0.0416	8.893
Soil suitability: Very marginal	0.00247 (0.003)	63732	0.0332	6.650
Soil suitability: Not suitable	0.00277 (0.003)	58667	0.0218	6.120

Notes. Each row represents a separate regression. All regressions include province fixed effects. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** p<.01, ** p<.05, * p<.1.

Table 4: Private Radio and Votes for Religious Parties

	Vote Share in Provincial Elections			Vote Share in National Elections		
	Religious Parties (1)	Sunni Parties (2)	Shia/ Alliance (3)	Religious Parties (4)	Sunni Parties (5)	Shia/ Allia (6)
...vate Radio	0.027***	0.015***	0.014**	0.004	0.007**	-0.003
	(0.009)	(0.007)	(0.006)	(0.010)	(0.004)	(0.009)
...ervations	3486	3614	4305	4119	5326	3642
...an of dep. var.	0.097	0.056	0.040	0.101	0.039	0.061
...imal Bandwidth	6.244	6.505	7.771	7.114	9.210	6.357
...vince FE?	Yes	Yes	Yes	Yes	Yes	Yes
...litional Controls?	Yes	Yes	Yes	Yes	Yes	Yes

...es. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** p<.01, ** p<.05, *p<.1.

Table 5: Private Radio and Schooling Outcomes

	Madrasa enrollment/ School enrollment			Madrasa enrollment/ School-age Children			School Enrollment Rate		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Private Radio	0.015**	0.017**	0.002	0.011**	0.013**	0.008	-0.016	0.005	-0.038
	(0.009)	(0.009)	(0.015)	(0.006)	(0.007)	(0.007)	(0.030)	(0.025)	(0.040)
Observations	677	670	643	648	617	849	764	882	800
Mean of dep. var.	0.024	0.022	0.025	0.016	0.017	0.015	0.777	0.830	0.686
Optimal Bandwidth	9.181	9.110	8.929	8.650	8.209	11.192	10.136	11.607	10.625
Province FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** $p<.01$, ** $p<.05$, *$p<.1$.

Figure 1: Private Radio Stations and the 50 km Boundary
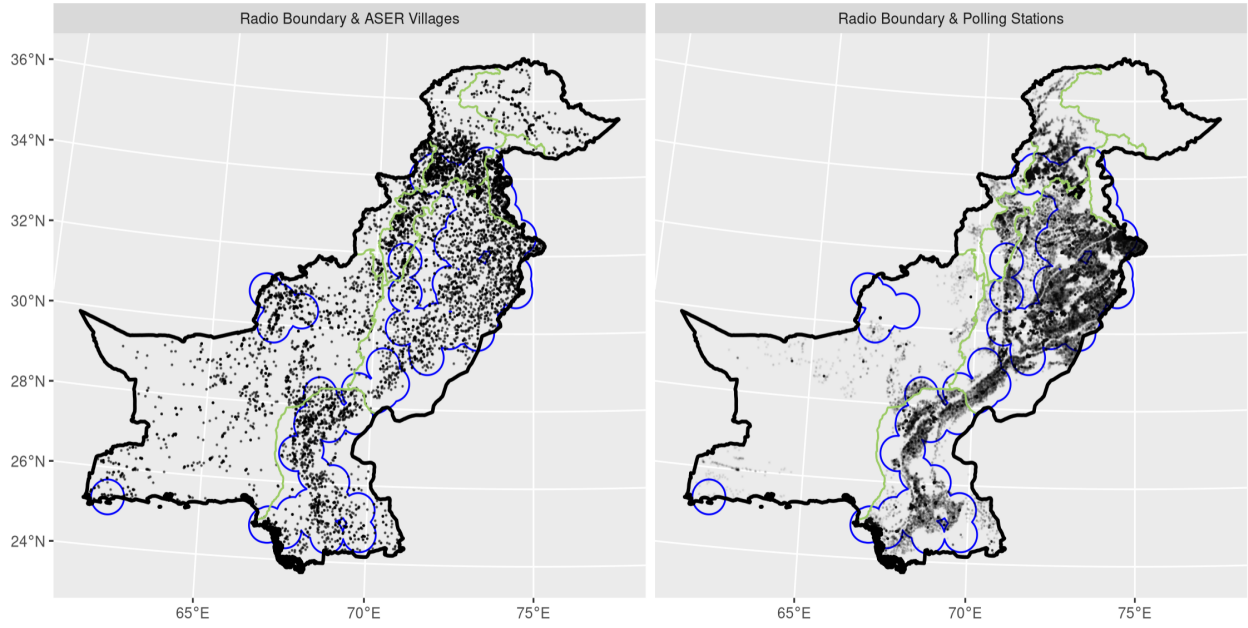
Notes. In this figure, dots denote the location of our units of anlayses (ASER Villages in the left panel and Polling Stations in the right panel). The blue lines depicts the union of the 50 km radii around private radio stations, which form the private radio boundary. Locations inside this boundary have access to private radio. Green lines depict provincial boundaries.

Figure 2: Private Radio, Votes for Religious Parties and Madrasa Enrollment
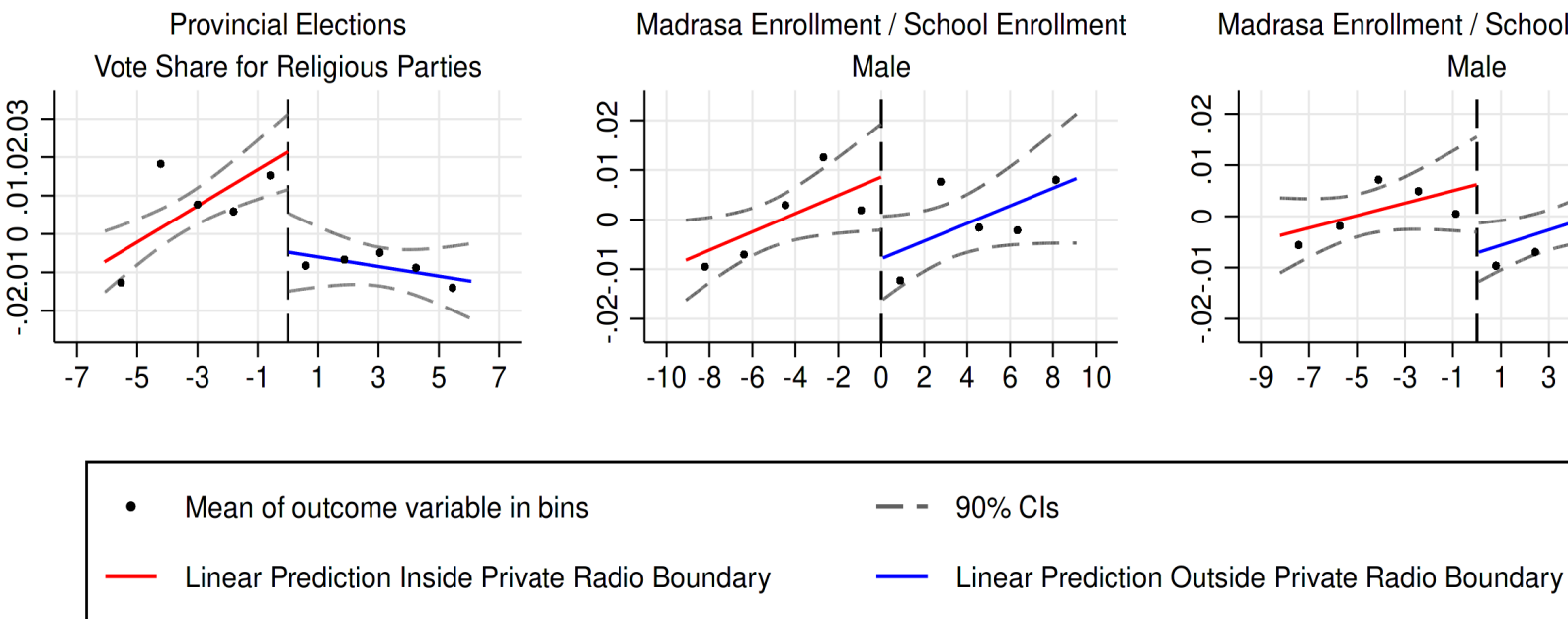
Notes. This figure corresponds to the results from Tables 4 and 5. The vertical axis represents the average of the outcome variable. The horizontal axis represents distance (in km) to the private radio boundary. Locations to right of the dashed line are outside the private radio boundary; locations to its left are inside the boundary and have access to private radio. The unit of the observation is the polling station or SER village, depending on the outcome. Dots denote means of the outcome variable, by bins of 1.24 km for the left-most figure, of size 1 km for the middle figure and size 1.64 km for the right-most figure.

Appendix Tables

Table A.1: Summary Statistics

	Mean	SD	Min	Max	Observations
Panel A: Grid-cell level variables:					
Private radio signal	33.207	14.342	0.000	78.843	139940
Night light	3.598	3.422	1.673	59.787	139940
Population	1.157	2.226	0.007	89.342	139827
Population (log)	-0.648	1.303	-5.010	4.492	139827
Elevation	438.437	671.248	-1.531	4821.057	139940
Agricultural land	0.454	0.449	0.000	1.000	139940
Mosaic agriculture (agri + forest land)	0.068	0.191	0.000	1.000	139940
Sparse vegetation	0.287	0.374	0.000	1.000	139940
Barren area	0.134	0.289	0.000	1.000	139940
Soil suitability: Very High	0.036	0.176	0.000	1.000	139868
Soil suitability: High	0.171	0.351	0.000	1.000	139868
Soil suitability: Good	0.317	0.436	0.000	1.000	139868
Soil suitability: Medium	0.140	0.301	0.000	1.000	139868
Soil suitability: Moderate	0.246	0.394	0.000	1.000	139868
Soil suitability: Marginal	0.039	0.154	0.000	1.000	139868
Soil suitability: Very marginal	0.031	0.147	0.000	1.000	139868
Soil suitability: Not suitable	0.017	0.119	0.000	1.000	139868
Panel B: Polling Station level variables:					
Provincial Elections					
Religious Vote Share	0.098	0.129	0.000	0.903	8633
Sunni Vote Share	0.055	0.091	0.000	0.798	8633
Shia/ Alliance vote share	0.043	0.109	0.000	0.903	8633
National Elections					
Religious Vote Share	0.092	0.135	0.000	0.983	9021
Sunni Vote Share	0.037	0.066	0.000	0.773	9021
Shia/ Alliance vote share	0.055	0.128	0.000	0.983	9021
Panel C: Village level variables:					
Madrasa enrollment/School enrollment					
Total	0.022	0.064	0.000	0.769	1123
Male	0.020	0.064	0.000	0.750	1121
Female	0.025	0.092	0.000	1.000	1097
Madrasa enrollment/School-age Children					
Total	0.015	0.039	0.000	0.556	1131
Male	0.015	0.042	0.000	0.387	1131
Female	0.015	0.054	0.000	0.783	1127
School Enrollment Rate					
Total	0.781	0.201	0.000	1.000	1131
Male	0.834	0.178	0.000	1.000	1131
Female	0.693	0.283	0.000	1.000	1127

Table A.2: Robustness to Bandwidth Selection - Religious Party Outcomes

	Vote Share in Provincial Elections			Vote Share in National Elections		
	Religious Parties (1)	Sunni Parties (2)	Shia/ Alliance (3)	Religious Parties (4)	Sunni Parties (5)	Shia/ Allia (6)
ate Radio	0.020**	0.011*	0.010	0.005	0.011**	-0.001
	(0.009)	(0.006)	(0.006)	(0.009)	(0.005)	(0.007)
ervations	3949	4128	4091	5091	3882	6625
an of dep. var.	0.098	0.058	0.040	0.096	0.040	0.053
imal bandwidth						
tside boundary	5.895	7.290	5.414	6.791	7.045	6.847
imal bandwidth						
side boundary	7.680	7.478	8.201	9.505	6.615	13.083
vince FE?	Yes	Yes	Yes	Yes	Yes	Yes
litional Controls?	Yes	Yes	Yes	Yes	Yes	Yes

es. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** p<.01, ** p<.05, *p<.1.

Table A.3: Robustness to Bandwidth Selection - Schooling Outcomes

	Madrasa enrollment/ School enrollment			Madrasa enrollment/ School-age Children			School Enrollment Rate		
	Total (1)	Male (2)	Female (3)	Total (4)	Male (5)	Female (6)	Total (7)	Male (8)	Female (9)
Private Radio	0.011*	0.013*	-0.009	0.010**	0.010**	0.008	-0.019	-0.001	-0.024
	(0.008)	(0.009)	(0.015)	(0.005)	(0.006)	(0.007)	(0.029)	(0.024)	(0.038)
Observations	786	740	765	788	736	1095	962	1098	949
Mean of dep. var.	0.023	0.022	0.023	0.016	0.016	0.015	0.780	0.833	0.692
Optimal bandwidth outside boundary	9.912	9.414	6.938	9.033	9.654	10.061	8.731	10.293	9.807
Optimal bandwidth inside boundary	10.754	10.184	12.579	11.257	9.928	17.116	15.157	16.974	14.358
Province FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** p<.01, ** p<.05, *p<.1.

Table A.4: Robustness to Quadratic Specification - Religious Party Outcomes

	Vote Share in Provincial Elections			Vote Share in National Elections		
	Religious Parties (1)	Sunni Parties (2)	Shia/ Alliance (3)	Religious Parties (4)	Sunni Parties (5)	Shia/ Allia (6)
ate Radio	0.031***	0.017***	0.008	0.004	0.011**	-0.006
	(0.009)	(0.006)	(0.006)	(0.010)	(0.006)	(0.008)
ervations	8225	9773	8020	7455	6398	7806
an of dep. var.	0.098	0.054	0.042	0.093	0.038	0.056
imal Bandwidth	14.430	16.954	14.074	12.599	10.839	13.150
vince FE?	Yes	Yes	Yes	Yes	Yes	Yes
litional Controls?	Yes	Yes	Yes	Yes	Yes	Yes

es. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** p<.01, ** p<.05, *p<.1.

Table A.5: Robustness to Quadratic Specification - Schooling Outcomes

	Madrasa enrollment/ School enrollment			Madrasa enrollment/ School-age Children			School Enrollment Rate		
	Total (1)	Male (2)	Female (3)	Total (4)	Male (5)	Female (6)	Total (7)	Male (8)	Female (9)
Private Radio	0.013	0.017*	0.001	0.009	0.012	0.009	-0.032	0.000	-0.054
	(0.009)	(0.010)	(0.015)	(0.006)	(0.008)	(0.007)	(0.034)	(0.028)	(0.049)
Observations	1011	992	1037	1020	987	971	1221	1385	1132
Mean of dep. var.	0.020	0.018	0.024	0.014	0.014	0.014	0.781	0.836	0.693
Optimal Bandwidth	13.575	13.343	14.262	13.612	13.152	12.972	16.066	18.431	15.071
Province FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** p<.01, ** p<.05, *p<.1.

Table A.6: Robustness to removing 1K around the 50K boundary - Religious Party Outcomes

	Vote Share in Provincial Elections			Vote Share in National Elections		
	Religious Parties (1)	Sunni Parties (2)	Shia/ Alliance (3)	Religious Parties (4)	Sunni Parties (5)	Shia/ Allia (6)
...ate Radio	0.023**	0.018***	0.020***	0.004	0.006	-0.004
	(0.010)	(0.006)	(0.006)	(0.014)	(0.005)	(0.014)
...ervations	4104	5661	5506	3070	4623	2604
...n of dep. var.	0.099	0.056	0.040	0.101	0.039	0.063
...imal Bandwidth	8.410	10.958	10.674	6.363	9.012	5.618
...vince FE?	Yes	Yes	Yes	Yes	Yes	Yes
...litional Controls?	Yes	Yes	Yes	Yes	Yes	Yes

es. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** p<.01, ** p<.05, *p<.1.

Table A.7: Robustness to removing 1K around the 50K boundary - Schooling Outcomes

	Madrasa enrollment/ School enrollment			Madrasa enrollment/ School-age Children			School Enrollment Rate		
	Total (1)	Male (2)	Female (3)	Total (4)	Male (5)	Female (6)	Total (7)	Male (8)	Female (9)
Private Radio	0.026**	0.030**	-0.011	0.014*	0.018*	0.014	0.016	0.012	0.012
	(0.013)	(0.014)	(0.027)	(0.009)	(0.011)	(0.011)	(0.032)	(0.029)	(0.043)
Observations	554	526	450	491	462	675	930	925	945
Mean of dep. var.	0.024	0.023	0.024	0.016	0.018	0.015	0.781	0.834	0.694
Optimal Bandwidth	8.478	8.187	7.271	7.650	7.211	10.028	13.498	13.418	13.733
Province FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** p<.01, ** p<.05, *p<.1.

Table A.8: Falsification of Religious Party Vote Share Outcomes at 40 KM and 60 KM Boundaries

	Vote Share in Provincial Elections			Vote Share in National Elections		
	Religious Parties (1)	Sunni Parties (2)	Shia/ Alliance (3)	Religious Parties (4)	Sunni Parties (5)	Shia/ Alliance (6)
	Panel A – 40 KM Boundary					
Inside Boundary	-0.004	-0.002	0.000	0.002	0.002	0.006
	(0.006)	(0.004)	(0.005)	(0.006)	(0.003)	(0.006)
Observations	5000	4191	5863	5094	4830	4540
Mean of dep. var.	0.086	0.051	0.035	0.074	0.035	0.040
Optimal Bandwidth	4.958	4.138	5.911	4.795	4.546	4.234
	Panel B – 60 KM Boundary					
Inside Boundary	0.001	0.010*	-0.011	-0.008	-0.000	-0.002
	(0.011)	(0.008)	(0.007)	(0.010)	(0.005)	(0.008)
Observations	2279	2716	2604	2201	3371	2350
Mean of dep. var.	0.115	0.055	0.060	0.103	0.038	0.068
Optimal Bandwidth	6.609	7.985	7.594	6.000	9.544	6.370
Province FE?	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls?	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table presents RD estimates on religious party vote share outcomes at boundaries 40 km and 60 km around private radio stations in Panels A and B, respectively. In Panel A, the additional control includes the fraction of soil highly suited to agriculture, which is imbalanced at the 40 km boundary. In Panel B, additional controls include the fraction of soil marginally suited to agriculture, agricultural land and mosaic agriculture which are imbalanced at the 60 km boundary. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** p<.01, ** p<.05, *p<.1.

Table A.9: Falsification of Schooling Outcomes at 40 KM and 60 KM Boundaries

	Madrasa enrollment/ School enrollment			Madrasa enrollment/ School-age Children			School Enrollment Rate		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Panel A − 40 KM Boundary								
Inside Boundary	0.004	0.004	0.008	0.002	0.003	0.002	-0.009	-0.009	0.020
	(0.008)	(0.008)	(0.011)	(0.005)	(0.006)	(0.006)	(0.024)	(0.025)	(0.033)
Observations	905	1105	844	803	923	800	1284	1096	1245
Mean of dep. var.	0.020	0.018	0.022	0.014	0.014	0.014	0.789	0.834	0.712
Optimal Bandwidth	9.011	10.898	8.554	7.976	9.129	7.951	12.442	10.749	12.103
	Panel B − 60 KM Boundary								
Inside Boundary	0.008	0.000	0.003	0.004	0.003	0.011	-0.009	0.002	-0.015
	(0.010)	(0.011)	(0.016)	(0.006)	(0.007)	(0.010)	(0.034)	(0.033)	(0.048)
Observations	417	423	536	427	467	744	611	558	598
Mean of dep. var.	0.024	0.023	0.030	0.016	0.016	0.017	0.772	0.840	0.663
Optimal Bandwidth	7.131	7.283	9.539	7.315	8.038	12.748	10.350	9.547	10.205
Province FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table presents RD estimates on schooling outcomes at boundaries 40 km and 60 km around private radio stations in Panels A and B, respectively. In Panel A, the additional control includes the fraction of soil highly suited to agriculture, which is imbalanced at the 40 km boundary. In Panel B, additional controls include the fraction of soil marginally suited to agriculture and mosaic agriculture which are imbalanced at the 60 km boundary. Robust standard errors adjusted for optimal bandwidth selection presented in parentheses. *** $p<.01$, ** $p<.05$, *$p<.1$.