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Abstract

The literature documenting the effect of electoral gender quotas on policy is extensive, and yet its potential mechanisms remain under-explored. In this paper, we examine the relative importance of differential preference of women leaders (supply) vis-a-vis greater demand expressed by women voters in the presence of female leadership in explaining the gender quota effect. We compile data on *household* level allocation of a politically salient good—toilets—for the entire rural population (over 25 million households) of Uttar Pradesh, the largest state of India. We argue and show that women exhibit a greater preference for toilets than men and this gender gap is significantly larger for Muslims than Hindus. Additionally, women in female headed households, relative to male headed ones, are more likely to express greater demand. We use the religious and gender identities of council presidents and household heads as proxies for toilet preference to disentangle demand and supply effects. Using a fuzzy regression discontinuity design, we find that gender quota among Muslim leaders has a large and statistically significant positive effect on toilet provision, while for Hindu leaders it doesn't have any average effect. Hindu female leaders, however, allocate disproportionately more toilets to *Muslim* female headed households. We establish that greater demand expressed by households explains most of the heterogeneous effects of gender quota across Hindu and Muslim Sarpanches, while we do not find any evidence of the supply mechanism. Our results have important policy implications and can reconcile the mixed evidence on the effects of gender quotas in elections.

JEL Classification: D78, H42, I18
Keywords: Sanitation, open defecation, women's agency, public good preference

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1 Introduction

There is now an extensive literature that documents whether gender of a political leader affects policy in India (Chattopadhyay & Duflo, 2004; Ban & Rao, 2008; Bardhan *et al.* , 2010; Clots-Figueras, 2011, 2012; Gajwani & Zhang, 2014; Deininger *et al.* , 2015) as well as in other countries.[1] Several of these papers use affirmative action policies for women, in the form of gender quotas in political positions, to identify the causal impact. These studies are primarily motivated by the observation that preferences for public goods are gendered, i.e., women and men prefer different public goods. Hence, gender quotas should change policy, as elected women would prioritize allocation of a different set of public goods than their male counterparts.

However, the theoretical models of political economy tell us that policy is shaped by the preference of the elected leader (Alesina, 1988) as well as the preferences (Downs, 1957) of and communication of these preferences (Banerjee & Somanathan, 2001) by the voters. Importantly, female voters may express the demand for their preferred policy more vigorously in the presence of female leadership (Chattopadhyay & Duflo, 2004; Beaman *et al.* , 2007). This can happen because registering demand to elected authorities is a costly process, especially for women who face a significantly higher cost of political participation and engagement. Consequently, women may feel that their demands may be heard more in the presence of female leaders (Iyer & Mani, 2019). Hence, gender quotas can lead to changes in policies either due to differential prioritization of policies by the female leader (i.e., supply side factors) or due to differential *demand* (from the female voters) faced by her.[2] Understanding the source of the effect is important because it has implications for policies to improve the substantive representation of women. If demand matters, then policies that empower female voters and facilitate their political participation can also contribute towards this goal. It would also imply that gender quotas may be more effective in the presence of more engaged female voters.

The two mechanisms, however, are hard to disentangle as they co-move. When a female leader is elected, both the demand and supply mechanisms come into force. In this paper, we overcome this identification challenge by compiling data on allocation of a publicly provided good that is targeted at the *household* level. We identify salient population groups that systematically differ in their gender gap in preference for the good and examine whether

[1] We discuss this literature later in this section.

[2] Gender quotas can also lead to different policies because female politicians could be less experienced (Gajwani & Zhang, 2014). However, such differences tend to be temporary in nature, as women politicians have been shown to catch up very rapidly in such contexts (Afridi *et al.* , 2017). We also show in our context that women politicians coming through gender quotas do not have differential ability in governance.

female quota leads to differential allocation of the same good across households belonging to these groups. This allows us to isolate demand from supply. Heterogeneous effect of gender quota across households is by itself not an evidence of demand. The female leader could be differentially focused on certain types of households, for electoral or other reasons, which may cause heterogeneous allocation. As discussed below, our analysis is robust to this criticism.

We examine the effect of female quotas in the 2015 village council president (or, *Sarpanch*) elections for the universe of village governments or *Gram Panchayats* in Uttar Pradesh (UP), the largest state in India (and comparable to the fifth most populous country in the world) on the provision of household toilets in the subsequent year, 2016–17. We use household toilets as our target public good due to a combination of factors. First, it is well known that women have a greater preference for toilets than men (Coffey *et al.* , 2014; Khanna & Das, 2016; Stopnitzky, 2017). Hence, we expect the gender quota to have an effect on its allocation. Moreover, open defecation is widely practiced in rural India due to severe lack of sanitation facilities. Consequently the construction of toilets has recently received a lot of emphasis from the policymakers, making it a politically salient public good. Finally, since toilets are allocated to individual households, unlike many other publicly provided goods, we can identify the demand and supply mechanisms.

We use the allocation of household toilets under the the *Swachh Bharat Mission* (SBM) or 'Clean India Mission', launched by the Government of India in 2014 as our outcome variable. The algorithm used to assign female quotas in the 2015 Sarpanch elections allows us to employ a fuzzy regression discontinuity design (RDD) to estimate the causal effect of the quota.[3] We compile a household level dataset on allocation of toilets for the entire rural population of UP (over 25 million households) and match it to the election results for the universe of about 59,000 GPs of the state. We find that, on average, gender quotas in 2015 lead to 15–28% increase (depending on bandwidth) in the probability of allocation of toilets to eligible households in 2016–17. The average effect, however, is imprecisely estimated. We then argue and show that the average noisy effect masks significant heterogeneity across the Gram Panchayats (GPs).

To uncover the heterogeneity, we first notice that the gender gap in the preference for toilets is significantly higher among Muslims than Hindus. This is due to religious considerations of purity and pollution that Hindus associate with in-home toilets (Coffey *et al.* , 2014, 2017). Such purity concerns are absent among Muslims, leading to a greater gender gap in preference for household toilets.[4] Using survey data on usage of and preference for toilets in

[3]We discuss the quota assignment algorithm in Section 2.2 and the associated identification strategy in Section 5.1.

[4]Another possible consideration among Muslim households might be greater restrictions on the mobility

rural North India (including UP), we find that the gender gap in preference is indeed significantly greater among Muslim households compared to Hindu households. We divide the GPs by the Sarpanch's religious identity, i.e., Hindu and Muslim, and separately estimate the impact of gender quota within each sample. While the samples of GPs with either Hindu or Muslim Sarpanches are clearly endogenous, our identification method works in each of the sample separately, producing causal effects of gender quotas in the two samples. We discuss this in detail in Section 5.4.

We argue that if the preferences of either voters (demand) or Sarpanches (supply) at all matter for toilet provision, then we should find a larger effect of the quota among Muslim Sarpanches compared to Hindu Sarpanches. This greater effect could either result from the larger gender gap in preferences among Muslim Sarpanches or a greater demand from women in the Muslim households, who are relatively numerous in GPs where Muslim leaders win. Consistent with this, we find that among Hindu Sarpanches, gender quota has no average effect on toilet construction. On the other hand, gender quota within Muslim Sarpanches increases toilet construction by 15 percentage points on a sample average of 13%, i.e., allocation probability more than doubles.

To identify the demand mechanism, we examine heterogeneity in the treatment effect across households headed by men and women.[5] For this, we use data on the gender identity of the household head, available for a subset of households that were eligible for the scheme. We argue that a household may register a greater demand for a toilet if it is headed by a woman. We show using pan-India survey datasets, that women members in female headed households exercise greater decision-making power within the household, enjoy greater autonomy in public participation, and indeed, participate more in the local political activities within the village. Therefore, we hypothesize that if demand is important, then the gender quota effect among either Hindu or Muslim Sarpanches is likely to be greater for households headed by women. Consistent with this, we find that gender quota among Hindu Sarpanches leads to a differentially large increase in the probability of toilet allocation to *Muslim* female headed households.[6] The Hindu female headed households also experience a differentially greater increase in the allocation probability. The effect, however, is smaller in magnitude

of women compared to Hindus, and consequently, restrictions on Muslim women to defecate in the open.

[5]We do not examine heterogeneous treatment effect across Hindu and Muslim households, as Muslim Sarpanches allocating greater number of toilets to Muslim households can be due to own-group favoritism–a supply side consideration. Moreover, both Hindu and Muslim Sarpanches could have electoral motives to allocate more toilets to Hindus, the majority group in both samples, which may lead to underestimation of the demand effect.

[6]We identify the religion of households by using a machine learning algorithm developed by Chaturvedi & Chaturvedi (2020) that predicts with high degree of accuracy the religion of a household based on the name of the household head. We discuss this in further detail in Section 4.4.

and statistically imprecise. The observation that Hindu female Sarpanches allocate more toilets to Muslim female headed households, relative to Hindu ones, establishes the demand mechanism. It also rules out the possibility that female Sarpanches being more concerned about (or focused on) female headed households in general drives the result.[7] Since female headed households comprise only 4% of eligible households, the average gender quota effect among Hindu Sarpanches becomes small and statistically insignificant.

Among Muslim Sarpanches, we find that gender quota differentially increases toilet provision to *both* Hindu and Muslim female headed households, but the effect is larger in magnitude and is statistically significant for the latter. These results show that household demand is an important factor in explaining heterogeneity in gender quota effect across GPs. Moreover, we show that the result is stronger in GPs with high population share of Muslims, i.e., in GPs that are likely to have a higher collective demand for toilets. Therefore, we find that the effect of household demand on the likelihood of it receiving the good partly depends on the overall level of demand in the population. Additionally, we examine the effect of electing female Sarpanches in open elections (i.e., elections without female quotas) using close elections between male and female candidates and find consistent patterns.

To identify and estimate the supply mechanism, we focus on GPs that had a close election between a Hindu and a Muslim candidate (both in GPs with and without female quotas). Within this sample, the religion of the Sarpanch is, in effect, randomly assigned. Hence, if we compare the GPs with Hindu and Muslim Sarpanches within this sample, they would on average, have the same demographic composition and voter preferences. Consequently, the demand effect induced by the female quota would, on average, be same across these two samples. Therefore, any differential female quota effect in the GPs with Muslim Sarpanches (relative to Hindu ones) would be evidence of the supply mechanism. We, however, find a null effect, implying that the supply mechanism is not present in our context. We, therefore, conclude that the overall effect of gender quota and more importantly its heterogeneity across villages can be explained exclusively by demand side factors.

The pioneering study by Chattopadhyay & Duflo (2004) that led to the emergence of this literature, considers both demand and supply mechanisms.[8] They indeed find that

[7]The observation could be consistent with Muslims being over-represented among the *eligible* female headed households, i.e., those that did not own toilet before 2016—17. Any emphasis by Hindu female Sarpanches to provide toilets to female headed households then may imply greater benefits going to Muslim female headed households. However, we do not find support for this argument in the data. The share of Muslim households among eligible female headed households is 11.76%, while that in the entire population of female headed households is 13.71%.

[8]They make distinctions between two related but separate supply mechanisms—female leaders implementing their differential preferences and female leaders being more responsive to female voters' preferences. They however do not find support for the second mechanism.

women voters express their preferences more under female leadership, suggesting presence of the demand channel. They, however, do not examine—possibly due to identification challenges—whether greater voicing of preferences by women voters causally influenced the treatment effect. Their results show that differential preference of female Sarpanches is likely to be the primary driver of the differential allocation of public goods. Subsequent papers in this literature do not explore these mechanisms.[9] We contribute to this literature by providing an identification strategy for estimating the demand effect and empirically demonstrating its importance.

While the literature emerged from the Indian context, several papers estimate the effect of female leaders on policy in other countries (Van der Windt *et al.* , 2018 (Congo); Devlin & Elgie, 2008 (Rwanda); Franceschet & Piscopo, 2008 (Argentina); Braga & Scervini, 2017 (Italy); Campa, 2011 (Spain); Ferreira & Gyourko, 2014 (USA)), as well as using cross-country comparisons (Dollar *et al.* , 2001; Swamy *et al.* , 2001; Barnes & Burchard, 2013; Hicks *et al.* , 2016; Bhalotra *et al.* , 2020). The literature, however, finds mixed evidence on the presence of gender quota effect, both in India as well as internationally. Bardhan *et al.* (2010), for example, do not find that female quotas lead to differential public good provision in GPs in West Bengal.[10] Our results help reconcile the mixed findings in the literature by showing explicitly that variation in demand across regions within the same state can critically shape the effect of gender quota on a politically salient good for which preference is starkly gendered.

2 Background

2.1 Swachh Bharat Mission

Sanitation policies have been around in India since 1986 when the Government of India launched the Central Rural Sanitation Program. The program was rechristened as the Total Sanitation Campaign (TSC) in 2000 and again as Nirmal Bharat Abhiyan (NBA) in 2012. These efforts were largely unsuccessful in achieving the desired reduction in open defecation rates in India. The proportion of households having toilets stood at 37% in 2001 which increased to 47% in 2011 (Census 2001, 2011). In rural India these numbers stood at 22% and 30.7% in 2001 and 2011 respectively—a paltry increase of 8 percentage points over a

[9] Beaman *et al.* (2007) point out the possibility of demand effects, but do not test for it. Bhalotra *et al.* (2018) experimentally demonstrate that citizens' reactions to the leader's religious identity in rural UP change the outcome of a coordination game.

[10] Internationally, Van der Windt *et al.* , 2018; Devlin & Elgie, 2008; Campa, 2011; Ferreira & Gyourko, 2014 find null effects while Franceschet & Piscopo, 2008; Braga & Scervini, 2017; Bhalotra *et al.* , 2020 find that women leaders indeed pursue different policies.

decade. The state of Uttar Pradesh, the context of our study, fared worse than the national average, with 19% and 22% rural households having access to toilets in 2001 and 2011 respectively.

In the most recent efforts to increase access to toilet access for households, Swachh Bharat Mission (SBM) or the 'Clean India Mission' was launched in October 2014 by the newly formed central government, led by the Bharatiya Janata Party (BJP), that came to power in May 2014. Providing access to toilets was one of the important policy platforms of the BJP during its election campaign. Therefore, after winning the elections, the government allocated substantial resources under the SBM towards construction of household and community toilets across the country. We specifically examine toilet construction in rural Uttar Pradesh (UP) because the lack of access to toilets and the incidence of open defecation is primarily concentrated in rural India, and especially so in UP.[11] The main thrust under the rural component of SBM was to provide subsidy towards the construction of household toilets. A subsidy of ₹12,000 was provided for construction of each Individual Household Latrine (IHHL).[12] A baseline survey was conducted in 2012 by the Government of India to identify households without toilets and determine the household eligibility for subsidy towards construction of IHHL.

The subsidy was provided in the form of a reimbursement, which a household could apply for after initiating toilet construction. It was paid in two installments of ₹6,000 each. The first installment was paid when the household reported that a pit was dug and filled out an agreement form. The second installment was paid after completion of toilet with the structure and submission of a completion form. These forms had to be submitted to the District Panchayat Office. All the households below the poverty line (BPL) were eligible for this subsidy. Among the above poverty line (APL) households, those belonging to Scheduled Castes, Scheduled Tribes, small and marginal farmers, landless laborers with homestead, physically handicapped and women headed households were eligible for subsidy.

Data from the Ministry of Drinking Water and Sanitation show that there has been a steady expansion of toilets since the start of the program in 2014. The proportion of rural households having toilets has increased from 38% in 2014 to 84% in 2018. In UP, the same has increased from 30% in 2014 to 66% in 2018. We comment on this data and its quality in greater detail in Section 4.2.

[11] According to Census 2011, 92 percent of households without access to a toilet or latrine were rural. Similarly, the Indian Human Development Survey (IHDS) 2011–12 reports that 90 percent of households practicing open defecation live in rural areas.

[12] The SBM promotes construction of twin-pit structures for toilets so that the feces decompose by themselves and no frequent manual cleaning of fecal sludge is required. This subsidy, on an average, is sufficient to cover all costs related to a twin-pit toilets in India. However, if a household wanted it could build a better quality toilet. The subsidy amount would remain unchanged.

2.2 Gram Panchayat

2.2.1 Structure and Responsibilities

The village councils or Gram Panchayats (GPs) are the lowest tier of the local governance structure in rural India. The council in a GP consists of elected members and a president or head of the council, who is known as the Sarpanch of the GP. The members are elected from individual wards within a GP, and the Sarpanch is either directly or indirectly elected depending on the state. In UP the Sarpanch is elected directly following a presidential system. The council is responsible for provision of local public goods such as hand pumps, toilets, local roads etc. and employment under public works. Moreover, the Sarpanch within the council enjoys substantial executive power in deciding the public good priorities of the council and its overall expenditure pattern (Besley *et al.* , 2004; Das *et al.* , 2017; Gulzar *et al.* , 2020).

The GPs played a pivotal role in the implementation of the SBM program. While the program implementation was monitored at the district level by the district magistrate, the primary implementing agency at the village level was the GP. The council was in charge of the identification of potential beneficiaries, fund flow and maintenance of records, mobilization of demand for construction of toilets, actual construction of toilets, and social audits.

2.2.2 Elections

The GP elections in Uttar Pradesh were held during November–December 2015. We focus on the election of Sarpanches in the GPs, as they are the key decision-makers within the council. The Sarpanch elections are subject to affirmative action policies or quotas for various caste (or ethnic) groups as well as for women. This is known as the "reservation policy" which sets aside a certain number of Sarpanch positions within each block for three disadvantaged caste groups —Scheduled Tribes (STs), Scheduled Castes (SCs) and Other Backward Classes (OBCs), where only members of these groups can run as candidates in the elections. If a GP is not reserved for any caste group then we refer to it as an unreserved GP. Within each of the four categories of GPs (reserved for ST, SC, OBC and unreserved), at least one-third are again reserved for women. If the Sarpanch position in a GP is reserved for SC and woman, for example, then only female SC candidates can run in the Sarpanch election in that GP. For unreserved GPs that are reserved for women, any woman can contest the election.

Due to the delimitation of constituencies of GPs based on the 2011 census, the assignment of SC, ST and OBC reservation, as well as female reservation for the 2015 elections was done

afresh, disregarding the allotment status in the previous elections.[13] Unlike some other states, the allocation of reservation positions across GPs in UP is not randomized but is based on a deterministic algorithm that we describe below.

2.2.3 Caste Reservation

The reservation status of GPs in the 2015 Sarpanch elections in UP was decided separately for each block. The proportion of Sarpanch positions to be reserved for a caste group in a block equals the rural population share of that caste group in that block. The number of GPs to be reserved for a caste group in that block is then determined by rounding off the the calculated share. The GPs within a block were first arranged in the descending order of the ST population share of the GPs. Then the top ranked GPs were selected to be reserved for ST, where the number of reserved GPs is given by the rounded off number calculated in the previous step. Then the remaining GPs within the block were arranged in descending order of their SC population shares. Again, the top ranked GPs were selected to be reserved for SC. For the remaining GPs within the block, OBC reservation status was decided using the same procedure.

2.2.4 Gender Reservation

At least a third of Sarpanch positions allocated to every caste group in each block are reserved for females of that caste. For this, the GPs reserved for a caste group are ranked in descending order of the population share of that caste. Top one-third of these GPs, rounded off to the higher integer, are reserved for women. The unreserved GPs in a block are listed in descending order of the "general" category population in the GPs.[14] We implement the caste and gender reservation algorithms using the population figures from the 2011 census, the same figures that the state government officials used. We are able to correctly predict the allotment of female reservation in almost 98 percent of GPs using the above algorithm.

3 Preference for Household Toilets

We use toilet allocation as our primary policy outcome. In this section, therefore, we discuss the existence of a gender gap in preferences for toilets and systematic differences in the gender gap in preference across well-identified population groups —across religions, i.e., Hindus and Muslims, and across male and female headed households.

[13] This was in accordance with the 10th amendment of Uttar Pradesh Panchayat Raj (Reservation and Allotment of Seats and Offices) Rules 1994.

[14] The "general" category is the group of upper castes, i.e., those who are not STs, SCs, or OBCs.

3.1 Gender Gap in Preferences

We first argue that women have a greater preference for household toilets than men (Coffey *et al.* , 2014; Khanna & Das, 2016; Stopnitzky, 2017). This is motivated by the observation that notions of shame and dignity are associated more strongly with women, especially in rural India, leading to their lower preference for defecating in the open. Men, on the other hand, consider defecating in the open a sign of strength and masculinity. Moreover, women face a greater risk of being harassed or attacked while defecating in the open (Mahajan & Sekhri, 2020). Additionally, menstruating women may prefer to use toilets due to hygiene concerns. Coffey *et al.* (2014) show direct evidence of gender gap in toilet preference by capturing within household variation in open defecation rates in the SQUAT survey (2014).[15] They find that among the households owning a latrine, men are twice as likely to defecate in the open than women. This suggests a lower revealed preference for open defecation among women. We validate this using the SQUAT survey data and find that women are 9 percentage points more likely to use a toilet, conditional on the household owning one, even within the same household (Appendix Table B1: Panel A, columns (1) and (2)). We also find that for the sample of households that do not own toilets, women report having higher preference for toilets than men (Appendix Table B1: Panel A, columns (3), (4) and (5)). We discuss the detailed results in Appendix Section A.1.

3.2 Gender Gap in Preferences across Religions

Having established the existence of gender gap in the preference for household toilets, we now argue that this gender gap is larger among Muslims than Hindus. This observation is motivated by existing evidence in the literature. For instance, Coffey *et al.* (2017) discuss the reasons for high rates of open defecation among Indian rural population than Sub-Saharan countries, despite higher per capita incomes, education and water availability.[16] Their findings show that cultural factors affecting notions of 'purity and pollution' among the Hindus, associated with defecating within a house, are an important factor for higher open defecation rates in India. Such purity concerns are absent among Muslims. Moreover,

[15]The SQUAT survey was carried out in rural areas of northern states of India, namely in Bihar, Uttar Pradesh, Haryana, Madhya Pradesh and Rajasthan, and captures information about household ownership and individual usage of toilets. The states in the survey are culturally similar in terms of their gender attitude and include the state that we study. The dataset is publicly available here: https://riceinstitute.org/data/2014-and-2018-rural-sanitation-surveys/.

[16]In 2015, the proportion of rural population in India defecating in the open stood at 43% while this figure was 32% for rural Africa and the world average in rural areas was 20%. The figures in rural parts of comparable economies like Bangladesh stood at 1.7% and China at less than 1% (World Development Indicators).

Muslim women face greater restrictions on mobility than Hindus, resulting in greater demand for household toilets.[17] Consequently, they have a higher likelihood of owning and using toilets than Hindus, in spite of being poorer than Hindus on average. Coffey *et al.* (2017) report that only 4% of rural Hindu households used inexpensive pit latrines, compared to 15% rural Muslim households. Data from the National Family Health Survey (NFHS) 2015–16 also show that Muslim households are 21% less likely than Hindu households to defecate in the open. In fact, Geruso & Spears (2018) argue that differential sanitation practices of Muslims and Hindus can explain the longstanding puzzle that in India, "[...]Muslim children are substantially more likely than Hindu children to survive to their first birthday, even though Indian Muslims have lower wealth, consumption, educational attainment, and access to state services."

We again validate this claim using the SQUAT survey data. We find that among households owning toilets, the gender gap in usage of toilets (i.e., in revealed preference for toilets) is 50% higher among Muslims compared to Hindus within the same village (Appendix Table B1: Panel B, columns (1) and (2)). Among households that do not own toilets, gender gap in preference for toilets is also significantly higher among Muslims (Appendix Table B1: Panel B, columns (3), (4) and (5)). Appendix Section A.2 discusses these results in detail.

3.3 Demand across Male and Female Headed Households

Toilet is a household level public good, even though preference for it differs starkly across male and female members of the household. Therefore, conditional on the preferences of the members of a household, whether the household publicly expresses a demand for toilets to the local government may depend on who is at the helm of the household. For instance, Coffey *et al.* (2014) discuss that young women are likely to have the largest demand for latrine use but have the least decision making power within the household. Therefore, the capacity or willingness of a household to register its demand may depend on the relative bargaining power and autonomy of women within the household as well as their political participation.[18] We argue that, conditional on the religious identity of a household, which captures the gender gap in preference within the household, it will publicly express greater demand for a toilet if it is headed by a woman. This is because, women belonging to a female headed household enjoy more decision-making power and autonomy as well as participate

[17] We find evidence of this claim in the National Family Health Survey (NFHS) 2015 that asked women if they can visit various public spaces in their village on their own. Muslim women are 7 percentage point less likely to say yes, relative to Hindu women (Appendix Table B2: Panel B, column (2)).

[18] Bargaining power within the household may be important in our context, since household often has to begin construction, i.e., pay an upfront cost, before seeking the subsidy for toilet under the SBM scheme, as described in Section 2.1.

more in the local political activities.

We test this claim using two nationally representative survey datasets, namely the National Family Health Survey 2015 (NFHS-4) and Rural Economic and Demographic Survey 2006 (REDS) data. We show that women from female headed households are significantly more likely to make household decisions on their own, venture out alone in public spaces, attend village meetings, and participate in activities of the political parties. We report the results in Appendix Table B2: Panel A and discuss them in Appendix Section A.3. Moreover, this difference between female and male headed households is similar across Hindus and Muslims (Appendix Table B2: Panel B).[19]

4 Data

4.1 GP Election

Detailed results for the 2015 GP head (or *Sarpanch*) election come from the State Election Commission of Uttar Pradesh. We focus on the 2015 election since this is the first election after the current central government came into power in 2014 and gave the sanitation campaign a major push by launching the SBM program in October 2014. There are over 59,000 GPs in UP and about 470,000 candidates contested the Sarpanch election in 2015. The election data contains information on candidate characteristics, such as their gender, caste etc., as well as the votes received by each of them. The election data also provides the reservation status of the Sarpanch position for each GP.

4.2 Toilet Construction

We compile household level toilet construction data using detailed information available on the official website of SBM maintained by the Ministry of Drinking Water and Sanitation, Government of India.[20] We scraped the data during March to April, 2018. The website provided the full list of households living in each GP and for each household, it indicated whether the household had a toilet at the time of the baseline survey, carried out in 2012. It subsequently tracked each household from 2013–14 onwards, and indicated whether it had a

[19]There is mixed evidence on whether female headed households (FHH) in rural India are poorer than male headed households. While Dreze & Srinivasan (1997) find no evidence that this is true, Gangopadhyay & Wadhwa (2004) show using more recent data that FHH are indeed poorer. We discuss the relevance of this issue for our results in Section 6.2. Dreze & Srinivasan (1997) also report that FHH have smaller household size than average. If it is easier to make a collective decision when household size is small, then this can also contribute to FHH expressing greater demand for toilet under female Sarpanches.

[20]The official website of SBM is https://swachhbharatmission.gov.in/.

toilet at the end of each financial year.[21] This information is given along with the name of the household head, the name of the parent or spouse of the head, and certain characteristics of the household such as whether it was Below Poverty Line (BPL), landless, whether the household head is a woman etc. For our purpose, we focus on toilet construction in the year 2016–17, the year following the Sarpanch elections in UP. This was the first financial year post the GP elections in UP. Moreover, in 2017, the ruling party at the center (the BJP) won the UP state election. The state government subsequently heavily pushed the SBM scheme in the state, especially in areas where construction was lagging, since the target set by the central government was to reach 100% toilet access by the end of 2019. Hence, toilet construction during 2016–17 is more likely to reflect political will of the Sarpanch and household demand in the GP, rather than being driven by the policy priorities of the state government. In rural Uttar Pradesh, the proportion of households having a toilet increased from 32% in 2012–2013 to 37.5% in 2015–2016 and further to over 44% in 2016–2017 (i.e., by 7 percentage points in just one year post the launch of SBM).

Data Quality: We provide evidence to show that the administrative data is of good quality for the period we consider. First, Mahajan & Sekhri (2020) show that the correlation between district level toilet coverage in the administrative data for 2015–16 with toilet ownership reported by households in NFHS-4, also conducted in 2015–16, is fairly high (0.70). We plot the proportion of households in a district with toilet access from the two data sources for the state of Uttar Pradesh in Appendix Figure B1 and demonstrate a similarly high association between them in our context.[22] In another study, Gupta *et al.* (2019) resurveyed a subset of households from the SQUAT survey of 2014 in 2018, to examine toilet construction under SBM and changes in open defecation during 2014–18.[23] They report that 74% of households in rural UP had toilets in October, 2018.[24] According to the administrative data, 64% of households in rural UP had toilets at the end of 2017–18, i.e., by March 2018. These figures are highly comparable. Moreover, they also observe a large drop (26 percentage points) in open defecation during 2014–18, and find that "nearly the entire change in open defecation between 2014 and 2018 comes from increases in latrine ownership, rather than

[21] From 2019 onward, the website only provided the list of households that received toilets in a year, i.e., it stopped showing the full list of households.

[22] One source of noise is the fact that NFHS proportions are estimates. Moreover, there is a small difference in coverage periods for the two data sources. The administrative data gives coverage at the end of fiscal year 2015–16 while NFHS reports an average over 2015–16. Thus, the official data is likely to report slightly higher coverage on an average.

[23] The 2018 resurvey was carried out in the states of Rajasthan, Madhya Pradesh, Uttar Pradesh and Bihar.

[24] This is an estimate for the entire rural UP arrived at using census population weights. The average estimate for the four states in the survey is 71%.

from changes in behaviour." This further validates the administrative data and confirms that toilet construction under SBM in the initial years led to perceptible changes in the practice of open defecation in these states.[25]

4.3 Census

We complement the data on election results and toilet construction with the Census 2011 village population and amenities data. The census villages are smaller geographic units than GPs. For instance, in UP there are about 106,000 census villages and 59,000 GPs. We use mapping between census villages and the GPs prepared by the Ministry of Panchayati Raj, Government of India to construct GP level figures from the census data.[26] Moreover, the state government of UP shared with us the caste group wise population (for General caste, OBCs, SCs, and STs) at the GP level for the entire state.

4.4 Religion Identification in Rural U.P.

We wish to identify preference for toilets using religious identity of beneficiaries and politicians. We focus on Hindus and Muslims, who are the primary religious groups in UP comprising more than 99% of the rural population (Census, 2011). The data on election results and the toilet construction do not provide information on religion. For this reason, we identify the religion using the names of household heads and candidates in village elections. We take advantage of the fact that the names of Hindus and Muslims in India are distinct. For example, Bhalotra *et al.* (2014) and Heath *et al.* (2015) infer religion of electoral candidates in India from their names. Therefore, we manually classify religion of candidates as Muslim or non-Muslim (which we refer to as Hindu) based on their names and the names of their parent or spouse.

For identifying the religious affiliation of the households, we use the names of the household heads and their fathers' or spouses' names. There are about 25 million households in rural Uttar Pradesh. Therefore, manual classification is not feasible. To overcome this, we use a new and highly accurate algorithm proposed by Chaturvedi & Chaturvedi (2020) who infer religion from names using character sequence based machine learning models used in Natural Language Processing (NLP).[27] Character sequence based models have the advan-

[25] It is possible that the administrative data is potentially manipulated in 2019, as there was an emphasis from the government to attain 100% toilet coverage by the end of 2019. Our period of study, 2016–17, however, is safely removed from such manipulation concerns.

[26] The mapping is accessed from the website `www.lgdirectory.gov.in` maintained by the ministry.

[27] For our purpose, we use a deep learning architecture which combines convolutional neural network with long short-term memory recurrent neural network.

tage that they can exploit differences in linguistic origins of the two religions, and hence can classify unseen names with a high degree of accuracy. In contrast, dictionary based methods which use string matching to identify religion can only classify names that exist in a predefined name list.

Within a random sample of manually annotated 20,000 households in rural UP, the model correctly identifies over 97% of true Hindus as well as true Muslims. Another test of the algorithm's accuracy is the correlation between the predicted Muslim household share at the sub-district or *tehsil* level in our data with that of Census 2011 population share of Muslims.[28] Figure B2 shows the relation between Muslim population share and the Muslim household share estimated by the algorithm at the tehsil level. The correlation between the two is 0.978. This shows that the model predicts religious affiliation of households very well in our data.

5 Overall Effect of Gender Quota

5.1 Identification

We use a fuzzy regression discontinuity design (RDD) strategy to find the causal effect of female reservation on construction of toilets. As discussed above, no less than one-third of the Sarpanch positions reserved for each caste group in every block are reserved for women of that caste. The procedure for allotment of gender quota described in Section 2.2.4 creates discontinuities in the mapping between a GP's rank in the ordered list and its female reservation status. We exploit these discontinuities to estimate the overall gender quota effect since the gender reservation status of the GPs is essentially randomized around the discontinuity for each caste group in each block. We define the running variable $X^c_{g,b}$ in GP g in block b reserved for caste group c in the following manner:

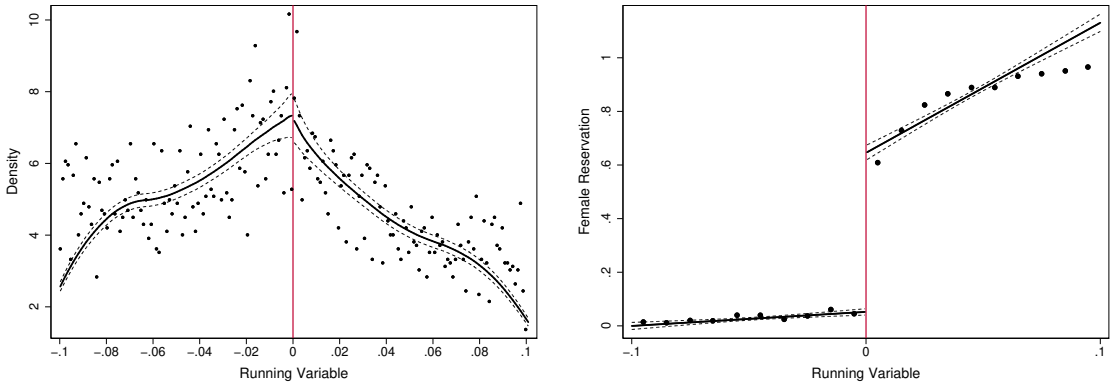
$$X^c_{g,b} = \frac{Pop^c_{g,b} - Pop^c_{threshold,b}}{\sigma^c}$$

where $Pop^c_{g,b}$ is the population share of caste c in GP g in block b, where $c \in \{SC, ST, OBC\}$. $Pop^c_{g,b}$ is the total general category population in GP g in block b for $c \in \{Unreserved\}$. The threshold value of caste c in block b is given by $Pop^c_{threshold,b}$. It is the mean of the lowest $Pop^c_{g,b}$ at which the GP Sarpanch position should be reserved for a woman of caste c in block b and the $Pop^c_{g,b}$ of the next GP in the ranking for caste c within the block. The denominator (σ^c) is the standard deviation of $Pop^c_{g,b}$ across the entire state. We follow this

[28] Sub-district or tehsil is the lowest geographic unit for which religion wise population figures are available in the 2011 Indian Census.

procedure to generate the running variable for GPs reserved for each caste category, i.e. ST, SC, OBC, as well as for the unreserved GPs. Since each GP can only be reserved for one caste or remain unreserved, this procedure gives a unique running variable for each GP depending on its caste reservation status.

Figure 1. RD plots: McCrary Plot and First Stage



(a) Overall McCrary Test

(b) Overall First Stage

McCrary test: We test for manipulation at the threshold using the test proposed by McCrary (2008). This tests for the null hypothesis that the density of the underlying running variable that defines the assignment at the discontinuity is continuous at the cutoff, against the alternative of a jump in the density function at that point, which can reflect manipulation in treatment assignment. Figure 1a shows that there is indeed no jump in the density of the running variable at the threshold.

Balance test: We perform balance tests on a large number of covariates around the discontinuity to test the validity of the RDD approach. The results for the balance tests performed for bandwidth 0.1 are shown in column (1) of Table B4: Panel A.[29] We compile a large number of development indicators using the census 2011 village amenities dataset and also test for balance in proportion of Muslim population and female headed households. As column (1) shows, there is no discontinuity in these covariates at the threshold.

Moreover, we also test for discontinuity in toilet provision at the threshold in the three years before the 2015 Sarpanch elections. Column (1) of Table B4: Panel B reports the results. We notice that the proportion of uncovered households that were provided a toilet in 2013–14, 2014–15 and 2015–16 does not change discontinuously at the threshold. These

[29]These balance tests hold at smaller bandwidths as well. We discuss bandwidth selection in Section 5.2.

results demonstrate that the female reservation assignment was indeed exogenous at the threshold value of the running variable.

5.2 Estimation Strategy

We use the running variable defined above to predict the treatment status of a GP in the first stage. The treatment variable ($Q_{g,b}$) equals one if the GP has a quota for women. The assignment variable ($A_{g,b}$) takes the value one if the female reservation algorithm predicts that the Sarpanch position should be reserved for a woman ($X^c_{g,b} \geq 0$) and 0 otherwise ($X^c_{g,b} < 0$). We restrict the sample to GPs where the running variable is near zero, i.e., $X^c_{g,b} \in [-t, t]$ for some small $t > 0$. We use the following specification:

$$Y_{h,g,b} = \alpha_0 + \tau Q_{g,b} + \alpha_1 X_{g,b} + \alpha_2 X_{g,b} * A_{g,b} + u_{g,b} \tag{1}$$

where $Y_{h,g}$ is a dummy variable that takes value one if a household h in GP g received a toilet during 2016–2017 under the SBM scheme, and zero otherwise. Our sample is the set of households which did not have toilets at the end of 2015–2016 and were eligible for the program. The treatment variable ($Q_{g,b}$) is instrumented with the assignment variable ($A_{g,b}$) in the following first stage equation:

$$Q_{g,b} = \beta_0 + \gamma A_{g,b} + \beta_1 X_{g,b} + \beta_2 X_{g,b} * A_{g,b} + \epsilon_{g,b} \tag{2}$$

We use the number of eligible households in a GP as weights in our regressions to give equal consideration to all GPs in the household level data. The standard method used to select bandwidths in RDD is the one proposed by Calonico *et al.* (2014). However, the "CCT bandwidth" is 0.475 for the second stage, which is particularly wide as it includes about 64% of GPs in the state. We, therefore, estimate the results using three manually chosen narrower bandwidths—0.100, 0.075 and 0.050 and cluster the standard errors at the GP level. The bandwidths correspond to 17.3%, 13.6% and 9.9% of GPs, respectively. Also, since we test for heterogeneity in the gender quota effects across different sub-samples, manually chosen fixed bandwidths maintain consistency and facilitate comparison of estimates across specifications.

5.3 Results

We graphically show the first stage results in Figure 1b. It shows that the likelihood of female reservation is zero on the left of the threshold and jumps to about 0.6 at the threshold. Appendix Table B5: Panel A reports the regression result for specification (2). It shows that we have a strong first stage across the three different bandwidths and the estimated

discontinuity in the probability of female reservation is in the range of 0.53–0.59 across specifications. This lines up well with Figure 1b.

Table 1—Gender Quota Effect

	HH Received Toilet in 2016–17		
	(1)	(2)	(3)
Female reservation	0.0152	0.0206	0.0282
	(0.0162)	(0.0192)	(0.0240)
Mean dep. var.	0.104	0.104	0.099
Observations	2,470,191	1,962,725	1,457,226
Number of GPs	9,179	7,234	5,277
Polynomial order	1	1	1
Bandwidth	0.100	.075	0.050

Notes: The dependent variable is a dummy that takes value one if the household received a toilet in 2016-17, and zero otherwise. The sample includes eligible households,i.e., those that did not have toilet at the end of 2015-16 and were eligible to receive toilet under the SBM scheme. The polynomial order is 1. The bandwidths are manually chosen. Standard errors clustered at gram panchayat level and reported in parentheses.

We now discuss the second stage results using the household level data. Table 1 reports the average effect of female reservation on the probability that any household without a toilet received one in 2016–2017. The coefficients at the three bandwidths—0.1 (column (1)), 0.075 (column (2)) and 0.05 (column (3))—are 0.0152, 0.0206 and 0.0282 respectively, i.e., they are all positive. The effect sizes vary from 15% (in column (1)) to 28% (in column (3)) of the mean allocation probability, i.e., they are moderate in size. But all the coefficients are statistically insignificant due to large standard errors. The average treatment effect is, therefore, positive but noisy. In the following section we show that the average noisy result subsumes significant heterogeneity across GPs.

5.4 Heterogeneity in Gender Quota Effect

Estimation: The effect of gender quota could be heterogeneous across GPs either due to supply or demand related factors. To test for heterogeneity in treatment effect, we estimate specification (1) separately for GPs with Muslim and non-Muslim (or, Hindu) Sarpanches. The gender gap in preferences is higher for Muslims than for Hindus as discussed in Section

3. Hence, the effect of gender quotas among Muslim Sarpanches on toilet provision could be higher than among Hindu Sarpanches due to differences in leader's preference (i.e., supply). However, Muslim Sarpanches are more likely to win in GPs with higher Muslim population shares. The average Muslim population share in the sample of GPs with Hindu Sarpanches is 10% while it is 49% in GPs with Muslim Sarpanches (see Appendix Table B3: Panel A). Appendix Figure B3 that plots the distribution of Muslim population shares for the two samples, also shows this clearly. If women from Muslim households express greater demand for toilets in the presence of female Sarpanches, then the effect of female reservation among Muslim Sarpanches could be higher due to changes in demand as well.

The sample of GPs with either Hindu or Muslim Sarpanches is obviously endogenous. However, within each sample, we can still estimate the causal effect of a female Sarpanch. This is because within each of the samples, it is still the case that female reservation status changes discontinuously at zero threshold value of the running variable. Appendix Figure B5 shows that this is indeed true. Additionally, Appendix Figure B4 shows the McCrary tests for the two samples separately. For both samples, we observe that the density of the running variable is continuous at the threshold, signifying non-manipulation in both the samples. Moreover, columns (2) and (3) in Appendix Table B4: Panel A report that the baseline characteristics of GPs do not show any jump at the threshold for the two samples. In Panel B, columns (2) and (3) show that toilet provision in previous years also does not change discontinuously at the threshold for either of the two samples. Therefore, we conclude that the same identification strategy is valid for each of the two samples. We hypothesize that if the gender gap in toilet preferences matters through either demand or supply, then we should expect:

Hypothesis 1 τ *(for Muslim Sarpanch)* $>$ τ *(for Hindu Sarpanch).*

Results: We have strong first stages for Hindu and Muslim Sarpanches separately, as depicted in the Appendix Figure B5 and estimated in Appendix Table B5 Panels B and C. The likelihood of female reservation is zero on the left of the threshold and jumps to approximately 0.6 and 0.5 at the threshold for Hindu and Muslim Sarpanches respectively. Table 2 columns (1)–(3) report the estimation results of specification (2) for the sample of GPs with Hindu Sarpanches while columns (4)–(6) report the results for the Muslim Sarpanches. As before, we show the results at the three bandwidths—0.1 (columns (1) and (4)), 0.075 (columns (2) and (5)) and 0.05 (columns (3) and (6)). The results show that female reservation within Hindu Sarpanches has no effect on toilet construction. The coefficients are small and statistically insignificant in all the three columns. On the other hand, among

Table 2—Gender Quota Effect and Its Heterogeneity

	Dep. Var.: HH Received Toilet in 2016–17					
	Hindu Sarpanch GPs			**Muslim Sarpanch GPs**		
	(1)	(2)	(3)	(4)	(5)	(6)
Female reservation	0.00325	0.00383	0.00598	0.153**	0.212***	0.263***
	(0.0166)	(0.0197)	(0.0246)	(0.0658)	(0.0792)	(0.0968)
Mean dep. var.	0.101	0.100	0.096	0.138	0.140	0.129
Observations	2,256,016	1,796,577	1,336,812	214,175	166,148	120,414
Number of GPs	8,278	6,541	4,774	901	693	503
Polynomial order	1	1	1	1	1	1
Bandwidth	0.100	.075	0.050	0.100	0.075	0.050

Notes: The dependent variable is a dummy that takes value one if the household received a toilet in 2016-17, and zero otherwise. The sample includes eligible households,i.e., those that did not have toilet at the end of 2015-16 and were eligible to receive toilet under the SBM scheme. The first and last three columns are households in GPs with Hindu and Muslim Sarpanches, respectively. The polynomial order is 1. The bandwidths are manually chosen. Standard errors clustered at gram panchayat level and reported in parentheses.

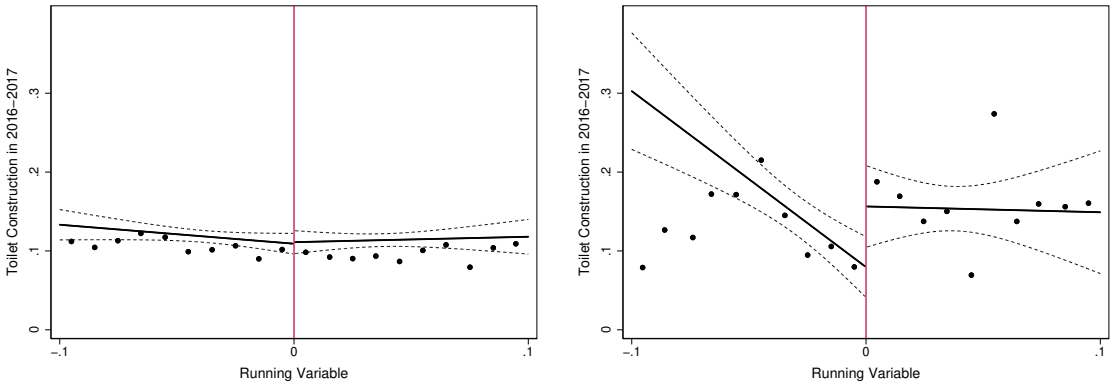
Muslim Sarpanches, female reservation has a large and statistically significant positive effect on construction of toilets for all bandwidths. The estimated coefficients are 0.15, 0.21 and 0.26 for the three bandwidths respectively. The magnitudes are large considering the mean probability of toilet provision is between 0.13–0.14 in the estimating sample.[30] This finding clearly validates Hypothesis 1.[31]

Figure 2 shows the second stage results graphically. It confirms the positive effect of gender quota among Muslim Sarpanches while we do not observe any jump in the probability of allocation in GPs having Hindu Sarpanches. In an alternate specification we pool all GPs in one sample and run a difference-in-discontinuities specification (Grembi *et al.* , 2016) to test whether the effect of female reservation is heterogeneous across GPs with Hindu and Muslim Sarpanches. Appendix Table B6 reports the result. Consistent with Table 2, we find that the effect is small and statistically insignificant for Hindu Sarpanches and is positive and statistically significant among Muslim Sarpanches.

[30]The results in Table 2 and all other results are robust to having a quadratic specification for the running variable on both sides of the threshold.

[31]The result could also have been consistent with the possibility of Muslim female Sarpanches exhibiting greater in-group favoritism (i.e., allocating more toilets to their own group than Hindus) than Hindu female Sarpanches. The empirical results in the next section, however, rule this out. We also rule out in Section 7 that the result is driven by higher gender gap in ability among Muslim Sarpanches (relative to Hindu ones).

Figure 2. RD plots: Second Stage for Female Reservation on Toilet Construction



(a) Hindu Sarpanch **(b)** Muslim Sarpanch

6 Isolating Demand and Supply Mechanisms

6.1 Identification

In order to understand whether the heterogeneity in the gender quota effect is driven by demand or supply mechanism, we perform the following analysis. Let $T_g(L_g, D_g)$ be the expected proportion of eligible households that receive toilets from the Sarpanch in GP g. The allocation depends on two features of the GP—(i) preference of the elected leader, captured by his/her gender identity (L_g), and (ii) the aggregate expressed demand from the households (D_g) in the GP. Let $T_{h,g}$ be the indicator of a household $h \in \mathcal{H}_g$ receiving toilet in GP g. Then,

$$T_g(L_g, D_g) \;=\; \mathbb{E}\left[\frac{1}{H_g}\sum_{h\in\mathcal{H}_g} T_{h,g}(L_g, D_g)\right]$$

where $\mathcal{H}_g$ is the set of eligible households in g and H_g is the number of such households.[32] For reasons argued above, T_g can also depend on the religion of the Sarpanch. For simplicity, we suppress this information for the most part of this section. We implicitly assume that when we change the leader's gender, we keep his/her religion the same.

The source of complexity is that demand itself can change in response to leader's gender (and hence, preference). For instance, when the leader changes from male ($L_g = 0$) to female ($L_g = 1$) due to the quota, female voters can express greater demand for toilets, increasing

[32]We allow the function $T_{h,g}(.,.)$ to be different across households within the same GP. This is because, $T_{h,g}$ can be a function of household specific characteristics, such as its religion, gender of the household head, wealth level etc. Hence two different households in the same GP can have different likelihoods of receiving toilets, even though they have the same values of L_g and D_g.

D_g. Therefore, D_g is also a function of L_g and $D_g(1) > D_g(0)$.[33] Moreover, only $T_{h,g}$ and L_g are observable, while D_g is not. Using our identification strategy explained above, we can generate random variation in the leader's gender identity. We, therefore, can compute the average treatment effect (ATE) of gender quota, given by

$$\Delta T_g \equiv [T_g(1, D_g(1)) - T_g(0, D_g(0))]. \tag{3}$$

As is evident from the expression, the average effect is driven by changes in both supply and demand. We can, therefore, decompose the total effect into demand and supply in the following manner:

$$\begin{aligned} \Delta T_g &= \underbrace{[T_g(1, D_g(1)) - T_g(1, D_g(0))]}_{Demand} + \underbrace{[T_g(1, D_g(0)) - T_g(0, D_g(0))]}_{Supply} \\ &\equiv \Delta^d T_g + \Delta^s T_g \end{aligned} \tag{4}$$

where $\Delta^d T_g$ denotes the expected change in the allocation due to greater demand, conditional on the gender quota being in place. We refer to this as the demand effect. $\Delta^s T_g$ denotes the expected change in allocation induced by change in the leader's identity, conditional on the demand remaining what it would be under male leadership. We refer to this as the supply effect.

Demand: To identify whether demand is important we rely on the argument, provided in Section 3 above, that male and female headed households would register differential increase in demand in the presence of female leadership. Let's denote the expected proportion of eligible male and female headed households receiving toilets by T_g^m and T_g^f, respectively. Hence,

$$T_g^m(L_g, D_g) = \mathbb{E}\left[\frac{1}{H_g^m}\sum_{h\in\mathcal{H}_g^m} T_{h,g}(L_g, D_g)\right], \quad \text{and} \quad T_g^f(L_g, D_g) = \mathbb{E}\left[\frac{1}{H_g^f}\sum_{h\in\mathcal{H}_g^f} T_{h,g}(L_g, D_g)\right]$$

where $\mathcal{H}_g^m$ ($\mathcal{H}_g^f$) is the set of male (female) headed households and H_g^m (H_g^f) is the number of such households. Hence, we can write that

$$T_g = (1 - \lambda_g)T_g^m + \lambda_g T_g^f = T_g^m + \lambda_g(T_g^f - T_g^m) \tag{5}$$

[33] Here, $D_g(1)$ represents the demand under a female leader and $D_g(0)$ represents demand under a male leader.

where λ_g is the proportion of female headed households in g. Following a similar definition as in equation 3 we can then compute:

$$\Delta T_g^m \equiv [T_g^m(1, D_g(1)) - T_g^m(0, D_g(0))], \quad \text{and} \quad \Delta T_g^f \equiv [T_g^f(1, D_g(1)) - T_g^f(0, D_g(0))].$$

where ΔT_g^m (ΔT_g^f) is the ATE among male (female) headed households. Similar to the decomposition carried in equation 4, we can write

$$\Delta T_g^m = \Delta^d T_g^m + \Delta^s T_g^m, \quad \text{and} \quad \Delta T_g^f = \Delta^d T_g^f + \Delta^s T_g^f$$

where $\Delta^d T_g^m$ ($\Delta^d T_g^f$) and $\Delta^s T_g^m$ ($\Delta^s T_g^f$) are the demand and supply side effects for male (female) headed households. If the supply side effect is completely determined by the leader's characteristics then it would be the same across both male and female headed households.[34] Therefore, $\Delta^s T_g^m = \Delta^s T_g^f$. Hence we get that,

$$\Delta T_g^f - \Delta T_g^m = \Delta^d T_g^f - \Delta^d T_g^m.$$

The L.H.S. can be estimated which, therefore, would allow us to estimate the difference in demand across female and male headed households. Using equation 5 we get:

$$\Delta^d T_g = \Delta^d T_g^m + \lambda_g(\Delta^d T_g^f - \Delta^d T_g^m) = \Delta^d T_g^m + \lambda_g(\Delta T_g^f - \Delta T_g^m). \tag{6}$$

Therefore, we partially identify $\Delta^d T_g$ by estimating $(\Delta T_g^f - \Delta T_g^m)$. Even though the proportion of female headed households in a GP is small, this identification is crucial to establish whether increased demand under female leadership can cause differential allocation.

Supply: To identify supply, we rely on the fact that the gender gap in preference is higher among Muslims than Hindus. Therefore, the supply effect of a Muslim female Sarpanch (relative to a Muslim male Sarpanch) would also be higher than that of a Hindu female Sarpanch (relative to a Hindu male Sarpanch). Analysis in Section 5.4 shows that the overall effect of Hindu female Sarpanch is effectively zero, implying that her supply effect would also be negligible. Therefore, if supply is at all an important mechanism, we should expect it to be positive for Muslim female Sarpanches. Therefore, we can write

$$\Delta^s T_g^I > \Delta^s T_g^H$$

[34] It is certainly possible for female leaders to be differentially focused on female headed households, leading to differential allocation to them driven by supply side considerations. We, however, rule out this possibility during our estimation.

where $\Delta^s T_g^I$ ($\Delta^s T_g^H$) is the supply effect in the sample of GPs with Muslim (Hindu) Sarpanches. Let ΔT_g^I and ΔT_g^H denote the ATE of a Muslim and a Hindu female Sarpanch respectively. Then, we can write

$$\Delta T_g^H \;=\; \Delta^d T_g^H \;+\; \Delta^s T_g^H \quad \text{and} \quad \Delta T_g^I \;=\; \Delta^d T_g^I \;+\; \Delta^s T_g^I$$

where $\Delta^d T_g^H$ and $\Delta^d T_g^I$ are the demand effects of female reservation in the two kinds of GPs. Now, generally $\Delta^d T_g^H$ and $\Delta^d T_g^I$ would be different, as the GPs where Muslims become Sarpanches would be very different from those with Hindu Sarpanches. However, if the religion of Sarpanches is randomly assigned (say, in a sample of GPs with close elections between a Hindu and a Muslim), then the GPs with Hindu and Muslim Sarpanches would be the same on average, implying that they would have the same demand effect due to gender quota. This is because the two samples would have the same demographics including same population share of Muslims and same preference for a Muslim Sarpanch (as the vote shares for a Muslim candidate would be almost identical). However, the overall effect of female reservation could still be different due to difference in the supply effect. Therefore, under the assumption that the religion of Sarpanch is randomly assigned, we get that

$$\Delta^d T_g^H \;=\; \Delta^d T_g^I$$

Therefore,

$$\Delta T_g^I - \Delta T_g^H \;=\; \Delta^s T_g^I - \Delta^s T_g^H$$

Suppose ω is the share of GPs with a Muslim Sarpanch. Then,

$$\Delta^s T_g \;=\; \Delta^s T_g^H + \omega(\Delta^s T_g^I - \Delta^s T_g^H) \;=\; \Delta^s T_g^H + \omega(\Delta T_g^I - \Delta T_g^H) \tag{7}$$

Similar to the identification of demand, we partially identify supply effect $\Delta^s T_g$ by ($\Delta T_g^I - \Delta T_g^H$). Moreover, $\Delta^s T_g^H$ is zero for reasons argued above. Hence, in practice, we are able to identify the full supply effect. Substituting equations (6) and (7) in equation (4) we get,

$$\Delta T_g \;=\; \overbrace{\Delta^d T_g^m + \underbrace{\lambda_g(\Delta T_g^f - \Delta T_g^m)}_{\text{Identifiable demand}}}^{\text{Demand effect}} \;+\; \overbrace{\underbrace{\Delta^s T_g^H}_{=0} + \underbrace{\omega(\Delta T_g^I - \Delta T_g^H)}_{\text{Identifiable supply}}}^{\text{Supply effect}} \tag{8}$$

The equation above clearly spells out our identification strategies for demand and supply. We estimate heterogeneous treatment effect across female and male headed households to identify demand and across GPs with (randomly assigned) Muslim and Hindu Sarpanches

to identify supply.[35]

6.2 Demand Estimation Strategy and Results

Estimation: We use the *difference-in-discontinuities* approach proposed by Grembi *et al.* (2016) to estimate $(\Delta T_g^f - \Delta T_g^m)$. We do it separately for the samples of GPs with Hindu and Muslim Sarpanches and within each case, for Hindu and Muslim households. We do this to guard against an alternate interpretation that our results are driven by favorable concern or focus that female Sarpanches may have for female headed households. We explain this point in greater detail after describing our empirical strategy.

Let $R \in \{H, I\}$ denote the religion of the Sarpanch and $r \in \{h, i\}$ denote the religion of any household, with H and h denoting Hindu and I and i, Muslim (Islam). Let $S_{R,r}$ denote the set of households belonging to religion r in GPs where the religion of the Sarpanch is R. For each combination (R, r), we then estimate following specification:

$$\begin{aligned} Y_{h,g} &= \alpha_0 + \tau^{R,r} Q_g + \alpha_1 X_g + \alpha_2 X_g * A_g \\ &+ F_{h,g} * [\theta_0 + \rho^{R,r} Q_g + \theta_1 X_g + \theta_2 X_g * A_g] + u_g, \quad \text{for } h \in S_{R,r} \end{aligned} \tag{9}$$

where $F_{h,g}$ is a dummy variable that indicates whether a household is headed by a woman or not. All parameters in equation (9) vary by (R, r). However, for notational simplicity we give the superscript (R, r) only to the main coefficients of interest ρ and τ. As before, Q_g is instrumented with A_g in the following first stage equations, which are again estimated for each combination (R, r):

$$Q_g = \beta_0 + \gamma A_g + \beta_1 X_g + \beta_2 X_g * A_g + F_{h,g} * [\delta_0 + \lambda D_g + \delta_1 X_g + \delta_2 X_g * A_g] + \epsilon_g \tag{10}$$

$$Q_g * F_{h,g} = \beta_0^{'} + \gamma^{'} A_g + \beta_1^{'} X_g + \beta_2^{'} X_g * A_g + F_{h,g} * [\delta_0^{'} + \lambda^{'} A_g + \delta_1^{'} X_g + \delta_2^{'} X_g * A_g] + \epsilon_g^{'} \tag{11}$$

Here, $\rho^{R,r}$ estimates the differential allocation to female headed households relative to male headed ones by female Sarpnches. It therefore estimates $(\Delta T_g^f - \Delta T_g^m)$ for each combination of (R, r). Since female headed households are more likely to register their demand under a female leader than male headed households of the same religion, we hypothesize that

[35] We can not identify demand by testing for heterogeneous treatment effects across Muslim and Hindu households because Muslim Sarpanches allocating more toilets to Muslim households could be due to own-group favoritism as well. Additionally, Hindus are the majority group on average even in GPs with Muslim Sarpanches. Therefore, Muslim Sarpanches may have electoral incentives to allocate toilets to Hindus, even if they do not demand it as much as Muslims. This may lead to underestimation of the demand effect. Female headed households constitute a small fraction of the GP population, and therefore, electoral concerns are absent in their case. We rule out the favoritism channel in our empirical results.

if demand is important for provision of toilets then:

Hypothesis 2 *$\rho^{R,r} > 0$ for all combinations of (R, r).*

Moreover, since the gender gap in preference is higher for Muslims, we hypothesize that:

Hypothesis 3 *(i) $\rho^{H,i} > \rho^{H,h}$ and (ii) $\rho^{I,i} > \rho^{I,h}$*

On the other hand, if differential allocation to female headed households is completely driven by supply side considerations, then we should expect $\rho^{H,i} = \rho^{H,h}$ and $\rho^{I,i} = \rho^{I,h}$. Additionally, if female Sarpanches are more focused on female headed households from their own religious group, then we should expect $\rho^{H,i} < \rho^{H,h}$. Therefore, validation of Hypothesis 3 would allow us to establish that our estimates indeed capture demand. From equation (8), we get that the estimate for τ captures $\Delta^d T_g^m + \Delta^s T_g$. Therefore, we need a separate estimate for the supply mechanism $\Delta^s T_g$ to infer what part of τ is supply.

Results: To test Hypotheses 2 and 3 we need to know the gender identity of the household head. This information is available only for the Above Poverty Line (APL) households. This is because all the Below Poverty Line (BPL) households are eligible for the scheme while a subset of APL households are eligible. One eligibility criteria is whether an APL household is headed by a woman.[36] Hence, we restrict our attention to eligible APL households for this exercise.[37] We estimate specification (9) in four sub-samples of eligible APL households: $S_{H,h}$, $S_{H,i}$, $S_{I,h}$ and $S_{I,i}$, i.e., Hindu (h) and Muslim (i) households in GPs with Hindu (H) and Muslim (I) Sarpanches. Table 3 columns (1)–(4) report the results for the four sub-samples respectively. We present the results at 0.1 bandwidth, but the results are similar for smaller bandwidths as well (reported in the Appendix Table B7).

The result in column (1) shows that female reservation within Hindu Sarpanches increases the probability of toilet provision to Hindu female headed households by 0.05. The coefficient is noisily estimated, even though the effect size is 45% of the mean. On the other hand, the probability increases by 0.35 (column (2)) for *Muslim* female headed households. The estimate is statistically significant at 5% level of significance and is a considerably large effect given the mean of 0.12. Moreover, the column (2) coefficient is larger than the column (1) coefficient (p-value = 0.02), which validates part (i) of Hypothesis 3.

Within GPs with Muslim Sarpanches, female reservation leads to a jump in the probability of provision by 0.36 among Hindu female headed households (column (3), row (2)). The coefficient, however, has a high standard error and is not statistically significant. The

[36] We discuss the eligibility criteria for the SBM scheme among APL households in Section 2.1.

[37] The result in Table 2 remains the same if we restrict the sample to eligible APL households instead of all eligible households.

Table 3—Gender Quota Effect: Identifying Household Demand

	HH Received Toilet in 2016–2017			
	Hindu Sarpanch		Muslim Sarpanch	
	Hindu HH (1)	Muslim HH (2)	Hindu HH (3)	Muslim HH (4)
Female reservation	0.0173	-0.0334	0.121	0.163*
	(0.0209)	(0.0475)	(0.0909)	(0.0861)
Female reservation * Female Headed HH	0.0500	0.346**	0.360	0.489***
	(0.0487)	(0.146)	(0.262)	(0.177)
Female Headed HH	-0.0318	-0.105***	-0.132*	-0.107*
	(0.0202)	(0.0301)	(0.0706)	(0.0612)
Mean dep. var.	0.111	0.120	0.135	0.202
Observations	1,330,303	131,334	83,770	57,155
Number of GPs	8010	7041	848	837
Bandwidth	0.1	0.1	0.1	0.1
Polynomial order	1	1	1	1

Notes: The sample is Above Poverty Line (APL) households who are eligible for the SBM program and did not have toilets at the end of 2015–2016. The sample for column (1) is Hindu households under Hindu leaders while that for column (2) is Muslim households under Hindu leaders. The samples for columns (3) and (4) are defined similarly under Muslim leaders. Female Headed HH is a dummy that takes value one if the household head is a woman and zero otherwise. The polynomial order is 1. The bandwidth is manually chosen to be 0.1. Standard errors clustered at Gram Panchayat level and reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

magnitude of the effect, nonetheless, is large—suggesting greater allocation to Hindu female headed households. The corresponding coefficient in column (4) is 0.49 and is statistically significant at 1% level. Therefore, we find that Muslim female headed households experience a meaningful and statistically significant increase in the likelihood of toilet provision due to female reservation among Muslim Sarpanch GPs. The difference between the coefficients in columns (4) and (3), is also positive (0.13=0.49-0.36), though not statistically significant. However, the positive difference is consistent with the part (ii) of the Hypothesis 3.[38] Moreover, all the four coefficients for the heterogeneous effect on female headed households (row 2), across columns (1)–(4) are positive and economically large, though only two are statistically significant, implying that Hypothesis 2 is validated as well. The difference in coefficients across columns (1) and (2), or across (3) and (4) is not due to different samples

[38]Our results are not driven by initial lower toilet provision to either Muslim households or households in GPs with Muslim Sarpanches. In fact, we find that 44% of Muslim households had access to toilets at the end of 2015-16 while it was 36% for Hindu households. Consistent with this, the average ownership of toilets in GPs with Muslim Sarpanches was also higher than those with Hindu GPs in the pre-treatment period (see Appendix Table B3: Panel B).

of GPs, as our results remain the same if we restrict columns (1) and (2), or (3) and (4) to the same set of GPs (Appendix Table B8). The results also hold when we restrict the sample to GPs that have both Hindu and Muslim female headed households (Appendix Table B9).

An alternate explanation for the result could be that female headed households are poorer and hence may need the toilet subsidy more, resulting in greater allocation by the Sarpanch. We, however, find that the coefficients for female headed households in row (3) across all the columns are negative and large in magnitude, implying that those households are *less likely* to receive toilets relative to male headed households when the Sarpanch is a man. This is not consistent with the above argument. Moreover, the result is in line with our demand mechanism: under a male Sarpanch, these households are less likely to register their demand for toilets compared to male headed households—leading to lower allocation. Finally, the coefficient for Female reservation (τ) in row 1 is small in columns (1) and (2), and large but noisy columns (3) and (4). This is also consistent with demand: Muslim Sarpanch GPs have significantly higher share of Muslim households and hence higher level of collective demand for toilets, which can result in higher allocation to male headed households among both Hindus and Muslims.[39] We, therefore, conclude that household demand is vitally important in understanding the effect of gender quota in elections on provision of goods by the leader.

6.3 Supply Estimation Strategy and Results

Estimation: We now estimate ($\Delta T_g^I - \Delta T_g^H$) in equation (8). We first select the sample of GPs where the top two candidates were a Hindu and a Muslim and the election was close. Within this sample, the religion of the Sarpanch would effectively be randomly assigned (see, for example, Meyersson, 2014). The close election regression discontinuity design is a popular method to generate random variation in the identity of elected leader (Eggers *et al.* , 2015). We, therefore, use the differences-in-discontinuities strategy to estimate ($\Delta T_g^I - \Delta T_g^H$)—where the (sharp) discontinuity around close elections generates random variation in the religion of Sarpanch and the quota for women is the difference variable. We prefer this strategy over an alternate one, where we use regression discontinuity in the running variable associated with female reservation (i.e., X_g in equation (9)) to generate exogenous variation in female reservation status. This method would require us to use RDD across both religion and female reservation in the same specification. While it would generate exogenous variation in both variables, it would force us to focus on a sample of GPs that are just around the threshold value of X_g as well as experienced a close election between a Hindu and a Muslim candidate. The sample of such GPs is small and very special. Moreover, the practice of using

[39]The coefficient estimates in row (1), columns (3) and (4) are similar in magnitude, implying that Muslim female Sarpanches do not exhibit significant own-group favoritism in allocation of toilets.

RDD strategies on both differencing variables is not common. Consequently, we believe our strategy is easier to interpret and gives a more reliable estimate due to the larger sample size.

We run the following specification on the sample of close election GPs to estimate the differential effect of having a Muslim Sarpanch (relative to a Hindu Sarpanch) in female quota GPs vis-a-vis non-female quota GPs:

$$\begin{aligned} Y_{h,g} &= \alpha_0 + \beta I_g + \alpha_1 V_g + \alpha_2 I_g * V_g \\ &+ Q_g * [\theta_0 + \phi I_g + \theta_1 V_g + \theta_2 I_g * V_g] + u_g \end{aligned} \tag{12}$$

where I_g is a dummy that takes value one if the Sarpanch in GP g is Muslim and zero otherwise. V_g is the margin of victory for a Muslim candidate, i.e., it is defined as (vote share of Muslim - vote share of Hindu). Q_g, as before, is an indicator of female quota in g. Our coefficient of interest is ϕ, which estimates $(\Delta T_g^I - \Delta T_g^H)$. Of course, the GPs with and without female reservation are not the same. Female reservation status is, however, almost completely determined by X_g. Hence, we show robustness of our result using an alternate specification where we control for X_g in the following way:

$$\begin{aligned} Y_{h,g} &= \alpha_0 + \beta I_g + \alpha_1 V_g + \alpha_2 I_g * V_g + \beta_1 X_g + \beta_2 Q_g * X_g \\ &+ Q_g * [\theta_0 + \phi I_g + \theta_1 V_g + \theta_2 I_g * V_g] + u_g \end{aligned} \tag{13}$$

Results: Table 4 reports the results from estimation of specification 12 in the sample of GPs with close election between a Hindu and a Muslim candidate.[40] The three columns refer to three definitions of close election. Column (1) reports the result when the absolute value of margin of victory is at most 0.1, while columns (2) and (3) report it for bandwidths 0.075 and 0.05 respectively.[41] We find that the female reservation dummy has a small and statistically insignificant coefficient across all the columns, implying null effect of the female quota among Hindu Sarpanches. This is consistent with the result in Table 2 columns (1)–(3). For all the bandwidth specifications, we find that the difference-in-discontinuity estimate is also very small and statistically insignificant. Therefore, election of a female Muslim Sarpanch vis-a-vis a female Hindu Sarpanch does not change the probability of toilet construction. This may seem surprising given the result in Table 2 that showed that the effect of female reservation is large and positive in GPs with Muslim Sarpanches (columns (4)–(6)). However, as we

[40] Appendix Figure B6 provides a McCrary Test for manipulation of the running variable in this sample of GPs. We find that there is no discontinuity in the density of running variable at the threshold value of zero.

[41] The CCT bandwidth in this case is 0.082.

Table 4—Muslim vs Hindu Sarpanches in Close Election GPs

	HH Received Toilet in 2016–2017		
	(1)	(2)	(3)
Female Reservation	-0.0106	-0.0154	-0.0120
	(0.0258)	(0.0293)	(0.0358)
Muslim Sarpanch	-0.0145	-0.0181	-0.00571
	(0.0228)	(0.0257)	(0.0309)
Female Reservation*Muslim Sarpanch	-0.00429	-0.00136	-0.00235
	(0.0368)	(0.0417)	(0.0505)
Mean dep. var.	0.099	0.099	0.104
Observations	943,640	777,713	569,103
Number of GPs	3,263	2,666	1,941
Bandwidth	0.100	0.075	0.050
Polynomial order	1	1	1

Notes: The sample of GPs included had a close election between a Hindu and a Muslim candidate. The absolute value of the margin of victory of the Muslim candidate is 0.1 in column (1), 0.075 in column (2) and 0.05 in column (3). The sample only includes eligible households that did not have toilets at the end of 2015–2016. The polynomial order is 1. Standard errors clustered at Gram Panchayat level and reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

argued in Section 5.4, the results in Table 2 can be due to either demand or supply, as the GPs with Muslim Sarpanches have high population share of Muslims relative to GPs with Hindu Sarpanches. We remove these differences across the two samples in Table 4 by conditioning on there being a close election between candidates belonging to different religions. The consequent null effect implies that supply mechanism can not explain the differential effects across the two samples. For robustness, we estimate equation (13). The results, reported in Appendix Table B10, remain the same.

7 Robustness

7.1 Demand Estimation in High Muslim Share GPs

The demand estimation results show that female headed households receive on average more toilets under a female Sarpanch than a male Sarpanch. However, the marginal effect of a female headed household demanding toilet may be greater when a greater share of the GP population is also demanding it, due to complementarities associated with collective action. Then the effect is likely to be even greater in GPs with high population share of Muslims—who have a greater preference for toilets. To test this, we estimate specification 9 on the sample of eligible APL households belonging to GPs with high Muslim population

shares. We define a GP to have a high Muslim share if its share is greater than the 85^{th} percentile of the Muslim share distribution in the full sample (= 27% of Muslim share). Table B11 reports the results. We find that the estimates of ρ are significantly larger across all the four columns in Table B11 relative to Table 3. These results confirm that the demand effect is stronger in GPs where Muslim population share is higher. We also observe that the main effect of female reservation in Muslim Sarpanch GPs is similar across Hindu and Muslim households. The coefficient estimate is 0.213 for Hindus (columns (3)) and 0.189 for Muslims (column (4)) in Table B11. This further rules out the possibility that the heterogeneous effect of gender quota in Muslim Sarpanch GPs is driven by greater own-group favoritism exercised by Muslim female Sarpanches.

7.2 Female Sarpanches in Open Elections

In our main analysis we have examined gender quota and the mechanisms behind its effect. In some of the GPs that are not reserved for women, i.e., where the Sarpanch election is open to both genders, female candidates also win and become Sarpanches. In this section, we test whether electing a female Sarpanch in an open election results in effects that are consistent with our main findings. While female Sarpanches that win open elections can be very different from those than come through quotas, the demand mechanism may still be at work in this case. We use regression discontinuity design method in the sample of open election GPs that had a close election between a man and a woman to generate exogenous variation in the gender of Sarpanch. To estimate the demand mechanism, we then run the following specification:

$$\begin{aligned} Y_{h,g} &= \beta_0 + \pi \mathbb{I}[MoV_g > 0] + \beta_1 MoV_g + \beta_2 MoV_g * \mathbb{I}[MoV_g > 0] \\ &+ F_{h,g} * [\theta_0 + \delta \mathbb{I}[MoV_g > 0] + \theta_1 MoV_g + \theta_2 MoV_g * \mathbb{I}[MoV_g > 0]] + \epsilon_g \end{aligned} \tag{14}$$

where MoV_g is the margin of victory for a woman candidate in GP g, defined as the difference between the vote shares of the female and male candidates in GPs where the top two candidates are a man and a woman. The dummy $\mathbb{I}[MoV_g > 0]$ therefore is an indicator of female Sarpanch. $F_{h,g}$ is an indicator of female headed household, as before. Our coefficient of interest is δ that captures the demand mechanism. We separately estimate δ for Hindu and Muslim female sarpanches against any male Sarpanch. We use any male Sarpanch in the control group as opposed to Hindu and Muslim male Sarpanch for the two samples separately because of sample size and power considerations. As before, within each case, we run separate regressions for Hindu and Muslim households to verify whether the heterogeneous treatment effect is indeed demand.

Appendix Table B12 reports the results. We maintain the same bandwidth choice of 0.1 in this case as well.[42] We find that even in open elections, Hindu and Muslim female Sarpanches allocate additional toilets to female headed households, except in column (1), where the coefficient is small and negative. The result, therefore, mostly validates Hypothesis 3. Additionally, estimate of δ in row (2) of Table B12 is larger in magnitude for Muslim households (columns (2) and (4)) compared to Hindu households (columns (1) and (3)), which is consistent with Hypothesis 3. Therefore, we find that the importance of demand mechanism driving the overall effect of female Sarpanches broadly generalizes to open elections as well.

7.3 Alternate Mechanism : Ability of Female Sarpanches

Here we consider an alternate hypothesis that the differential female reservation effect across GPs with Hindu and Muslim Sarpanches could be driven by differential ability of Hindu and Muslim women who come to the leadership position. To examine this, we look at employment provision under National Rural Employment Guarantee Scheme (NREGS), which is the largest expenditure head in a GP budget and constitutes an overwhelming majority of a GP's annual expenses.[43] Greater provision under this scheme could potentially signal higher ability of Sarpanches to implement public projects. We estimate the effect of female reservation on two outcomes in Appendix Table B13—expenditure on NREGS scheme per capita in a GP (columns (1) and (3)) and person days of employment generated under the scheme per capita (columns (2) and (4)). We estimate it separately for GPs with Hindu and Muslim Sarpanches. We find that female reservation does not lead to greater provision under the scheme among either Hindu or Muslim Sarpanches. Thus, our results for toilet provision are unlikely to be driven by differential gender gap in the ability of female Sarpanches across religions.

8 Conclusion

This paper uses a novel identification strategy and data to infer whether the effect of gender quotas in elections on public goods provision can be driven by greater demand expressed by female voters in the presence of female leadership. We identify both demand and supply side channels by using provision of a good that is targeted at the household level and for which women exhibit a greater preference, namely household toilets. We document stark

[42] The CCT bandwidths are 0.103 and 0.111 for Hindu and Muslim female leader GPs, respectively.

[43] This scheme was launched in 2006 and aims to provide 100 days of employment per year to every adult in rural India.

differences in gender gap in preference for toilets across two well-identified and salient population groups—Hindus and Muslims. We also show that conditional on the religion of the household, female headed households are likely to express greater demand for toilets due to greater autonomy in decision making and higher political participation of women in these households. Consistent with the demand mechanism, we find that female reservation leads to a significantly higher allocation for female headed households, and the result is even stronger among Muslims households. The religion of the female Sarpanch, on the other hand, has no effect on toilet provision, implying absence of the supply mechanism. Our results establish that there is a large heterogeneity in the effect of female quota on toilet provision across GPs within a state and the demand side factors drive all of the heterogeneity. The result, therefore, highlights the importance of variation in the preference for public goods across regions in potentially explaining the mixed evidence found in the literature on the effect of gender quotas in elections. More importantly, it suggests that policies that empower women voters and encourage them to participate in political processes can make gender quotas more effective and can significantly improve the substantive representation of women.

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Appendix

For Online Publication

A Preferences for Toilets: Evidence from Survey Data

A.1 Gender Gap in Preference for Toilets

We use the SQUAT survey to analyze preference for toilets. First, we examine the revealed preference for toilets by analyzing how likely a person is to use a toilet conditional on the household owning one. In Table B1, columns (1) and (2), we look at the probability of using a toilet for defecation, by gender, conditional on household owning a toilet using village and household fixed effects respectively. Results in Panel A, columns (1) and (2), clearly show that women are more likely to use in-home toilets. For the set of households that do not own a toilet, the survey asks a randomly chosen member of the household about his or her top three priorities for the household from a list of assets that the household does not possess, if money is not a constraint. We create three indicator variables that capture whether the respondent states toilet ownership to be among the top most, one of top two or top three priorities. We test whether respondent gender matters for the responses. The results are reported in columns (3), (4), (5) of the same table. We find that women are more 5% points more likely to state that their most top-most priority is a toilet for the house (column (3)). The estimates for the other two specifications are also positive, but are statistically insignificant. Overall our analysis demonstrates that, consistent with existing evidence, women have a stronger preference for a household toilet than men.[44]

A.2 Gender Gap in Preference between Hindus and Muslims

In panel B of Table B1, we examine the heterogeneity in the gender gap in preference for toilets across Hindus and Muslims, using the SQUAT survey. Columns (1) and (2) show that conditional on having a toilet, Muslim households are more likely to use a toilet than Hindu households. Moreover, the usage gap between Muslim women and men is almost double of the gap between Hindu women and men. Focusing on the households that do not yet own a toilet, columns (3), (4) and (5) show that relative to Muslim men, Muslim women are 22–24% more likely to report that it is among the top two or three priorities for them. The gender gap in reported preference among Hindus is positive but statistically insignificant.

[44] Similar gender gap in toilet preference has been documented in other countries as well (Jenkins & Curtis (2005), Santos *et al.* (2011)).

These results show that on the whole, the gender gap in preference for toilets is much higher for Muslims relative to Hindus.

A.3 Demand across Male and Female Headed Households

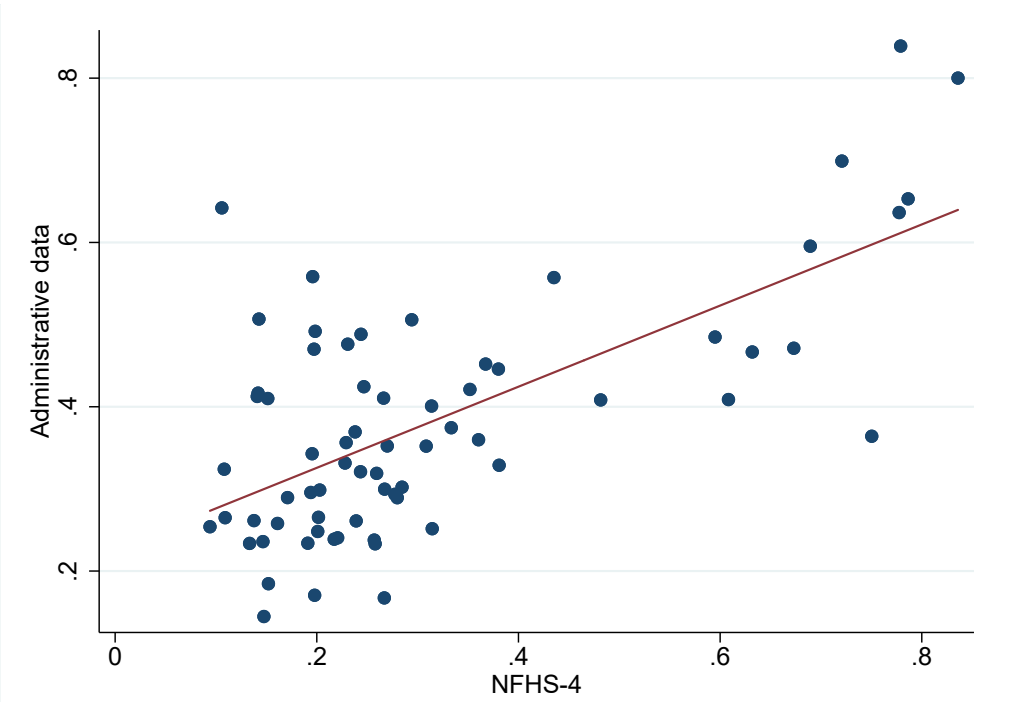
To examine female autonomy across male and female headed households, we create two indicators using the NFHS-4 survey. The first indicator uses the set of questions on whether the woman can make any of the following decisions on her own –accessing health care, major household purchases and visits to family. The second indicator captures whether the woman is allowed alone to any of these places –market, health facility and outside village. We regress these indicators on whether a woman belongs to a household headed by a woman and report the results in Appendix Table B2 Panel A, columns (1) and (2) respectively. We control for various individual and household characteristics and village fixed effects. The results show that women residing in households headed by women are more likely to take decision and go alone to places, indicating greater decision making power and autonomy for women in these households. We also find that female memebers who are not the head of the family themselves also enjoy this greater agency in female headed households (table not reported).

Additionally, we also test if women are more politically active if they live in a woman headed household by using the REDS data. Appendix Table B2 Panel A, columns (3) and (4) show the results for whether a woman has attended any of the last four village meetings and whether a woman is actively involved with any political party, respectively. We find a positive association between female headship of the household and women's active role in community and political engagement, controlling for religion and other household and individual level characteristics and village fixed effects. These results show that, conditional on women having greater demand for toilets, households headed by women are more likely to express the demand for it.

In Panel B of the same table we test if the positive relationship we found is driven by Hindus. We interact the indicator of female headed households with the indicator of the household being Muslim. We find that the relationship (both in the NHFS-4 and REDS) is similar across Hindus and Muslims. If anything, women in female headed Muslim households tend to enjoy greater bargaining power within the household (column (1)) and attend village meetings more (column (3)) compared to their counterparts in Hindu female headed households.

B Additional Figures and Tables

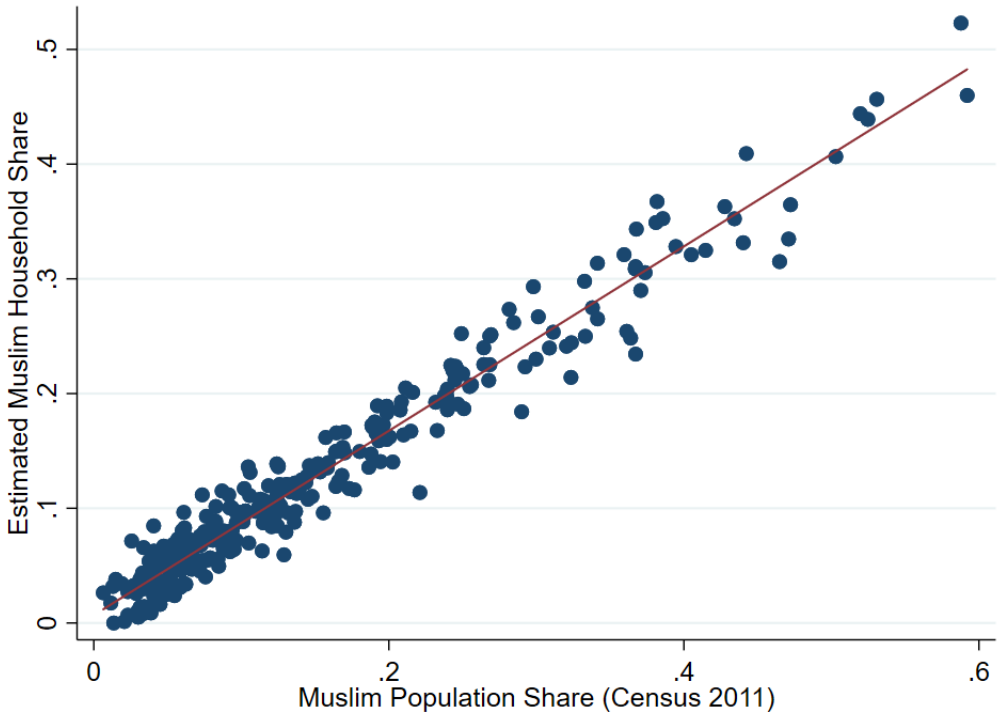
Figure B1. Comparing Toilet Coverage: Administrative Data versus Survey Data (2015–16)



Source: Ministry of Drinking Water and Sanitation (MDWS), India for administrative toilet data and National Family Health Survey (NFHS)-4 (2015–16) for sanitation survey data.

Notes: The figure plots the proportion of households having a toilet in the administrative data and the proportion of households having a toilet in the NFHS data for the same district. A linear relationship between the two is fitted. Correlation = 0.7.

Figure B2. Comparing true and predicted Muslim population share



Notes: The true Muslim population share based on 2011 census is on the x-axis. Population share estimated by the algorithm for 312 tehsils in U.P. is on y-axis. Correlation = 0.9776.

Figure B3. Density of Muslim Population Share

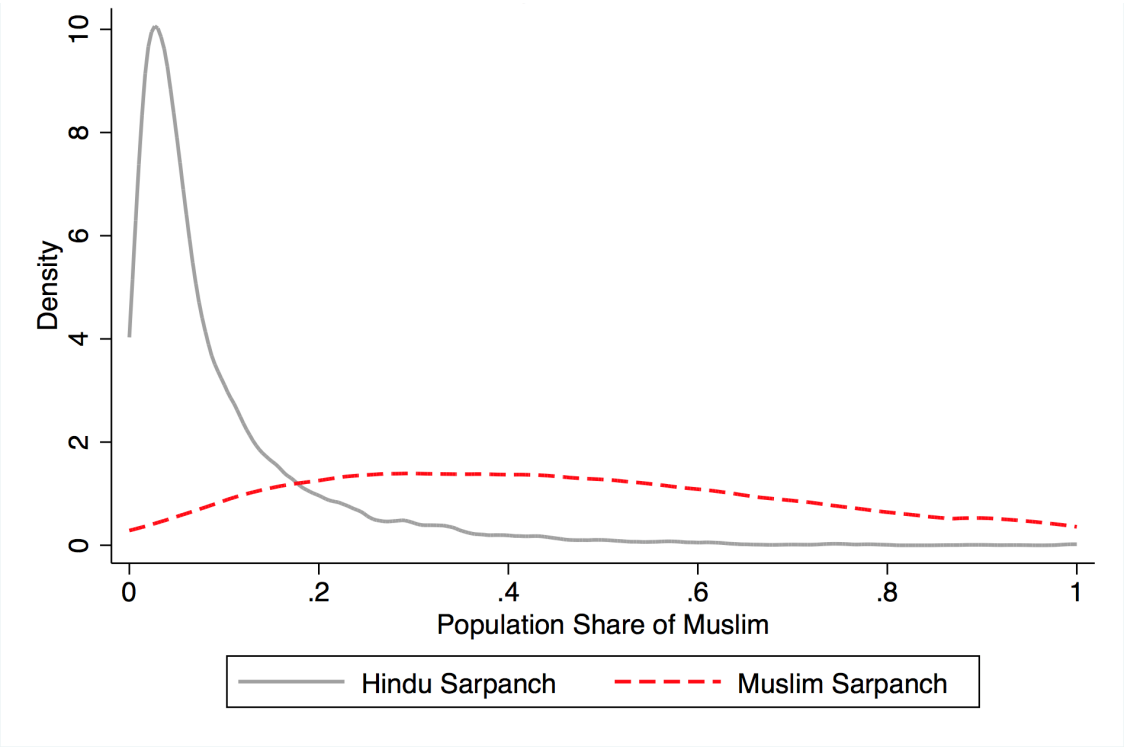
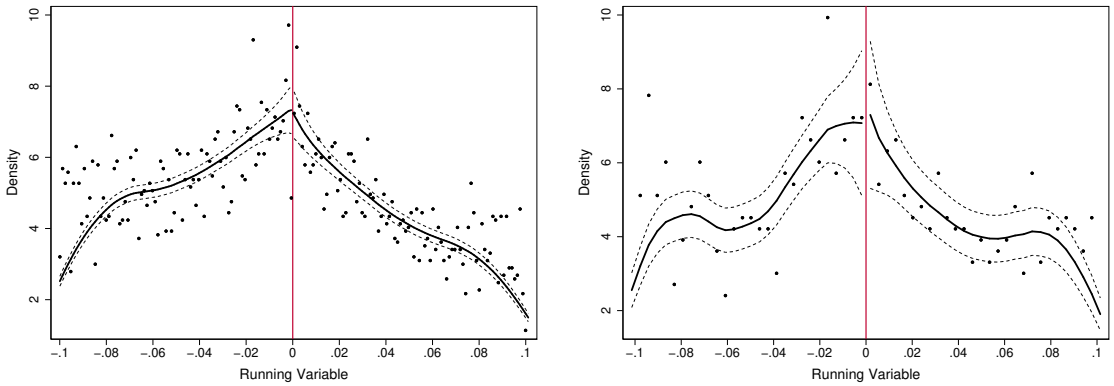
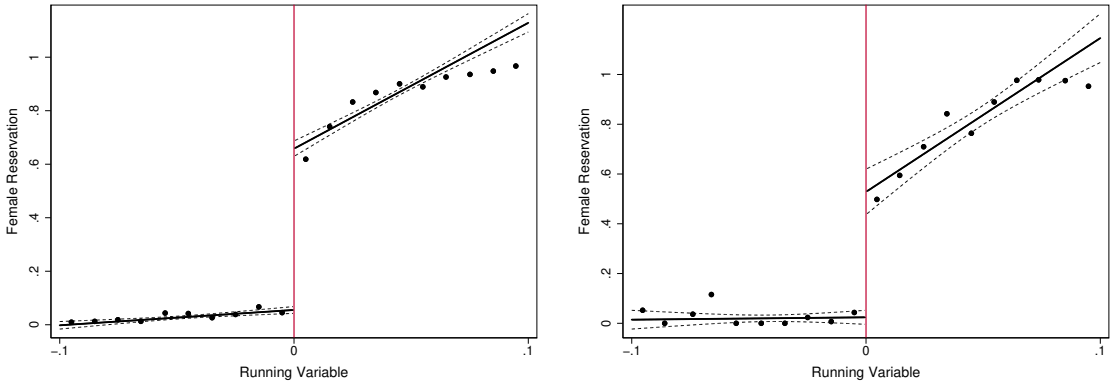


Figure B4. McCrary Plots for Discontinuity at the Cut-off



(a) Hindu Sarpanch **(b)** Muslim Sarpanch

Figure B5. RD plots: First Stage for Female Reservation



(a) Hindu Sarpanch **(b)** Muslim Sarpanch

Figure B6. McCrary Plot: Hindu vs Muslim Close Election

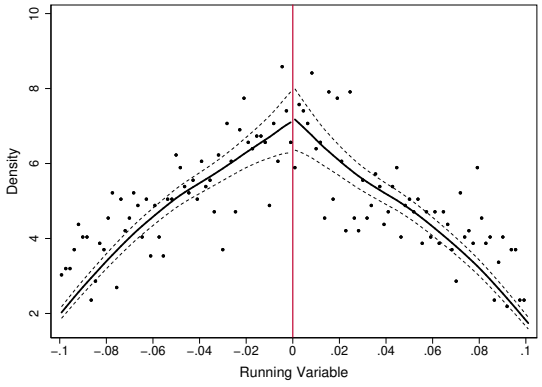


Table B1—SQUAT Survey: Gender Gap in Latrine Preference

	Latrine Usage		Latrine Preference		
			Top	Top 2	Top 3
	(1)	(2)	(3)	(4)	(5)
	Panel A: Overall Gender Gap				
Female	0.0933***	0.0940***	0.0507*	0.0114	0.0215
	(0.00792)	(0.00620)	(0.0300)	(0.0282)	(0.0252)
	Panel B: Heterogeneity in Gender Gap				
Female	0.0889***	0.0903***	0.0456	0.00322	0.0150
	(0.00841)	(0.00651)	(0.0309)	(0.0290)	(0.0257)
Muslim * Female	0.0549**	0.0475**	0.0811	0.238*	0.221*
	(0.0234)	(0.0209)	(0.141)	(0.124)	(0.114)
Muslim	0.0903***		0.0328	0.0128	0.00193
	(0.0252)		(0.119)	(0.107)	(0.106)
Mean Dep. Var.	0.80	0.80	0.46	0.64	0.78
Observations	7,731	7,717	1,472	1,472	1,472
Fixed Effect	Village	HH	Village	Village	Village

Notes: The dependent variable for columns (1) and (2) is a dummy that takes value one if the individual uses the latrines for defecation. The samples in the first two columns only include households which have latrines. The dependent variable in each of the columns (3), (4), and (5) is a dummy that takes value one if the respondent reports a toilet as being the topmost, top two or top three priorities, respectively, if money was not a constraint, from a list of assets that the household does not have. The samples in the last three columns only include households which do not have latrines. The SQUAT states are Haryana, Uttar Pradesh, Madhya Pradesh, Bihar, and Rajasthan. Columns (1) and (3)-(5) have village fixed effects and control for household level assets and household's main source of income. Columns (2) and (4) have household level fixed effects. The number of observations in columns (1) and (2) differ with village and household fixed effects as single member households are dropped from the analysis. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B2—Female Autonomy in Female Headed Households

	NFHS Dataset		REDS Dataset	
	Decision	Allowed alone	Village Meeting Attendance	Political Party Activity
	(1)	(2)	(3)	(4)
			Panel A: Overall	
Female Headed HH	0.111***	0.084***	0.036***	0.022***
	(0.006)	(0.005)	(0.014)	(0.007)
			Panel B: Heterogeneity by Religion	
Female Head HH	0.106***	0.083***	0.028**	0.023***
	(0.007)	(0.006)	(0.014)	(0.008)
Female Head HH * Muslim	0.044**	0.011	0.099**	-0.005
	(0.019)	(0.018)	(0.047)	(0.019)
Muslim	0.001	-0.072***	0.005	0.005
	(0.009)	(0.011)	(0.016)	(0.005)
Mean Dep. Var.	0.16	0.59	0.12	0.01
Observations	51,541	70,369	10,342	10,342
Fixed Effect	Village	Village	Village	Village

Notes: The samples in columns (1) and (2) come from the NFHS 2015-16 dataset, while that in columns (3) and (4) come from the REDS 2006 dataset. Column (1) includes all married rural Hindu or Muslim women aged 15-49 while column (2) includes all rural Hindu or Muslim women aged 15-49. Columns (3) and (4) include all (rural) Hindu or Muslim women aged 18 years and above. *Decision* is an indicator variable that takes value one if a respondent can take any of these decision on her own: decisions about health care, decisions about making major household purchases, decisions about visits to family. *Allowed alone* is an indicator variable that takes value one if a respondent is allowed alone to any of these places: market, health facility, outside village. The dependent variable in column (3) is an indicator of whether a woman has attended any of the past four village meetings. The dependent variable in column (4) is an indicator of whether a woman is actively involved with a political party. *Female Headed HH* is an indicator that takes value one if the women respondent belongs to a household headed by a woman. Other controls in all the four columns include age, age squared, years of schooling and its square, religion, caste and village fixed effects. Robust standard errors clustered at village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B3—Summary Statistics (GP Level)

	Overall (1)	Hindu Sarpanch (2)	Muslim Sarpanch (3)
	Panel A: Demographics		
Total Households	462.12 (342.52)	455.88 (334.90)	513.37 (396.13)
% APL hh	66.81 (27.34)	66.63 (27.15)	68.30 (28.84)
% Muslim hh	13.97 (18.48)	9.73 (11.51)	48.89 (26.35)
% Women headed hh	2.17 (4.80)	2.16 (4.78)	2.25 (4.97)
	Panel B: Toilet Ownership by Year		
% HH owning toilets end of 2012–13	29.97 (23.31)	29.39 (23.17)	34.69 (23.98)
% HH owning toilets end of 2013–14	30.59 (23.62)	29.99 (23.45)	35.53 (24.42)
% HH owning toilets end of 2014–15	32.55 (24.43)	31.86 (24.22)	38.21 (25.37)
% HH owning toilets end of 2015–16	35.08 (25.38)	34.29 (25.13)	41.52 (26.50)
% HH owning toilets end of 2016–17	42.25 (28.89)	41.41 (28.70)	49.12 (29.49)
Observations	54,012	48,153	5,851

Notes: The table reports the summary statistics at the GP level. Column (1) reports the results for the full sample of GPs, while columns (2) and (3) report it for samples with Hindu and Muslim Sarpanches respectively. Standard deviation reported in parentheses.

Table B4—Covariates and Pre-treatment Outcomes Balanced (GP Level)

	Overall	Hindu Sarpanch	Muslim Sarpanch
	(1)	(2)	(3)
		Panel A: Covariates	
Total population	84.17 (96.37)	106.7 (101.2)	-146.0 (315.0)
Primary school within 5 km	0.00970 (0.0175)	0.0143 (0.0184)	-0.0362 (0.0582)
Middle school within 5 km	0.0314 (0.0239)	0.0427* (0.0246)	-0.0955 (0.0981)
Secondary school within 5 km	0.0169 (0.0321)	0.00456 (0.0332)	0.154 (0.123)
Tap water	-0.0219 (0.0242)	-0.00779 (0.0252)	-0.181** (0.0894)
Closed drainage	0.00310 (0.0137)	0.00486 (0.0140)	-0.0138 (0.0559)
Waste disposal	-0.00379 (0.0173)	-0.00506 (0.0181)	0.0119 (0.0594)
All weather roads	0.0116 (0.0299)	-0.00388 (0.0310)	0.189* (0.113)
Domestic power	0.0115 (0.0177)	0.0168 (0.0180)	-0.0496 (0.0784)
Irrigation	0.00283 (0.0138)	-0.00402 (0.0143)	0.0840 (0.0544)
% APL hh	-0.00341 (0.0192)	0.00284 (0.0197)	-0.0707 (0.0795)
% Muslim hh	-0.00183 ((0.0113)	0.00335 (0.00764)	0.0114 (0.0649)
% Women headed hh	0.00200 (0.00326)	0.00141 (0.00326)	0.00835 (0.0156)
		Panel B: Pre-treatment Outcomes	
Share of HH received toilets in 2013–14	-0.00344 (0.00412)	-0.00361 (0.00447)	-0.00153 (0.00571)
Share of HH received toilets in 2014–15	-0.00558 (0.00640)	-0.00348 (0.00669)	-0.0256 (0.0223)
Share of HH received toilets in 2015–16	0.00269 (0.00825)	0.00671 (0.00843)	-0.0388 (0.0355)
Polynomial order	1	1	1
Bandwidth	0.10	0.10	0.10

Notes: The table reports the estimated jump at the threshold of the running variable for female reservation dummy. The variables from "Total Population" to "Irrigation" in Panel A are obtained from the Census 2011 data on village amenities. The remaining variables are obtained using the SBM administrative data. Panel B reports the estimates for the share of eligible households without toilets at the end of the previous year that received toilets in a given year. Column (1) reports the results for the full sample of GPs, while columns (2) and (3) report it for samples with Hindu and Muslim Sarpanches respectively. The polynomial order is 1. The bandwidths is manually chosen to be 0.1. Standard errors are clustered at Gram Panchayat level and reported in parentheses.

Table B5—First Stage

	Female Sarpanch		
	Panel A: Overall		
	(1)	(2)	(3)
Female instrument	0.593***	0.563***	0.528***
	(0.0153)	(0.0177)	(0.0213)
Mean dep. var.	0.395	0.393	0.383
Observations	2,470,191	1,962,725	1,457,226
Number of GPs	9,179	7,234	5,277
Polynomial order	1	1	1
Bandwidth	0.100	.075	0.050
	Panel B: Hindu sarpanch		
	(1)	(2)	(3)
Female instrument	0.603***	0.572***	0.535***
	(0.0161)	(0.0186)	(0.0225)
Mean dep. var.	0.397	0.396	0.389
Observations	2,256,016	1,796,577	1,336,812
Number of GPs	8,278	6,541	4,744
Polynomial order	1	1	1
Bandwidth	0.100	.075	0.050
Estimated mean at the threshold	0.0548	0.0568	0.0590
	Panel C: Muslim sarpanch		
	(1)	(2)	(3)
Female instrument	0.504***	0.483***	0.465***
	(0.0487)	(0.0557)	(0.0663)
Mean dep. var.	0.376	0.361	0.315
Observations	214,175	166,148	120,414
Number of GPs	901	693	503
Polynomial order	1	1	1
Bandwidth	0.100	.075	0.050

Notes: The polynomial order is 1. The bandwidths are manually chosen. Standard errors clustered at gram panchayat level and reported in parentheses.

Table B6—Heterogeneous Effect of Female Reservation across GPs

	HH Received Toilet in 2016–2017		
	(1)	(2)	(3)
Female Reservation	0.00325	0.00383	0.00598
	(0.0166)	(0.0197)	(0.0246)
Muslim Sarpanch	-0.0332	-0.0539**	-0.0584*
	(0.0222)	(0.0254)	(0.0301)
Female Reservation*Muslim Sarpanch	0.149**	0.209**	0.257**
	(0.0678)	(0.0816)	(0.0999)
Mean dep. var.	0.104	0.104	0.098
Observations	2,470,191	1,962,725	1,457,226
Number of GPs	9,179	7,234	5,277
Bandwidth	0.100	0.075	0.050
Polynomial order	1	1	1

Notes: The sample is restricted to households which did not have toilets at the end of 2015–2016. The polynomial order is 1. The bandwidth is manually chosen to be 0.1. Standard errors clustered at Gram Panchayat level and reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B7—Gender Quota Effect: Differentiating between Demand and Supply

	HH Received Toilet in 2016–2017			
	Hindu Sarpanch		Muslim Sarpanch	
	Hindu HH	Muslim HH	Hindu HH	Muslim HH
	(1)	(2)	(3)	(4)
	Panel A: Bandwidth 0.075			
Female reservation	0.0232	-0.0277	0.179	0.214**
	(0.0247)	(0.0587)	(0.111)	(0.0963)
	(0.0189)	(0.0403)	(0.0877)	(0.0820)
Female reservation * Female Headed HH	0.0532	0.298*	0.263	0.455***
	(0.0585)	(0.156)	(0.242)	(0.166)
Female Headed HH	-0.0298	-0.0995***	-0.105**	-0.0429
	(0.0230)	(0.0349)	(0.0489)	(0.0469)
Mean dep. var.	0.110	0.120	0.135	0.209
Observations	1,049,926	104,433	66,117	44,114
Number of GPs	6,325	5,542	656	647
Bandwidth	0.075	0.075	0.075	0.075
Polynomial order	1	1	1	1
	Panel B: Bandwidth 0.05			
Female reservation	0.0323	-0.00946	0.261*	0.320***
	(0.0305)	(0.0758)	(0.139)	(0.112)
Female reservation * Female Headed HH	0.0251	0.131	0.163	0.333*
	(0.0715)	(0.226)	(0.232)	(0.172)
Female Headed HH	-0.0122	-0.0470	-0.0956**	-0.0134
	(0.0257)	(0.0414)	(0.0457)	(0.0440)
Mean dep. var.	0.105	0.114	0.118	0.201
Observations	784,725	77,530	47,307	29,647
Number of GPs	4,622	4,055	474	466
Bandwidth	0.05	0.05	0.05	0.05
Polynomial order	1	1	1	1

Notes: The data is at the household level. The sample for column (1) is Hindu households under Hindu leaders while that for column (2) is Muslim households under Hindu leaders. The samples for columns (3) and (4) are defined similarly under Muslim leaders. Female Headed HH is a dummy that takes value one if the household head is a woman and zero otherwise. The polynomial order is 1. The bandwidth is manually chosen to be 0.075 in Panel A and 0.05 in Panel B. Standard errors clustered at Gram Panchayat level and reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B8—Gender Quota Effect: Identifying Household Demand (Common GPs)

	HH Received Toilet in 2016–2017			
	Hindu Sarpanch		Muslim Sarpanch	
	Hindu HH	Muslim HH	Hindu HH	Muslim HH
	(1)	(2)	(3)	(4)
Female reservation	0.00351	-0.0330	0.115	0.167*
	(0.0211)	(0.0475)	(0.0908)	(0.0868)
Female reservation * Female Headed HH	0.0597	0.254*	0.366	0.485***
	(0.0508)	(0.134)	(0.263)	(0.177)
Female Headed HH	-0.0346	-0.100***	-0.136*	-0.106*
	(0.0218)	(0.0302)	(0.0708)	(0.0612)
Mean dep. var.	0.111	0.120	0.135	0.201
Observations	1,280,507	131,297	83,457	57,085
Number of GPs	7,026	7,026	823	823
Bandwidth	0.1	0.1	0.1	0.1
Polynomial order	1	1	1	1

Notes: The sample is Above Poverty Line (APL) households who are eligible for the SBM program and did not have toilets at the end of 2015–2016. The sample for column (1) is Hindu households under Hindu leaders while that for column (2) is Muslim households under Hindu leaders. The samples for columns (3) and (4) are defined similarly under Muslim leaders. The sample of GPs for columns (1) and (2), and for columns (3) and (4) is common. Female Headed HH is a dummy that takes value one if the household head is a woman and zero otherwise. The polynomial order is 1. The bandwidth is manually chosen to be 0.1. Standard errors clustered at Gram Panchayat level and reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B9—Gender Quota Effect: Identifying Household Demand (GPs with Hindu and Muslim Female Headed Households)

	HH Received Toilet in 2016–2017			
	Hindu Sarpanch		Muslim Sarpanch	
	Hindu HH	Muslim HH	Hindu HH	Muslim HH
	(1)	(2)	(3)	(4)
Female reservation	-0.0505	-0.153	0.301**	0.274**
	(0.0471)	(0.152)	(0.146)	(0.115)
Female reservation * Female Headed HH	0.142**	0.371**	0.292	0.434**
	(0.0667)	(0.170)	(0.288)	(0.178)
Female Headed HH	-0.0354	-0.161***	-0.137	-0.0867
	(0.0288)	(0.0595)	(0.0856)	(0.0623)
Mean dep. var.	0.100	0.130	0.133	0.181
Observations	337,411	45,035	37,069	27,101
Number of GPs	1,443	1,443	276	276
Bandwidth	0.1	0.1	0.1	0.1
Polynomial order	1	1	1	1

Notes: The sample is Above Poverty Line (APL) households who are eligible for the SBM program and did not have toilets at the end of 2015–2016. The sample for column (1) is Hindu households under Hindu leaders while that for column (2) is Muslim households under Hindu leaders. The samples for columns (3) and (4) are defined similarly under Muslim leaders. The sample restricted to GPs having both Hindu and Muslim female headed households. Female Headed HH is a dummy that takes value one if the household head is a woman and zero otherwise. The polynomial order is 1. The bandwidth is manually chosen to be 0.1. Standard errors clustered at Gram Panchayat level and reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B10—Muslim vs Hindu Sarpanches in Close Election GPs: Robustness

	HH Received Toilet in 2016–2017		
	(1)	(2)	(3)
Female Reservation	-0.00389	-0.00955	-0.00474
	(0.0275)	(0.0313)	(0.0385)
Muslim Sarpanch	-0.0136	-0.0172	-0.00501
	(0.0228)	(0.0258)	(0.0310)
Female Reservation*Muslim Sarpanch	-0.00557	-0.00264	-0.00338
	(0.0369)	(0.0418)	(0.0507)
Mean dep. var.	0.099	0.099	0.104
Observations	943,224	777,713	569,103
Number of GPs	3,262	2,666	1,941
Bandwidth	0.100	0.075	0.050
Polynomial order	1	1	1

Notes: The sample is restricted to households which did not have toilets at the end of 2015–2016. The polynomial order is 1. All regressions additionally control for the reservation assignment variable and its interaction with gender reservation. The bandwidth is manually chosen to be 0.1. Standard errors clustered at Gram Panchayat level and reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B11—Gender Quota Effect in High Muslim Population Share GPs

	Household Received Toilet in 2016–2017			
	Hindu Sarpanch		Muslim Sarpanch	
	Hindu HH	Muslim HH	Hindu HH	Muslim HH
	(1)	(2)	(3)	(4)
Female Sarpanch	0.0195	-0.0568	0.213*	0.189**
	(0.145)	(0.253)	(0.110)	(0.0941)
Female Sarpanch * Female Headed HH	0.509	0.906***	0.510*	0.508***
	(0.316)	(0.350)	(0.289)	(0.185)
Female Headed HH	-0.0825	-0.202*	-0.127	-0.0847
	(0.0567)	(0.105)	(0.137)	(0.0674)
Mean dep. var.	0.139	0.142	0.158	0.211
Observations	64,693	31,485	49,453	49,798
Number of GPs	554	532	613	616
Bandwidth	0.1	0.1	0.1	0.1
Polynomial order	1	1	1	1

Notes: The sample is Above Poverty Line (APL) households who are eligible for the SBM program and did not have toilets at the end of 2015–2016. Samples for all the columns only include GPs with population share of Muslims higher than the 85^{th} percentile of the Muslim population share distribution in the full sample. The sample for column (1) is Hindu households under Hindu leaders while that for column (2) is Muslim households under Hindu leaders. The samples for columns (3) and (4) are defined similarly under Muslim leaders. Female Headed HH is a dummy that takes value one if the household head is a woman and zero otherwise. The polynomial order is 1. The bandwidth is manually chosen to be 0.1. Standard errors clustered at Gram Panchayat level and reported in parentheses.

Table B12—Close Election Gender Effect: Identifying Household Demand

	Household Received Toilet in 2016–2017			
	Hindu Female, any male		Muslim Female, any male	
	Hindu HH	Muslim HH	Hindu HH	Muslim HH
	(1)	(2)	(3)	(4)
Female Sarpanch	0.0391**	0.0920**	0.0107	-0.000459
	(0.0193)	(0.0357)	(0.0762)	(0.0731)
Female Sarpanch * Female Headed HH	-0.0417	0.134	0.296*	0.636***
	(0.0507)	(0.124)	(0.164)	(0.205)
Female Headed HH	0.0682*	0.0376	0.0101	-0.142**
	(0.0364)	(0.0654)	(0.0940)	(0.0670)
Mean dep. var.	0.113	0.121	0.147	0.171
Observations	659,787	67,756	41,404	27,744
Number of GPs	4,116	3,646	423	405
Bandwidth	0.1	0.1	0.1	0.1
Polynomial order	1	1	1	1

Notes: The sample is Above Poverty Line (APL) households who are eligible for the SBM program and did not have toilets at the end of 2015–2016. The sample for column (1) is Hindu households under Hindu females, any males leaders while that for column (2) is Muslim households under Hindu females, any male leaders. The samples for columns (3) and (4) are defined similarly under Muslim female, any male leaders. Female Headed HH is a dummy that takes value one if the household head is a woman and zero otherwise. The polynomial order is 1. The bandwidth is manually chosen to be 0.1. Standard errors clustered at Gram Panchayat level and reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table B13—Gender Quota Effect in NREGS Implementation: No Heterogeneity

	Expenditure/Capita 2016–17			Person-days/Capita 2016–17		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Hindu sarpanch					
Female reservation	0.00485	0.00562	0.0111	0.0277	0.0520	0.0771
	(0.0249)	(0.0300)	(0.0386)	(0.117)	(0.141)	(0.183)
Observations	7,834	6,195	4,520	7,891	6,238	4,548
Polynomial order	1	1	1	1	1	1
Bandwidth	0.100	.075	0.050	0.100	.075	0.050
Estimated mean at the threshold	0.290	0.294	0.297	1.292	1.300	1.309
	Panel B: Muslim sarpanch					
Female reservation	0.0490	0.0531	0.0524	0.327	0.261	0.340
	(0.0800)	(0.0972)	(0.119)	(0.353)	(0.438)	(0.541)
Observations	879	673	490	884	677	493
Polynomial order	1	1	1	1	1	1
Bandwidth	0.100	.075	0.050	0.100	.075	0.050
Estimated mean at the threshold	0.255	0.253	0.264	1.093	1.112	1.156

Notes: The expenditure reported is in thousands of ₹. The polynomial order is 1. The bandwidths are manually chosen. Standard errors clustered at gram panchayat level and reported in parentheses.