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Gender and Public Goods Provision in Tamil Nadu's Village Governments

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Abstract

Using data from 144 village-level governments in India's Tamil Nadu state, this paper investigates political reservations for women and whether the gender of village government leaders influences the provision of village public goods. A knowledge test of village government presidents and a survey about the interaction between village presidents and higher-level officials reveal that female village government presidents have much lower knowledge of the village government system than do their male counterparts and have significantly less contact with higher-level government officials. Although male and female presidents provide similar amounts of some public goods, there is strong evidence that village governments led by a woman built fewer schools and roads—two public goods that require relatively more contact and coordination with higher-level officials.

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Gender and Public Goods Provision in Tamil Nadu's Village Governments

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The role of women in developing country governance has received much attention in recent years. Today, 57 countries have quotas for women specified in their constitution or in national legislation; this figure increases to 94 when including countries with voluntary political party quotas.[1] Gender equality is also one of the eight Millennium Development Goals, and the World Bank has put gender empowerment high on their agenda, stating that gender inequality hinders development and poverty reduction (World Bank 2001).

One key motivation for the reservation of government seats for women is to address the exceptionally poor status of women in developing countries. Among the poorest individuals in the developing world, women are particularly worse off in terms of health, income, job opportunities, rights, and political representation. Political reservations are one way to attempt to improve the status of women in society and ensure their participation in government. Women's well-being also affects others, especially their children. Political reservations thus also aim to lead to more pro-women policies, which may include pro-child, pro-family, and pro-health policies. Understanding the performance of women who hold reserved seats, therefore, becomes of utmost importance. To this end, we investigate women's political reservations in village governments in India's Tamil Nadu state and whether the gender of political leaders influences public goods provision.

The impact of women's reservation policies has been hotly contested in both policy and academic arenas, largely because of a lack of counterfactuals. India's large-scale political reservations provide an excellent setting for evaluating the impact of reservation policies; the

[1] From the database at http://www.quotaproject.org. These statistics include countries with quotas at national or sub-national levels. Political party quotas are only used in places with a proportional representation system, as opposed to first-past-the-post. These figures do not account for non-compliance issues.

evidence, however, is mixed.[2] Chattopadhyay and Duflo (2004) undertake, to our knowledge, the first major attempt to empirically analyze the effect of women politicians in India by exploiting the randomness some Indian states use in implementing reservation policies. Using data on female presidents and public goods provision in village level governments (called *gram panchayats*, henceforth GPs) combined with data on women's preferences, the authors show that female GP presidents (known as *pradhans* in some states) in women-reserved seats invest more in public goods considered important by women, such as drinking water and roads in West Bengali GPs and drinking water in Rajasthani GPs. Duflo and Topalova (2004) find a positive impact on public goods provision in women-headed GPs; however, they also find that citizens in GPs with women presidents are generally more dissatisfied with public goods provision and perceive these women to be ineffective leaders.[3] In their empirical analysis of West Bengal's GPs, Beaman et al. (2009) provide evidence that this 'perception bias' fades over time with repeated exposure to female leaders. They additionally find evidence that GPs with prior female president reservations have significantly more women in *unreserved* GP-level elected seats, suggesting that reservations may improve the electoral potential of women. Beaman et al. (2010) build on each of these three papers by examining villages in West Bengal over an additional GP election cycle as well as a panel of 11 Indian states. They confirm the main findings of these papers in addition to showing that women GP presidents from Chattopadhyay and Duflo (2004) perform even better over time: in the second election cycle analyzed, women presidents engaged in more repairs of schools and health centers and investments in irrigation facilities. In the 11 states overall, they find that women perform better for some public goods. However, they do not

[2] Mansuri and Rao (2013) provide an excellent discussion of the literature on women's political reservations—particularly in India—and their impacts on participation in government as well as public goods provision.
[3] Duflo and Topalova (2004) assume that reservations at the GP level are randomly assigned in all states in their analysis. However, many states—including states in their sample—use population ratios to assign reservations.

report how this varies across states. Village citizens might also be impacted by a role model effect of women GP presidents: Beaman et al. (2012) identify a shrinking gender gap between boys' and girls' aspirations, as well as parents' aspirations for their sons and daughters, in GPs reserved for women for two election cycles in one district in West Bengal.

In contrast, Ban and Rao (2008) examine four states in southern India and find that female presidents do not provide public goods in line with their preferences, nor do they provide fewer public goods than men. Rajaraman and Gupta (2012) show that GP expenditures on water-related issues (a women-preferred public good, as found in some previous studies) are unaffected by the GP president's gender but are significantly higher in GPs with characteristics associated with more water-borne diseases outbreaks. Bardhan et al. (2005) find mixed results in West Bengal regarding the impact of women GP president reservations on program targeting by the GP: women in reserved seats do better in bringing IRDP credit programs to the poor[4] but fare worse regarding employment programs, construction of new concrete roads, and raising non-tax revenue. Although Bardhan et al. (2005) cite the difficulty in aggregating these results into an overall impact on welfare, they estimate that women-reserved GPs may be worse off in terms of targeting the poor because the gains from improved IRDP targeting are more than offset by the losses from worse employment-program targeting. Scheduled Caste (SC) and Scheduled Tribe (ST) households in women-reserved GPs are particularly negatively affected, and this effect is worse in GPs with higher land inequality among SC and ST households. Using the same set of West Bengali GPs as Bardhan et al. (2005) but in a later time period (1998–2004), Bardhan et al. (2010) find no evidence of improved targeting to the poor in female-reserved GPs. They do find a negative effect of women's reservation on targeting to SC and ST households; however, in

[4] IRDP (Integrated Rural Development Programme) credit is an Indian government program that gives poor rural families access to credit and/or skills training so they can engage in income-generating activities.

contrast to their previous study, the negative impact of women in reserved GPs on poorer targeting to SC and ST households is lessened in GPs with higher land inequality. Ban and Rao (2008) and Beaman et al. (2010) find lower job-related knowledge among women GP presidents. However, the disparity between men and women presidents in Beaman et al. (2010) disappears two years into their term in office. Clearly, the empirical findings on the impact of women's GP reservations are mixed.

In this paper, we investigate public goods provision by male and female GP presidents in Tamil Nadu. Although the methodology of this paper is similar to that of Chattopadhyay and Duflo (2004) and Ban and Rao (2008), we contribute to the literature on the effectiveness of women in India's village governments by building on previous work[5] in the following ways. (1) We analyze the results of a knowledge test of GP rules and regulations, given to GP presidents in the fourth year of their presidency.[6] (2) We incorporate data on the frequency of interaction between GP presidents and key individuals in other tiers of sub-state governance in Tamil Nadu to understand the extent of women GP presidents' activity and connections while holding office.[7] (3) We discuss important differences in the history of local governance in India's states, which may explain why our findings differ from some previous findings, particularly in West Bengal. Context is extremely important in examining women's reservations, and findings in one area cannot be assumed to hold in other areas. (4) We develop a detailed village-level dataset for two time periods using village-level government records instead of recall data on public goods, as in some previous studies. This allows for a more precise difference-in-differences (DID) analysis.

[5] We focus on the literature examining decentralized governance in India. There are numerous analyses of decentralization and public goods provision in other countries. See, for example, Zhang and Zhou (1998), Faguet (2004), and Zhang et al. (2004).

[6] Our knowledge test questions focus on GP functioning and panchayat rules and thus differ from the knowledge assessments in Ban and Rao (2008) and Beaman et al. (2010).

[7] In assessing interaction with higher-level officials, Ban and Rao (2008) use only a binary measure of whether a GP president has met with any higher panchayat official.

We also use several outcome variables to measure public goods provision by the GP, allowing us to check the robustness of our results.

We find that female GP presidents are much less knowledgeable than are male presidents regarding the GP president position and the Panchayat system in general. Additionally, female presidents have significantly less contact with higher-level government officials vis-à-vis their male counterparts. This is important because contact and coordination with higher-level officials is necessary for certain village public goods. The results of our analysis strongly suggest that female presidents provide their GPs with fewer schools and roads, two public goods that require more connection with higher-level officials in the panchayat system. To the best of our knowledge, these results are new in the literature. We also find weak evidence that women provide fewer household toilet connections, household drinking water connections, and streetlights. For all other public goods, there is generally no statistically significant difference between provision by male and female presidents. Given the low level of public goods and infrastructure in these GPs, we consider more public goods provision to be indicative of "better" performance as a GP president.

In the next section, we briefly review the history of local governance in India, specifically in Tamil Nadu. We describe our field survey in Section II and our empirical strategy in Section III. In Section IV, we analyze the performance of female presidents and estimate the effect of president gender on village public goods provision. In the final two sections, we discuss our findings and offer some concluding thoughts.

I. Setting

Self-governing village communities in India seem to have existed since two to three thousand years ago (Mathew 2000b). Village governance weakened during British rule in India

but then strengthened following independence in 1947, motivated by Gandhi's vision of strong decentralized governments.[8] Although some form of local governance existed in many states, the structure, duties, reservation policies, and consistency of elections varied widely across states. Uniformity of decentralization across states was largely advanced in the early 1990s through the 73rd and 74th Constitutional Amendments. The 73rd Amendment, which focuses on decentralization in rural areas,[9] required the creation of three tiers of sub-state governance—called *panchayats*—at the district, block (or union), and village levels in each of India's 28 states.[10] The 73rd Amendment notably calls for the reservation of seats at all levels of panchayats for women, Scheduled Caste (SC), and Scheduled Tribe (ST) persons.[11]

Village panchayats, known as gram panchayats (GPs), have recently received much attention in the literature due to their use of political reservations. A minimum of one-third of GP presidents' seats within each state must be reserved for women, and another portion is reserved for SC and ST persons based on the composition of SC and ST persons within the state. These mandatory reservations are well suited for empirically analyzing the role of GPs in public goods provision and the extent of influence of the GP president. [12]

Our study focuses on Tamil Nadu, India's southernmost state. Tamil Nadu was originally part of the Madras State after India's independence and became present-day Tamil Nadu in 1968. Aram and Palanithurai (2000) provide a summary of the rich history of local

[8] For a brief history of local governments in each of India's states, see Mathew (2000a).
[9] The 74th Amendment applies to municipalities.
[10] India's seven Union Territories are headed by a federal government-appointed administrator.
[11] "Scheduled Caste" refers to persons historically found at the bottom of India's caste system of social hierarchy, formerly referred to as "Untouchables."
[12] Reservation of seats for women, SC, and ST persons is required for all elected positions in the three tiers of panchayats; we focus solely on the position of GP president.

governance in Tamil Nadu.[13] During the peak of the Chola Dynasty (roughly 900–1200 AD), villages were strong, self-governing units. Local governance was also reasonably strong during the colonial period, though it weakened in the final years before independence. Through the Madras Panchayat Act of 1958, local governance strengthened, and Tamil Nadu was a panchayat success story. However, from the 1970s to the mid-1980, things were in flux. After the passage of India's 73rd Constitutional Amendment, Tamil Nadu created the 1994 Tamil Nadu Panchayats Act, which included women's reservations. Its first post-Act panchayat elections were held in 1996 and have since been held every five years.

The 73rd Amendment outlines 29 areas that can be allocated to the GP; each state then chooses which areas it will devolve. The Amendment also sets requirements on the reservation of seats, but each state can implement this in its own way. In Tamil Nadu, the *Rural Development and Panchayati Raj Department* of the Government of Tamil Nadu is responsible for the Tamil Nadu Panchayats Acts of 1994 as well as many other documents and government orders outlining the rules of the panchayat system and what is devolved to the GP.[14] GP reservations in Tamil Nadu are held for 10 years (two five-year election terms), and the selection of GPs for reservation—for women, SC, and ST persons—is performed at the block level. Tamil Nadu, similar to many Indian states, does not randomly select GPs for women, SC, and ST reservations. For the 1996 elections (the first elections following the Tamil Nadu Panchayats Act), one-third of GPs in each block were reserved for women, and 20 percent were reserved for SC and ST presidents. Reserved GPs are chosen as follows:

[13] All historical information about Tamil Nadu's governance in this paragraph comes from Aram and Palanithurai (2000).

[14] Some documents are available on the *Rural Development and Panchayati Raj Department* website: http://www.tnrd.gov.in/acts_go.html. Many, however, are not. We obtained some documents from our field contacts to help in understanding the devolution of power and responsibility to GP presidents in Tamil Nadu.

1. All GPs within a block are arranged in descending order of the ratio of SC persons to the total population. The top 20 percent are set aside for SC and ST reservations.
2. If the ST population in a block is above a certain level, one GP is reserved for an ST president. If not, all SC and ST reservations chosen in part (1) are set for SC reservation.[15]
3. The GPs in the 20 percent reserved for SC/ST reservations are arranged in descending order of the ratio of female SC persons to the total SC population. The top one-third is reserved for female SC presidents.
4. The remaining GPs are sorted in descending order of the ratio of females to the total population. The top one-third is reserved for female presidents.
5. All reservations are held for 10 years (two terms). After 10 years, the same procedure is implemented, except that GPs previously reserved for SC and ST presidents are excluded from step (1), and GPs previously reserved for women are excluded from step (4).

Given this reservation method, a regression discontinuity (RD) approach would be ideal for identifying the effect of reservations on differences in public goods provision. However, based on the available data, an RD analysis requires that we omit all GPs with an SC reservation, resulting in a significant loss in observations, especially because the analysis is conducted within a small bandwidth of the discontinuity. Thus, we use RD only as a check of our key findings.

Although the assignment of reservations in Tamil Nadu is not random, we believe that women's reservations are not related to any unobservable determinants of public goods provision on the following grounds: (i) the female-to-total population ratio is extremely similar across GPs

[15] No GPs in our sample were selected for ST reservation. Tamil Nadu's very small ST population means that very few GPs in Tamil Nadu are selected for ST reservation overall.

within each block (Table 1); (ii) GPs selected for female reservation do not differ significantly from non-reserved GPs in a number of village attributes (Table 2, first three columns);[16] (iii) the female-to-total population ratio is uncorrelated with any village characteristics for which we have data (Table S1.1 in the supplemental appendix); and (iv) a t-test of the difference in mean public goods levels in 1991 (before reservation assignments were made) shows that GPs selected for female reservation in 1996 did not differ significantly from unreserved GPs in most of the 11 public goods measures used in this analysis (Table 3). Reserved GPs did have fewer public toilets; however, we do not feel that this affects our main findings. Because we use a DID approach to estimate the effect of women's GP reservations, even if unobservable factors exist that influence a GP's reservation status and affect public goods provision, our estimate of the effect of reservation on public goods provision will be unbiased as long as those factors do not change over time. We discuss this further in Sections III and IV.

II. Data

The data for this study come from village government records and village-level surveys conducted in Tamil Nadu in 2005 and 2006, implemented through a joint research project of the International Food Policy Research Institute (IFPRI) and Tamil Nadu Agricultural University (TNAU).[17] Tamil Nadu has 29 district panchayats (DPs), 385 panchayat union councils (PUCs), and 12,618 GPs in total. To select GPs for our survey, we divided the districts of Tamil Nadu into three categories based on their Human Development Index: Developed, Moderately Developed, and Less Developed. We randomly selected one district from each of the three

[16] There is one exception: the number of Christian households is significantly greater in unreserved villages. However, Christian households comprise less than two percent of total households in our sample, so we are not concerned with this difference.

[17] We also used election data posted by the Tamil Nadu State Election Commission to verify the reservation status of GPs in our study (http://tnsec.tn.nic.in).

human development categories, from which four PUCs were randomly chosen. From each of the 12 PUCs, we randomly selected 12 GPs, for a total of 144 GPs from 12 PUCs from three districts. The three districts from which the 144 GPs for this survey were selected are Coimbatore, Pudukottai, and Vellore.

Data were collected using several surveys. For this analysis, the data come from individual interviews with each GP president, interviews with 270 randomly selected citizens, and a secondary data schedule used to gather current and historic data on GP characteristics and levels of public goods. Summary statistics for all data are given in Tables 4a and 4b.

III. Empirical Strategy

This study aims to examine the treatment effect of reserving the GP president's position for women by comparing reserved and unreserved GPs. However, because we can never observe a reserved GP in the absence of a reservation, estimates of the effect of reservations can be biased. Additionally, one may be concerned about the use of GP female-population ratios to determine women's reserved seats. One technique to control for potential bias caused by unobservable factors is a difference-in-differences (DID) estimation strategy.

DID estimation uses a control group and an experimental group and observations in at least two time periods: one before the 'change' and one after. The benefit of using DID is that even if there are unobservable factors that influenced a GP's reservation status and could affect public goods provision, our estimate of the effect of reservation on public goods provision will be unbiased if those factors do not change differently over time in reserved and unreserved GPs.

In its most general form, the DID estimator compares the change over time between the two groups. Consider unreserved (U) and reserved (R) GPs and the time periods 1991 (before the 73rd Amendment policies were instituted in Tamil Nadu) and 2005 (the fourth year of a Tamil

Nadu GP president's term in office, which is the ninth year of a 10-year reservation cycle).[18] In this case, the DID estimator is given by

$$\widehat{DID} = \left(\overline{Y}_{\mathrm{R},2005} - \overline{Y}_{\mathrm{R},1991}\right) - \left(\overline{Y}_{\mathrm{U},2005} - \overline{Y}_{\mathrm{U},1991}\right), \quad (1)$$

where Y is the dependent variable of interest (public goods), group R consists of reserved GPs, group U consists of unreserved GPs, and $\overline{Y}_{g,t}$ is the mean value of Y for group g and time t. The DID estimator can also be obtained from a regression of the form

$$Y_{it} = \alpha + \beta_1 RESERVED_i + \beta_2 AFTER_t + \beta_3 (RESERVED_i * AFTER_t) + \varepsilon_{it} \quad (2)$$

for GP i in time period t, where *RESERVED* is a dummy variable equaling 1 for reserved GPs and *AFTER* is a dummy variable equaling 1 for observations occurring in 2005, after Tamil Nadu's reservation policy was implemented. $\hat{\beta}_3$ is the DID estimate. In a fixed effects estimation—as we perform in Section IV—*RESERVED* is dropped.

An unbiased estimate of β_3 from Equation (2) requires that any unobservable factors that influence whether a GP received treatment and affect the GP's public goods outcomes have a similar trend over time in reserved and unreserved GPs. For example, if, over time, GPs with higher female population ratios have a different rate of change in political party affiliations and if political party affiliations impact public goods provision, then our estimates could be biased. We provide some evidence of similar trends in reserved and unreserved GPs by comparing the change in village characteristics over 1991–2005 (Table 2, rightmost column). We see no statistically significant difference in the change in village characteristics over the 1991–2005 period for any variables except for the SC population. Although the rate of growth in the SC population was greater in GPs that were unreserved in 2005, we do not think this is a major

[18] Data on public toilets, household toilets, and buses and minibuses are from 1995 and 2004. Because 1996 was the first year of reservation, these years are suitable for the analysis, as they provide data from before reservation and from the eighth year of the reservation.

cause for concern for two reasons. First, the SC population in two unreserved GPs increased by more than 600 percent from 1991–2005, growing from 23 to 192 and 64 to 465. There are also four other unreserved GPs whose SC populations grew by more than 150 percent. Excluding these huge growers causes the statistical significance to disappear. Second, there is anecdotal evidence that with the advent of SC reservations and other SC affirmative action-type programs, more people are claiming SC status or are no longer denying their SC status (Anand and Sharma 2011). This phenomenon might explain the observed difference in the SC population.

We further refine our DID estimation to include covariates, so our estimates will still be accurate even if there are different trends in the SC population or other variables. The DID estimate in this case is given by $\hat{\gamma}_3$ of the following regression:

$$Y_{it} = \alpha + \gamma_1 RESERVED_i + \gamma_2 AFTER_t + \gamma_3 (RESERVED_i * AFTER_t) + \boldsymbol{\varphi X} + \varepsilon_{it} \quad (3)$$

where $\boldsymbol{X}$ contains covariates such as the GP's female and SC population ratios in 1991 (i.e., the values on which the reservations are based).[19]

IV. The Analysis

Of the 144 villages in our survey, 47 have GPs with presidential seats reserved for women,[20] which perfectly represents India's requirement that one-third of GP president seats be reserved for women. Only one GP failed to comply with the reservation policy by seating a male president, leaving 46 women-led GPs in our analysis. The women presidents are 42 years of age on average (ranging from 27 to 65), and 61 percent cite farming as their primary occupation.

[19] Because we perform a fixed-effects regression, time-invariant covariates (such as 1991 population ratios) are interacted with a time dummy (i.e., AFTER). A more intuitive way to think about this is as a cross-sectional regression of the form $yDIFF_i = \alpha + \delta_1 RESERVED_i + \boldsymbol{\eta X} + \varepsilon_i$, where *yDIFF* is the change in the amount of public good *y* from 1991 to 2005 and $\widehat{\delta_1}$ is the DID estimate.

[20] In a previous version of this paper, we cited different reservation statistics. This was the result of a data entry error, which has been checked and rectified in this paper.

Thirty-nine percent of the women cite the reservation of the presidential seat as their primary motivation for running for office, 33 percent cite past work with the community as their motivation, and 28 percent cite 'other' reasons. There are no women presidents in unreserved GPs.

Tamil Nadu is a leader in women's empowerment in India, and this is reflected by the high literacy rate for women: 64 percent, compared to the all-India female literacy rate of 54 percent.[21] The education level of female presidents in our sample is also very comparable to that of male presidents: 47 and 41 percent of male and female GP presidents, respectively, have at least a high school education, and 82 and 74 percent have at least a middle-school education. However, on a knowledge test[22] of the GP president's duties and the panchayat system in general that was given to presidents during the individual interviews, female presidents scored much lower than their male counterparts (Figure 1). For example, only 28 percent of female presidents in women-reserved GPs answered at least 11 of the 19 questions correctly, compared to 90 percent of male presidents. Gender strongly predicts presidents' test scores even after controlling for presidents' age, whether this is their second term, education, income, caste, religion, political party affiliation, and motivation for running for office (Table 5). The correlation between gender and test scores is not only strongly significant but of large magnitude as well. Given such poor knowledge of the GP, we might expect the performance of female presidents in women-reserved GPs to suffer. In particular, we might expect to see fewer public goods provided by female presidents in women-reserved GPs because the GP president plays a key role in procuring public goods for the GP. This knowledge disparity is much more

[21] These statistics come from the 2001 Census.
[22] The 19 questions on the knowledge test are given in Appendix A1.

pronounced than Beaman et al. (2010) find in West Bengal. Additionally, this GP knowledge gap among women GP presidents in Tamil Nadu exists the *fourth year* into their term in office.

Reserved-female presidents also have much less contact with higher-level officials (Table 6). These findings are significant at the one percent level and represent substantial differences in contact for all three higher-level officials. To fund projects within a GP, the GP president must be in contact with higher-level officials to apply for funds through government schemes administered at higher levels. According to our survey team's observations, the main function of the GP president is to identify needs and take the necessary steps to mobilize funds. Only very low-cost village projects can be undertaken by the GP president without consultation with higher-level officials. The most important person with whom Tamil Nadu's GP presidents must be in contact is the Block Development Officer (BDO), followed by the Panchayat Union Chairman (PUC), both of whom are officials at the intermediate level (Union) of the three-tier panchayat system. Contact with the District level is largely left to the Union. This is supported by our data: most contact is with the BDO, followed by the PUC. Both men and women GP presidents have much less contact with the District Panchayat Chairman (DPC), though the difference between men and women is still statistically significant. Thus, women GP presidents' significantly lower contact with higher-level officials—particularly at the Union level—provides another reason to suspect that they may have difficulty providing public goods for their constituency.

A natural question is whether these differences between men and women result from more experience by male presidents vis-à-vis female presidents. However, there are very few incumbents on both sides: only nine percent for women (four of 46 seats) and 12 percent for men (12 of 98 seats). Given only 16 experienced presidents in the dataset, the prospects for analysis

are limited. However, we can confidently say that differences in experience are not driving the knowledge and contact differences between men and women presidents. Eliminating the 16 experienced presidents does not change the findings or the significance of the difference between men and women in terms of their contact with the higher-level officials, and it does not impact the strong correlation between gender and test scores. Interestingly, the 16 experienced presidents have statistically significantly (1) higher knowledge test scores (on average, they answer almost two more questions correctly) and (2) more contact with the PUC compared to non-experienced presidents, providing some evidence that experience as a GP president does matter. However, differences in experience alone do *not* drive the differences between men and women.

Preferences

We examine male and female preferences for public goods to determine whether presidents provide public goods according to their preferences. We estimate preferences using survey questions posed to 270 citizens (139 men and 131 women) randomly sampled in 27 villages over the three districts surveyed in Tamil Nadu. One question asks citizens to list up to five infrastructure items needed in their village. All persons of a given GP were surveyed from the same village, so no bias resulted from different provision in different villages of the GP. More than 30 different responses were given by the 270 citizens.[23]

The results of chi-square tests of whether men's and women's preferences are drawn from different distributions are presented in the supplemental appendix (Table S1.3). Regardless of whether we conduct the test on all responses given by the group or the top five or 10 responses within the group, we cannot reject the null hypothesis that men's and women's

[23] A list of all responses is given in the supplemental appendix (Table S1.2).

preferences are drawn from the same distribution.[24] This finding is in contrast to Chattopadhyay and Duflo (2004), who find differences in preferences for public goods in Rajasthan and West Bengal using a chi-square test, illustrating the importance of context-specific analyses. We also provide individual *t*-tests of the percentage of men and women that listed each infrastructure item (Table S1.4). There are no statistically significant differences, with the exception of veterinary services (mentioned by only 14 citizens). Of the top 11 areas mentioned, we investigate eight in our public goods analysis. We do not have good data on 'drainage' or 'group houses,' and the GP president does not have much control over 'companies and industries.'[25]

Results

We next compare changes in public goods from 1991 to 2005 across unreserved and reserved GPs. Regardless of whether there is a gender difference in preferences, we are still interested in examining whether men and women provide different amounts of public goods because there are strong reasons to suspect there may be a difference:

1) Women's low scores on the knowledge test suggest that women might not be able to function well as GP presidents and thus might have lower public goods provision.
2) Women's minimal interaction with higher-level officials suggests that women might have lower public goods provision, at least for those goods that require coordination and/or support from higher levels of the panchayat system.

We have data on many measures of public goods provision in the GPs, but we restrict this analysis to public goods that coincide with citizens' most preferred items of infrastructure, as

[24] In a previous version of this paper, we counted only the first three—instead of all five—responses given by individuals, thinking that this indicated individuals' strongest opinions. However, after discussions with the research team, we determined that it was erroneous to omit any responses. All responses are thus counted in this analysis.
[25] We use the top 11 responses instead of 10 because "Streetlights" and "Independent pipeline/toilet connections" are tied as the tenth most mentioned items of infrastructure.

discussed in Section IV. We use 10 public goods measures (covering eight areas of public goods), which are described in Appendix A2. These variables reflect changes in physical *infrastructure* during a president's time in office as well as changes in *outcomes*. For example, we use data on the number of schools to measure investment in schools and education, whereas we use data on the percentage of children given various immunizations as an outcome measure of investments in health. These measures are used in a basic DID estimation strategy (Equation 2), with results given in Table 7.

Of our 10 measures of public goods, five measures exhibit no statistically significant difference in provision between male and female presidents: children's health, bus trips, public toilets, borewells, and common taps. Of these five, the point estimates are quite small in all cases with the exception of common taps. For the other five measures, we find that GPs with and without a woman in a reserved president seat had statistically significantly different changes in provision from 1991 to 2005: women-reserved GPs added fewer schools, fewer household drinking water connections, fewer household toilet connections, and fewer operational streetlights, and the distance to the nearest concrete road was farther away. In all cases, the change in the level of public goods indicates lower provision in women-reserved GPs versus unreserved GPs. Although we will not place too much emphasis on precise numbers, these differences are of non-trivial magnitude. The results suggest that women-reserved GPs had close to one fewer school, 13 fewer operational streetlights, 49 fewer household toilets, and 50 fewer household drinking water connections, and the nearest concrete road was 0.08 kilometers farther away compared with unreserved GPs.

Table 8 shows the results of a DID estimation with the following covariates added (Equation 3): the number of villages that compose the GP, GP female and SC population ratios

in 1991, log of GP total population in 1991, a dummy variable indicating a president's membership in the AIADMK political party,[26] log of total land area of the GP in 1991, the knowledge test score, and a dummy variable indicating low (=0) or high (=1) frequency of contact with the Block Development Officer, an important official situated one level above the GP.[27] These covariates control for relevant characteristics that could influence public goods provision if they are trending differently over time.

The results suggest that fewer schools and roads were created in female-reserved GPs, and these differences are non-trivial. For the remaining measures of public goods, we find no statistically significant difference in provision between reserved and unreserved GPs. However, the point estimates on the effect of having a woman in a reserved seat remain large, of the same sign, and have comparable coefficients vis-à-vis the basic DID findings in the cases of streetlights, household toilet connections, and household drinking water connections, all indicating lower levels of provision in women-reserved GPs. Only in the case of common taps is the point estimate suggestive that women presidents in reserved GPs are providing more of this public good, although this is statistically insignificant in all specifications. Thus, overall, we find strong evidence that female presidents in Tamil Nadu's reserved GPs provide fewer schools and roads and weak evidence that they provide less of some other goods as well. We find almost no evidence of women in reserved seats doing better in any aspect of GP public goods provision.

Including presidents' test scores and frequency of contact with the BDO reveals that higher test scores and more frequent contact are positively correlated with public goods

[26] The party in power in Tamil Nadu generally alternates between the DMK (Dravida Munnetra Kazhagam) and AIADMK (All India Anna Dravida Munnetra Kazhagam) parties. In 2005, the AIADMK was in power from the 2001 elections. For GP-level elections, the *de jure* rules state that candidates cannot run on a political party. However, *de facto*, their party affiliation does play a role.

[27] We also did this for contact with the Panchayat Union Chairman (PUC) and District Panchayat Chairman (DPC); the results are similar. We report only the results using BDO to save space. Additionally, the BDO is arguably the most important higher-level official with whom to be in touch.

provision. Although these variables are significant in only a few cases, this is likely due to inflated standard errors from the relatively high correlation between test scores, frequency of contact, and a GP's reservation status. Indeed, the correlation between reservation status and test scores is 61 percent, and it is 50 percent between reservation status and frequency of contact with the BDO.

As expected, a larger population is positively correlated with the provision of some public goods: household toilet and water connections, schools, borewells, and roads. We also find that having more villages that compose a GP is associated with greater provision of schools, which coincides with our intuition. Additionally, affiliation with the AIADMK party is associated with more common taps and more schools.

Further Checks

As discussed in Section I, a regression discontinuity design is ideal in many ways. However, given data restrictions, we do not pursue RD as the main analysis. We instead present a simple RD analysis in the supplemental Appendix S3. The results show a clear gap in the case of schools and smaller gaps for roads and household drinking water connections, although none of the results is statistically significant. This is likely due to too few observations when we consider data only within a bandwidth around the discontinuity.

Given concerns that experienced presidents might be driving the results, we also duplicate the DID with covariates analysis excluding the 16 presidents in their second term in office. Our findings hold and, in fact, are stronger: in addition to schools and roads, there is some evidence that women presidents provide fewer household toilet and drinking water connections, which are also higher-cost public goods that require coordination with higher-level officials such as the BDO and PUC (Table S1.5).

V. Discussion

Our findings suggest that for at least some public goods, presidents in women-reserved GPs are providing fewer public goods relative to unreserved GPs. There is evidence that these women are performing similarly to men in some aspects, but there is almost no evidence that they are providing more of any public good.

Given women's apparent lack of knowledge regarding the GP coupled with their limited contact with block- and district-level officials, it is not surprising that we find women presidents in reserved GPs providing fewer public goods compared to male presidents. We can identify two pathways through which the knowledge test helps to explain women's poorer performance. If the knowledge test *is* an accurate measure of a president's ability, then the test results indicate that women are of lower ability. We would thus expect to see lower public goods provision in female-reserved GPs. If the knowledge test is *not* a good measure of ability and one could be a successful president despite being unable to correctly answer most questions on our knowledge test, the lower test scores are still indicative of *something*. Presidents took this knowledge test, consisting of basic questions about the panchayat, in the fourth year of their presidencies. If a sitting president is active in their position, he or she should be able to answer most questions correctly, having encountered those issues during their four years in office. The poor test results of female presidents at least indicate a lack of engagement with their political office. Therefore, if a low test score indicates a lack of participation in GP activities by the president, we would again expect to see lower public goods provision by presidents with lower test scores.

Next, we consider schools and roads, two public goods for which there exists a robust difference in provision between reserved and unreserved GPs. Our data suggest that over the course of the first reservation cycle in Tamil Nadu GPs, there were significantly more schools

created in unreserved versus women-reserved GPs. The creation of a new school requires substantial coordination with higher-level officials. Thus, this finding is consistent with reserved women presidents' clear lack of engagement with higher-level officials. A similar story holds for roads, where our results show that the distance to the nearest concrete road is farther in women-reserved GPs. Additionally, there are fewer household drinking water and toilet connections and fewer operational streetlights. These are only significant in the basic DID, although the sign and size of the point estimates are consistent in the DID with covariates. Household connections are another GP public good that require coordination with higher-level officials because part of their funding is provided by the panchayat (hence their inclusion in our analysis of public goods). As a comparison, vaccinations are completely out of the control of the GP president, and we see no difference in vaccinations to children measured by the HEALTH variable. To the best of our knowledge, these findings are new in the literature.

Our research underscores the importance of context in empirical studies. The findings in some previous research are compelling and provide evidence of women's reservations doing good for women in parts of West Bengal (Chattopadhyay and Duflo 2004; Beaman et al. 2009; Beaman et al. 2012). However, these results do not represent the status of women's reservations throughout India's GPs. Mathew (2000a) reviews the history of local governance throughout India, showing the differences in Indian states' experiences with decentralized governance. West Bengal, for example, is often cited as India's panchayat success story and has had regular elections to the panchayats since 1978 (Ghosh 2000). Additionally, West Bengal amended its state panchayat act in 1992—before India's 73rd Amendment was passed—to provide for one-third reservation of all seats in all three levels of panchayats for women (although there was no explicit reservation for the position of president) (Ghosh 2000). In accordance with the 73rd

Amendment, West Bengal amended its state panchayat act to reserve one-third of GP presidential seats for women. Of its own accord, West Bengal further amended its panchayat system to reserve one-third of vice-president positions for women as well. Thus, by the late 1990s, women in West Bengal's panchayats had significant experience in panchayats in addition to participating in panchayats that had been successful since the late 1970s.

We contrast West Bengal's experience with that of Tamil Nadu. Tamil Nadu had reasonably successful local governance under British rule (Aram and Palanithurai 2000). After India's independence in 1947, Tamil Nadu's 1958 panchayat act led to what was considered a rather successful panchayat system until about 1970 (Aram and Palanithurai 2000). However, after the 1970 panchayat elections, Tamil Nadu's elections were postponed until 1986. From then until Tamil Nadu's Panchayat Act of 1994, local governance was very different than it is now and was very different from the experience of West Bengal. For example, prior to the 1994 Act, Tamil Nadu had a district-level panchayat with minimal power, whereas most power was at the block level.

Thus, the performance of panchayats and women in panchayats certainly varies by state given their diverse histories and experiences with panchayat institutions. Although the 73rd Amendment set forth a constitutionally mandated structure of panchayats for all states, the rich history of local governance preceding the 73rd Amendment has surely influenced the functioning of panchayats following the 73rd Amendment. It is this important notion that we wish to emphasize in our findings of public goods provision by women presidents in women-reserved GPs in Tamil Nadu.

VI. Concluding Remarks

Given the rising prevalence of gender reservations and quotas in developing country governments, our study seeks to better understand the role of gender in public goods provision in a specific setting. Using data from 144 village-level governments in Tamil Nadu, we investigate women's reservations at the GP level and evaluate the role of presidents' gender on local public goods provision. For some public goods, provision is similar among female and male presidents. However, we find very suggestive evidence that public goods provision by women presidents in women-reserved GPs is lower than that of their male counterparts. In particular, we find strong evidence that GPs with women-reserved president seats created fewer schools and roads than unreserved GPs during the period under study. We find weak evidence that women are providing fewer streetlights and household drinking water and toilet connections. These findings are correlated with strong evidence of women's lack of interaction with higher-level government officials and women's low knowledge of the GP.

These findings contribute to the literature on women's reservations in India by highlighting that the GP reservation system may be falling short in providing knowledge of the GP to women who are new to political office and in providing a pathway for connections between women GP presidents and higher-level officials. To our knowledge, this is the first study to document a clear lack of communication between women GP presidents and higher-level officials at the block and district levels and to link this lack of communication to demonstrably worse outcomes for the GP, particularly in terms of the provision of schools and roads.

This study highlights the need—in at least some parts of India—to improve women's preparedness for the office of GP president and their connections while in office. Increased or

more targeted training for female presidents may help to improve their knowledge of the panchayat system and their understanding of their role as GP president and in *panchayati raj* in general, thus improving their performance of official duties and the procurement of funds and public goods for their GP. Indeed, many of the female presidents interviewed for this study complained that training was given either too late or not at all and that they were given an overwhelmingly large amount of paperwork to read and understand without accompanying support. This suggests that more timely and adequate training for female presidents may further support their role in Indian governance and help them to better achieve one of the main goals of women's reservation policies: having pro-women, pro-family, pro-children advocates in government.

Our findings also highlight the importance of context in empirical analyses. Previous findings in West Bengal show that women's reservations have the potential to address the needs of women. Our findings in Tamil Nadu show that this does not happen automatically. We need not wait 30 years for women in Tamil Nadu to learn to make the most out of their positions in office. Our study shows that there is a lack of knowledge among women GP presidents and a weak relationship between women GP presidents and higher-level officials. We do not take our findings to represent the state of women's reservations across India. We do, however, interpret our findings as representative of women's reservations in at least some parts of Tamil Nadu and as evidence that the implementation of women's reservations in India needs further improvement to realize the potential of women's representation in government.

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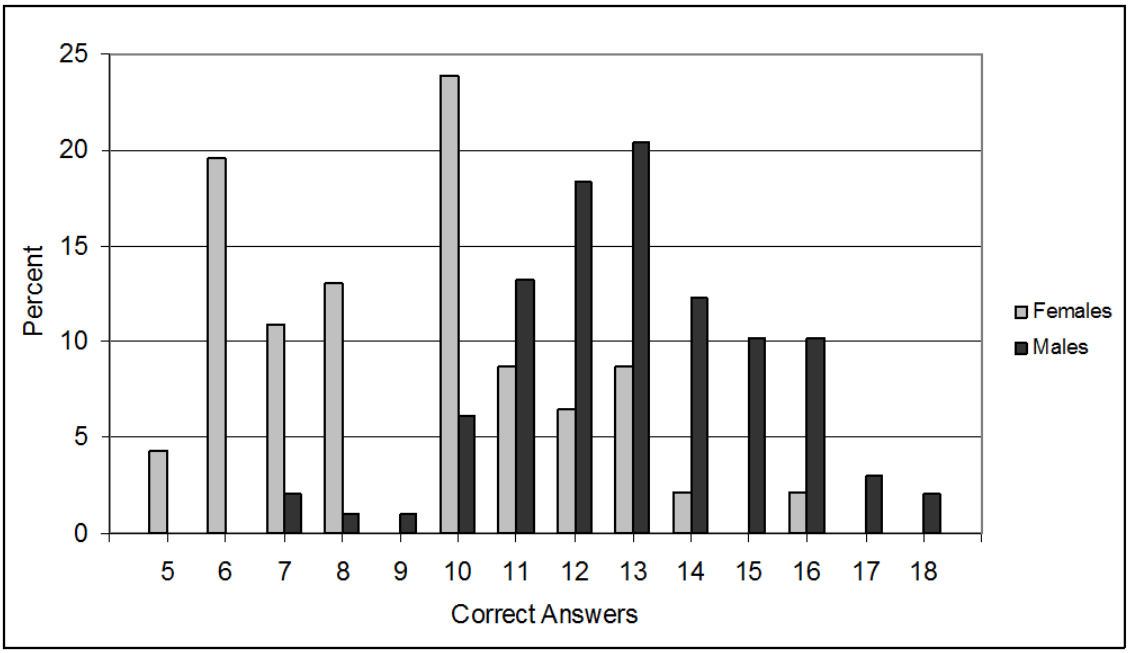
Figure 1: Results of a 19-Question Knowledge Test Given to GP Presidents



Source: Authors' analysis based on data described in text.

Table 1: Female and SC Population Ratios by Block (Year=1991)

District	Block	GPs per block (in sample)	Mean, female/total population ratio	Standard deviation	Mean, SC/total population ratio	Standard deviation
Coimbatore	Avinashi	12	0.480	0.016	0.257	0.063
	Gudimangalam	12	0.497	0.011	0.266	0.065
	Palladam	12	0.491	0.013	0.209	0.056
	Pollachi (North)	12	0.489	0.014	0.218	0.092
Pudukottai	Aranthangi	12	0.506	0.012	0.104	0.076
	Karambakudi	12	0.498	0.012	0.271	0.168
	Kunnandar Koil	12	0.495	0.010	0.179	0.133
	Ponnamaravathi	12	0.522	0.016	0.198	0.115
Vellore	K.V. Kuppam	12	0.494	0.015	0.287	0.177
	Kanniyambadi	12	0.505	0.011	0.242	0.111
	Natrampalli	12	0.491	0.009	0.223	0.176
	Nemeli	12	0.496	0.012	0.290	0.174

Source: Authors' analysis based on data described in text.

Table 2: Comparing Village Characteristics in GPs Unreserved and Reserved for Female Presidents

Variable	1991 Mean, Unreserved GPs	1991 Mean, Reserved GPs	Difference in 1991 Means	Difference in Percent Change 1991 to 2005
Village population - total	2648.622	2289.717	358.905 *251.410*	0.145 *0.112*
Female population	1299.816	1153.130	146.686 *121.847*	0.152 *0.108*
Scheduled Caste (SC) population	551.959	552.935	-0.976 *70.585*	0.327* *0.167*
Households total	607.592	533.544	74.048 *61.262*	0.165 *0.112*
Hindu households	575.929	512.674	63.255 *60.499*	0.174 *0.144*
Muslim households	19.959	14.870	5.090 *4.300*	0.060 *0.160*
Christian households	11.704	6.000	5.704** *2.607*	0.052 *0.174*
Farm households	329.845	303.130	26.715 *38.818*	0.163 *0.125*
Village citizens working in village	594.490	481.804	112.685 *74.921*	-2.317 *1.770*
Female village citizens working in village	271.857	220.696	51.161 *35.393*	-3.878 *2.566*
Total Land (acres)	2227.691	2077.151	150.540 *242.569*	0.141 *0.103*
Literates	1221.255	1084.391	136.864 *132.655*	0.218 *0.170*

Source: Authors' analysis based on data described in text.
Notes: Standard errors from a t-test of a difference in means are shown in *italics*.
Indicates significance at *10%, **5%.

Table 3: Comparing Initial Public Goods Levels in GPs Unreserved and Reserved for Female Presidents (Year=1991)

	Unreserved GPs	***GPs Reserved for Women***	**Difference**
	Mean 1991	Mean 1991	
Number of borewells	3.330	3.780	-0.451 *0.545*
Distance to nearest borewell	0.232	0.230	0.002 *0.040*
HEALTH - Composite measure	-0.017	0.037	-0.054 *0.179*
Distance to nearest concrete road	0.447	0.364	0.082 *0.093*
Number of schools	2.582	2.261	0.321 *0.265*
Number of public toilets	0.459	0.304	0.155* *0.088*
Number of bus and minibus trips	8.643	7.674	0.969 *1.702*
Common taps	44.133	48.178	-4.045 *9.929*
HH toilets	10.980	7.652	3.327 *2.844*
HH drinking water connection	19.061	16.891	2.170 *8.285*
Streetlights	60.551	52.870	7.681 *8.266*

Source: Authors' analysis based on data described in text.
Notes: Standard errors from a t-test of a difference in means are shown in *italics.*
* p<.10.

Tables 4a-4b: Summary Statistics

Table 4a: Summary Statistics (Year=1991)

Variable	Obs	Mean	Standard Deviation	Min	Max
Village population - total	144	2533.97	1411.77	364	7355
Female population	144	1252.96	682.82	185	3519
Scheduled Caste (SC) population	144	552.27	393.55	0	1891
Ratio of SC to total population	144	0.23	0.13	0	0.67
Ratio of females to total population	144	0.50	0.02	0.43	0.55
Households - total	144	583.94	343.32	75	1892
Hindu households	144	555.72	338.61	53	1863
Muslim households	144	18.33	24.09	0	113
Christian households	144	9.88	14.78	0	100
Farm households	143	321.25	216.43	31	1260
Total land (acres)	144	2179.60	1354.29	281.70	5719
Village citizens working in village	144	558.49	421.04	5	1757
Female village citizens working in village	144	255.51	198.78	0	985
Literates	144	1177.54	742.39	160	3436
Number of schools	144	2.48	1.49	1	10
Distance to nearest concrete road	144	0.42	0.52	0	5
Number of bus and minibus trips	144	8.33	9.50	0	60
Streetlights	144	58.10	46.23	0	270
Number of public toilets	144	0.41	0.49	0	1
Common taps	143	45.41	54.98	0	425
Number of borewells	139	3.46	2.93	0	14
HH toilets	144	9.92	15.93	0	82
HH drinking water connections	144	18.37	46.20	0	325
Percentage of children under 6 with DPT vaccine	144	0.21	0.21	0.04	1.36
Percentage of children under 6 with BCG vaccine	144	0.21	0.21	0.03	1.36
Percentage of children under 6 with OPV vaccine	144	0.22	0.23	0	1.43
Percentage of children under 6 with measles vaccine	144	0.20	0.22	0.04	1.56
Percentage of children under 6 with TT vaccine	144	0.30	0.30	0.05	2.11
GP reserved for woman	144	--	--	--	--
GP president's age	144	--	--	--	--
GP president member of AIADMK	143	--	--	--	--
GP president test score (out of 19)	144	--	--	--	--
Frequency of contact with Block Development Officer	144	--	--	--	--
Frequency of contact with Panchayat Union Chairman	144	--	--	--	--
Frequency of contact with District Panchayat Chairman	144	--	--	--	--
Number of villages in GP	144	--	--	--	--

Source: Authors' analysis based on data described in text.
Notes: Since the first GP elections in accordance with the 73rd Amendment took place in 1996, GP president-specific information is for 2005 only.

Table 4b: Summary Statistics (Year=2005)

Variable	Obs	Mean	Standard Deviation	Min	Max
Village population – total	144	3120.21	2135.04	344	15420
Female population	144	1558.88	1043.27	170	7353
Scheduled Caste (SC) population	144	655.89	471.32	0	2296
Ratio of SC to total population	144	0.23	0.13	0	0.70
Ratio of females to total population	144	0.50	0.02	0.43	0.57
Households - total	144	735.88	515.74	68	4287
Hindu households	144	693.61	504.60	45	4187
Muslim households	144	26.58	37.71	0	261
Christian households	144	15.69	22.73	0	150
Farm households	144	365.44	262.04	35	1725
Total land (acres)	142	2086.79	1318.02	223.50	5729.40
Village citizens working in village	144	861.88	681.83	2	3780
Female village citizens working in village	144	399.58	339.60	2	2220
Literates	144	1853.95	1359.26	184	10188
Number of schools	144	3.30	2.14	1	13
Distance to nearest concrete road	144	0.25	0.38	0	3.00
Number of bus and minibus trips	144	13.22	14.38	0	80
Streetlights	144	100.66	70.41	0	451
Number of public toilets	144	1.75	1.62	0	10
Common taps	144	84.48	74.65	0	430
Number of borewells	139	6.74	5.08	0	31
HH toilets	144	129.70	203.83	0	1750
HH drinking water connections	144	125.96	150.95	0	900
Percentage of children under 6 with DPT vaccine	144	0.31	0.29	0.03	1.90
Percentage of children under 6 with BCG vaccine	144	0.30	0.30	0.02	1.84
Percentage of children under 6 with OPV vaccine	144	0.32	0.31	0.03	1.90
Percentage of children under 6 with Measles vaccine	144	0.30	0.30	0.03	1.88
Percentage of children under 6 with TT vaccine	144	0.44	0.40	0.04	2.33
GP reserved for woman	144	0.32	0.47	0	1
GP president's age	144	47.00	8.86	27	68
GP president member of AIADMK	143	0.60	0.49	0	1
GP president test score (out of 19)	144	11.76	3.00	5	18
Frequency of contact with Block Development Officer*	144	2.75	0.47	1	3
Frequency of contact with Panchayat Union Chairman*	144	1.74	1.00	0	3
Frequency of contact with District Panchayat Chairman*	144	1.01	0.76	0	3
Number of villages in GP	144	6.26	4.68	1	39

Source: Authors' analysis based on data described in text.
Notes: * "Frequency of Contact with…" was a question posed to GP presidents. 0="never," 1="rarely," 2="sometimes," and 3="frequently."

Table 5: Predicting Test Scores

Dependent variable for all regressions: President's score on the knowledge test

President Characteristics	(1)	(2)	(3)	(4)	(5)	(6)
Gender	-3.457***	-3.480***	-3.472***	-3.310***	-3.380***	-3.199***
	(0.483)	(0.470)	(0.473)	(0.477)	(0.481)	(0.474)
Primary school	-0.470	-0.428	-0.419	-1.044	-1.064	-0.814
	(1.247)	(1.202)	(1.206)	(1.215)	(1.207)	(1.121)
Middle school	0.725	0.857	0.864	0.140	0.159	0.463
	(1.169)	(1.128)	(1.131)	(1.183)	(1.163)	(1.069)
High school	1.044	1.159	1.143	0.465	0.447	0.923
	(1.165)	(1.117)	(1.121)	(1.163)	(1.137)	(1.056)
Higher secondary	0.945	1.276	1.284	0.569	0.734	1.455
	(1.451)	(1.428)	(1.433)	(1.566)	(1.545)	(1.500)
College	2.269*	2.511**	2.519**	1.700	1.507	1.951
	(1.302)	(1.259)	(1.263)	(1.308)	(1.307)	(1.213)
Age	0.041*	0.043*	0.042*	0.028	0.031	0.029
	(0.023)	(0.023)	(0.024)	(0.024)	(0.024)	(0.024)
Second term	1.275	1.324*	1.333*	1.292*	1.393*	1.663**
	(0.838)	(0.798)	(0.801)	(0.732)	(0.732)	(0.774)
SC		0.782	0.790	1.447***	1.343**	1.380**
		(0.546)	(0.549)	(0.549)	(0.559)	(0.571)
MBC		0.989	1.003	1.146*	1.357*	1.315*
		(0.643)	(0.646)	(0.617)	(0.690)	(0.666)
Muslim			1.007**	1.508***	1.282***	0.662
			(0.415)	(0.424)	(0.464)	(0.594)
Log total income				0.434**	0.400**	0.331*
				(0.191)	(0.198)	(0.199)
AIADMK Party					0.462	0.745*
					(0.422)	(0.447)
Motive: polit						2.126**
						(0.910)
Motive: reserved						-0.937*
						(0.477)
Motive: other						0.393
						(0.466)
Constant	10.029***	9.649***	9.654***	5.865**	5.850**	6.188**
	(1.615)	(1.623)	(1.628)	(2.467)	(2.442)	(2.415)
Observations	144	144	144	142	141	141
R-squared	0.458	0.471	0.472	0.479	0.487	0.511

Source: Authors' analysis based on data described in text.*Notes*: Robust standard errors in parentheses. Schooling level indicates highest level completed, MBC=most backward caste, AIADMK indicates affiliation with the AIADMK party, and 'Motive' indicates presidents' motives for running for office (polit=nominated by political party, reserved=seat was reserved). Two observations are lost when the income variable is added due to two presidents with zero income.

*** p<0.01

** p<0.05

* p<0.1.

Table 6: GP Presidents' Contact with Higher-Level Panchayat Officials

	Unreserved GPs	***GPs Reserved for Women***	**Difference**
Contact with Block Development Officer (BDO)	2.908	2.413	0.495*** *0.072*
Contact with Panchayat Union Chairman (PUC)	2.214	0.717	1.497*** *0.129*
Contact with District Panchayat Chairman (DPC)	1.306	0.391	0.915*** *0.112*

Source: Authors' analysis based on data described in text.
Notes: Standard errors from a t-test of a difference in means are shown in *italics*.
'Contact with…' refers to the frequency of contact between the GP president and the listed official, as answered by the GP president in an interview. 0='Never,' 1='Rarely,' 2='Sometimes,' 3='Frequently.'
*** p<.01.

Table 7: Basic DID Estimation

Variable	Reserved GPs		Unreserved GPs		Time Period Difference		DID Estimator
	Mean 1991	Mean 2005	Mean 1991	Mean 2005	Diff Reserved	Diff Unreserved	
Health (Composite Measure)	0.037	0.047	-0.017	-0.022	0.010	-0.005	**0.014**
	(1.029)	(0.841)	(0.986)	(1.065)	[0.075]	[0.082]	**[0.110]**
Schools	2.261	2.609	2.582	3.622	0.348***	1.041***	**-0.693*** **
	(1.219)	(1.291)	(1.592)	(2.375)	[0.095]	[0.162]	**[0.187]**
Distance (km) to nearest concrete road	0.364	0.249	0.447	0.253	-0.115***	-0.193***	**0.078***
	(0.297)	(0.326)	(0.593)	(0.401)	[0.026]	[0.035]	**[0.044]**
Bus and minibus trips	7.674	12.761	8.643	13.439	5.087***	4.796***	**0.291**
	(7.457)	(13.820)	(10.346)	(14.693)	[1.330]	[0.611]	**[1.452]**
Streetlights	52.870	86.370	60.551	107.367	33.500***	46.816***	**-13.316** **
	(47.842)	(54.832)	(45.493)	(75.970)	[3.931]	[4.308]	**[5.804]**
Public toilets	0.304	1.478	0.459	1.878	1.174***	1.418***	**-0.244**
	(0.465)	(1.472)	(0.501)	(1.676)	[0.224]	[0.172]	**[0.281]**
Common taps	48.178	96.587	44.133	78.796	50.111***	34.663***	**15.448**
	(54.542)	(84.957)	(55.410)	(69.024)	[8.914]	[4.646]	**[9.975]**
Number of borewells	3.780	7.154	3.330	6.565	3.374***	3.235***	**0.139**
	(3.513)	(6.078)	(2.655)	(4.629)	[0.523]	[0.303]	**[0.599]**
HH toilet connection	7.652	94.348	10.980	146.296	86.696***	135.316***	**-48.621***
	(10.861)	(101.868)	(17.776)	(235.716)	[15.244]	[23.920]	**[28.273]**
HH drinking water connection	16.891	90.196	19.061	142.745	73.304***	123.684***	**-50.379** **
	(47.532)	(100.499)	(45.800)	(167.372)	[12.427]	[16.613]	**[20.667]**

Source: Authors' analysis based on data described in text.
Notes: Standard deviations are given in (parentheses).
Robust Standard errors are given in [brackets].
*** p<0.01
** p<0.05
* p<0.10.

Table 8: DID Estimation with Covariates

	Health (Composite Measure)	Schools	Distance (km) to nearest concrete road	Bus and minibus trips	Streetlights	Public toilets	Common taps	Number of borewells	HH toilet connection	HH drinking water connection
Woman Res*2005	**-0.104**	**-0.840*** **	**0.106***	**0.357**	**-4.291**	**0.121**	**17.938**	**0.423**	**-20.315**	**-45.331**
	(0.164)	**(0.252)**	**(0.062)**	**(1.677)**	**(7.982)**	**(0.371)**	**(13.279)**	**(0.733)**	**(32.610)**	**(29.094)**
2005	-3.415	-7.421**	0.350	-10.881	11.068	-5.383	72.311	-14.983*	-270.358	-248.201
	(2.440)	(3.678)	(0.798)	(18.586)	(160.442)	(6.728)	(191.438)	(7.950)	(480.199)	(553.813)
# Vills in GP	-0.016	0.050**	0.008	0.144	2.191	0.014	-1.335	0.007	10.228	1.978
	(0.020)	(0.020)	(0.006)	(0.152)	(1.831)	(0.035)	(1.111)	(0.087)	(12.132)	(4.877)
SC Pop Ratio (1991)	0.917**	0.703	0.081	-1.620	-5.539	-0.903	-17.820	1.968	210.418**	150.727
	(0.407)	(1.179)	(0.173)	(3.551)	(19.341)	(0.888)	(24.746)	(1.671)	(82.553)	(93.549)
Female Pop Ratio (1991)	7.719	9.296	1.014	11.613	-90.043	9.404	-283.453	7.100	-1,481.365*	-379.429
	(5.579)	(5.842)	(1.261)	(31.666)	(270.071)	(9.512)	(313.125)	(12.954)	(887.773)	(879.073)
AIADMK Party	0.160	0.387*	0.015	1.004	7.576	0.007	15.674*	-0.050	13.432	19.973
	(0.117)	(0.211)	(0.052)	(1.199)	(5.611)	(0.331)	(8.220)	(0.505)	(29.490)	(20.940)
Log Total Pop (1991)	-0.138	0.764***	-0.109**	0.555	4.192	-0.182	1.781	0.971**	90.779***	73.802***
	(0.175)	(0.219)	(0.044)	(0.997)	(5.432)	(0.299)	(9.917)	(0.441)	(25.816)	(20.769)
Log Total Land (1991)	0.088	-0.412**	-0.058*	1.277	2.551	0.356	16.086*	0.740*	38.009*	6.526
	(0.101)	(0.164)	(0.034)	(1.131)	(8.158)	(0.329)	(8.598)	(0.412)	(22.416)	(20.229)
Test Score	0.019	-0.043	0.011	-0.042	1.358	0.107*	0.740	0.064	-0.253	-0.280
	(0.018)	(0.039)	(0.008)	(0.272)	(1.382)	(0.060)	(1.720)	(0.100)	(5.415)	(3.416)
Contact BDO	-0.407	0.778***	0.025	-4.678	-7.597	-0.367	-38.132	0.250	18.136	-126.937
	(0.263)	(0.196)	(0.140)	(7.364)	(13.366)	(0.244)	(45.460)	(0.499)	(42.221)	(137.387)
Constant	0.003	2.455***	0.421***	8.308***	58.203***	0.413***	45.032***	3.415***	9.986	18.497***
	(0.029)	(0.053)	(0.012)	(0.293)	(1.518)	(0.068)	(2.055)	(0.127)	(7.239)	(5.584)
Observations	286	286	286	286	286	286	285	276	286	286
R-squared	0.117	0.412	0.330	0.364	0.614	0.436	0.448	0.579	0.481	0.475
Number of GPs	143	143	143	143	143	143	143	138	143	143

Source: Authors' analysis based on data described in text.

Notes: Robust standard errors (clustered by village) in parentheses.

'Contact BDO' is a dummy variable that is equal to 1 when a president's contact with the BDO is "high." Here, "high" contact means the president stated they were in contact 'sometimes' or "frequently" with the BDO and "low" contact means the president replied "low" or "never."

*** p<0.01

** p<0.05

* p<0.1

Appendix

A1: The GP Knowledge Test

The 19 questions asked of every GP president in our survey are given below.

1. Which Amendment recognizes the village panchayat as local self-government?

2. What is the reservation percentage for women in the new panchayat act?

3. How many tiers does the local self-government have?

4. Does the district collector have the power to dissolve the village panchayat?

5. If the village panchayat is dissolved, within what time limit should an election be conducted?

6. Who has the power to remove the panchayat president?

7. What is the minimum population required for a village panchayat?

8. Who advises the state government on the release and allocation of funds to the panchayat?

9. What is the minimum and maximum number of members in a village panchayat?

10. If no women participants are elected in the village panchayat, how does the selection of women members take place?

11. How many sub-committees are formed in the village panchayat?

12. Which committee is responsible for the planning of the district as a whole?

13. What is the tenure of the village panchayat?

14. The panchayat audit is done by whom?

15. What is the minimum percentage of attendance required for conducting the village Gram Sabha meeting?

16. How many times should the village Gram Sabha meeting be conducted in a year?

17. How will you inform the public regarding the village Gram Sabha meeting?

18. Who initiates the resolution during the village Gram Sabha meeting: president/vice president/village people?

19. What is the maximum amount a panchayat can utilize for village development works without any permission from higher officials?

A2: The Public Goods Measures

Eight (of the top 11) public goods mentioned in the citizen survey are listed on the left, with the corresponding public goods data used in our analysis on the right.

Drinking Water:	Number of borewells; Number of common taps
Health/Hospital:	Composite measure[a] of the percentage of children given immunizations for DPT, BCG, OPV, Measles, Tetanus-Toxoid
Roads:	Distance to nearest concrete road (in kilometers)
School/Education:	Number of schools
Sanitation:	Number of public toilets
Buses:	Number of bus & minibus trips
Individual Pipeline/ Toilet Connection:	Number of households with a drinking water connection; Number of households with a toilet
Streetlights:	Number of operational streetlights

[a] The 'composite measure' is a weighted average of all of the factors listed in the group. The weighted values were calculated using a factor analysis procedure.

Supplemental Appendix

Appendix S1: Supplementary Tables

Table S1.1: Correlation between Female-to-Total Population Ratio and Village Characteristics

1991 Values	Correlation
Village population - total	-0.31
Female population	-0.26
Ratio of females to total population	1.00
Scheduled Caste (SC) population	-0.21
Households total	-0.30
Hindu households	-0.31
Muslim households	0.07
Christian households	0.05
Farm households	-0.24
Total land (acres)	-0.21
Village citizens working in village	-0.26
Female village citizens working in village	-0.23
Literates	-0.29

Table S1.2: All Responses from Villagers to the Question "What infrastructure is most needed?"

Infrastructure	**Responses from Men**	**Responses from Women**
Bank	1	1
Bridges	2	0
Buses	55	53
Community hall	3	2
Companies and Industries	17	15
Drainage	47	49
Drinking water (borewells, public/common taps)	77	84
Electricity	2	0
Employment	0	2
Graveyard	1	1
Group houses	21	21
Health/Hospitals	64	61
Independent pipeline/toilet connections	10	15
Internet	1	0
Library	5	7
Market facility	3	4
No Comment	112	110
Other*	1	3
Pipelines	2	1
Playground	0	1
Post Office	1	0
Ration Cards shops	1	1
Roads	84	77
Sanitation	38	27
Schools/Education	51	37
SHG (self-help group) building	3	6
Streetlights	15	11
Veterinary services	12	2

Sample Size: 139 men, 131 women.

* "Other" refers to difficult-to-categorize responses from individuals.

Note: Individuals could list up to five items of infrastructure they felt were most needed in their village. While they were not prevented from giving the same response more than once, our analysis does not count repeat-responses from the same individual.

Table S1.3: Chi-Square Test of Preference Distribution by Gender

	All Responses		**Top 11 Responses**	
	Men	Women	Men	Women
Bank	1	1		
Bridges	2	0		
Buses	55	53	55	53
Community hall	3	2		
Companies & Industries	17	15	17	15
Drainage	47	49	47	49
Drinking water	77	84	77	84
Electricity	2	0		
Employment	0	2		
Graveyard	1	1		
Group houses	21	21	21	21
Health/Hospitals	64	61	64	61
Independent pipeline/toilet connections	10	15	10	15
Internet	1	0		
Library	5	7		
Market facility	3	4		
Other	3	3		
Pipelines	2	1		
Playground	0	1		
Post Office	1	0		
Ration Card shops	1	1		
Roads	84	77	84	77
Sanitation	38	27	38	27
Schools/Education	51	37	51	37
SHG building	3	6		
Streetlights	15	11	15	11
Veterinary Services	12	2		
	Pearson chi^2= 23.331 Pr = 0.614		Pearson chi^2 = 5.689 Pr = 0.841	

Note: we use the top 11 responses instead of 10 because “Streetlights” and “Independent pipeline/toilet connections” are essentially tied.

Table S1.4: Individual Tests of Preferences by Gender (percent of group listing each item)

Response	Men	Women	Difference
Bank	0.007	0.008	0.000
			0.010
Bridges	0.014	0	0.014
			0.010
Buses	**0.396**	**0.405**	**-0.009**
			0.060
Community hall	0.022	0.015	0.006
			0.016
Companies/Industries	**0.122**	**0.115**	**0.008**
			0.040
Drainage	**0.338**	**0.374**	**-0.036**
			0.058
Drinking water	**0.554**	**0.641**	**-0.087**
			0.061
Electricity	0.014	0.000	0.014
			0.010
Employment	0	0.015	-0.015
			0.010
Graveyard	0.007	0.008	0.000
			0.010
Group houses	**0.151**	**0.160**	**-0.009**
			0.044
Health/Hospital	**0.460**	**0.466**	**-0.005**
			0.061
Individual pipeline or toilet connection	**0.072**	**0.115**	**-0.043**
			0.035
Internet	0.007	0	0.007
			0.007
Library	0.036	0.053	-0.017
			0.025
Market facility	0.022	0.031	-0.009
			0.019
Other	0.022	0.023	-0.001
			0.018
Pipelines	0.014	0.008	0.007
			0.013
Playground	0	0.008	-0.008
			0.007
Post Office	0.007	0	0.007
			0.007
Ration Card shops	0.007	0.008	0.000
			0.010
Roads	**0.604**	**0.588**	**0.017**
			0.061
Sanitation	**0.273**	**0.206**	**0.067**
			0.052
School/Education	**0.367**	**0.282**	**0.084**
			0.057
Self-Help Group building	0.022	0.046	-0.024
			0.022
Streetlights	**0.108**	**0.084**	**0.024**
			0.036
Veterinary services	0.086	0.015	0.071***
			0.027

Standard errors are given in italics. Significant at ***1%.

Bold numbers represent the top 11 mentioned items. Of these top 11 items, we investigate eight in our public goods analysis; we do not look at 'drainage,' 'group houses,' and 'companies and industries.' We do not have good data on 'drainage' and 'group houses' and the GP president does not have control over 'companies and industries.'

Table S1.5: DID with Covariates, excluding experienced presidents

	Health (Composite Measure)	Schools	Distance (km) to Nearest Concrete Road	Bus and Minibus Trips	Streetlights	Public Toilets	Common Taps	Number of Borewells	HH Toilet Connection	HH Drinking Water Connection
Woman Res*2005	**-0.143**	**-0.914*** **	**0.122***	**2.166**	**-10.207**	**0.283**	**14.256**	**0.507**	**-65.839*** **	**-73.090** **
	(0.177)	**(0.278)**	**(0.072)**	**(1.371)**	**(8.699)**	**(0.435)**	**(15.206)**	**(0.843)**	**(24.071)**	**(30.029)**
2005	-3.932	-8.127**	0.817	-36.767**	-2.932	-6.894	37.774	-13.166	-234.741	-649.886
	(2.561)	(3.786)	(0.825)	(16.212)	(163.613)	(6.947)	(191.674)	(8.391)	(291.507)	(524.057)
# Vills in GP	-0.022	0.042*	0.009	0.274*	-0.173	-0.016	0.148	0.105*	-6.716***	-3.930
	(0.027)	(0.025)	(0.008)	(0.144)	(1.059)	(0.046)	(1.119)	(0.061)	(2.565)	(3.073)
SC Pop Ratio (1991)	0.863**	0.877	0.138	-3.196	-15.311	-0.837	-8.120	1.177	115.594*	104.630
	(0.400)	(1.245)	(0.176)	(3.335)	(19.144)	(0.914)	(25.627)	(1.703)	(58.873)	(91.578)
Female Pop Ratio (1991)	9.515	9.669	0.148	35.712	-52.946	10.122	-322.103	8.991	-914.032	247.652
	(5.792)	(5.904)	(1.316)	(28.957)	(274.483)	(9.638)	(319.791)	(13.339)	(618.876)	(838.933)
AIADMK Party	0.223*	0.378	0.006	1.441	13.525**	0.014	17.434*	0.118	38.943*	33.684
	(0.125)	(0.231)	(0.059)	(1.207)	(5.462)	(0.368)	(8.879)	(0.519)	(22.893)	(21.416)
Log Total Pop (1991)	-0.155	0.845***	-0.104**	0.485	4.022	-0.140	3.497	0.848*	90.162***	62.902***
	(0.186)	(0.235)	(0.045)	(1.009)	(5.903)	(0.321)	(10.471)	(0.447)	(24.036)	(19.746)
Log Total Land (1991)	0.107	-0.426**	-0.049	1.184	1.752	0.398	12.387	0.451	18.506	13.813
	(0.120)	(0.190)	(0.038)	(1.258)	(9.100)	(0.389)	(9.362)	(0.429)	(18.712)	(19.363)
Test Score	0.012	-0.044	0.017*	0.327	0.851	0.147**	0.727	0.064	-9.970**	-4.787
	(0.020)	(0.046)	(0.009)	(0.204)	(1.650)	(0.074)	(1.965)	(0.108)	(3.891)	(3.873)
Contact BDO	-0.712***	0.856***	-0.185***	4.754***	13.933**	-0.163	19.431*	-0.056	70.053***	84.055***
	(0.121)	(0.250)	(0.054)	(1.687)	(6.780)	(0.359)	(10.897)	(0.755)	(26.138)	(26.215)
Constant	0.062*	2.315***	0.426***	7.520***	55.669***	0.449***	40.025***	3.402***	11.189**	20.591***
	(0.031)	(0.058)	(0.013)	(0.284)	(1.453)	(0.075)	(2.137)	(0.129)	(5.012)	(5.444)
Observations	254	254	254	254	254	254	253	244	254	254
R-squared	0.143	0.413	0.268	0.396	0.617	0.431	0.445	0.573	0.535	0.437
Number of GPs	127	127	127	127	127	127	127	122	127	127

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

"Contact BDO" is a dummy variable where "high" contact is if the president stated they were in contact "sometimes" or "frequently" and "low" contact is if presidents replied "low" or "never."

Appendix S2: Calculation of Errors in GP Women's Reservations

Recall that reservations in Tamil Nadu are made at the block level. Thus, to recreate which GPs should have been reserved from 1996-2006, one needs the female population ratios for all GPs in the three blocks in our sample. However, village-level population data collected in the Census do not 100 percent correspond to the composition of all GPs; our population data come directly from GP records. Therefore, we can only *estimate* the errors in reservation status by establishing whether the GPs *in our sample* conform to the Tamil Nadu reservation policy: after removing GPs with an SC reservation, are the remaining 117 GPs in our sample reserved such that GPs in the 66.67 percentile of female population ratios in their block received a reservation and the others did not? We estimate that 14 GPs had an erroneous reservation status.

	Did not have reservation	Had reservation
Should not have reservation	74	**6**
Should have reservation	**8**	29

Appendix S3: Regression Discontinuity Design

Because Tamil Nadu uses population ratios to assign reservations to GPs, a regression discontinuity (RD) approach would be ideal for identifying the effect of reservations on differences in public goods provision. However, the nature of Tamil Nadu's reservations requires that we omit GPs with SC reservations in an RD analysis, since women's reservations were based on female population ratios *after* SC reservations had been determined.[28] Additionally, because RD involves examining only GPs around the discontinuity, the resulting sample size is small. Thus, we pursue a simple RD analysis as a supplemental inquiry into our main findings.

Out of 117 remaining GPs that did not have a reservation for SC, we estimate that 14 GPs had an erroneous women's reservation: six GPs with a reservation for a female GP president should have been unreserved and eight GPs with unreserved president seats should have had a reservation for a woman (see Appendix S2)**.** Therefore, we pursue a *fuzzy* RD design.[29]

Figures S3.1 and S3.2 show the results of a basic fuzzy RD analysis. The *x*-axis of all the figures indicates whether GPs are above or below the cutoff female population ratio for reservations in their block; GPs above zero should be reserved and GPs below zero should not. The *y*-axis indicates reservation status in Figure S3.1; in Figure S3.2, it measures the change in each public goods measure from 1991 to 2005.

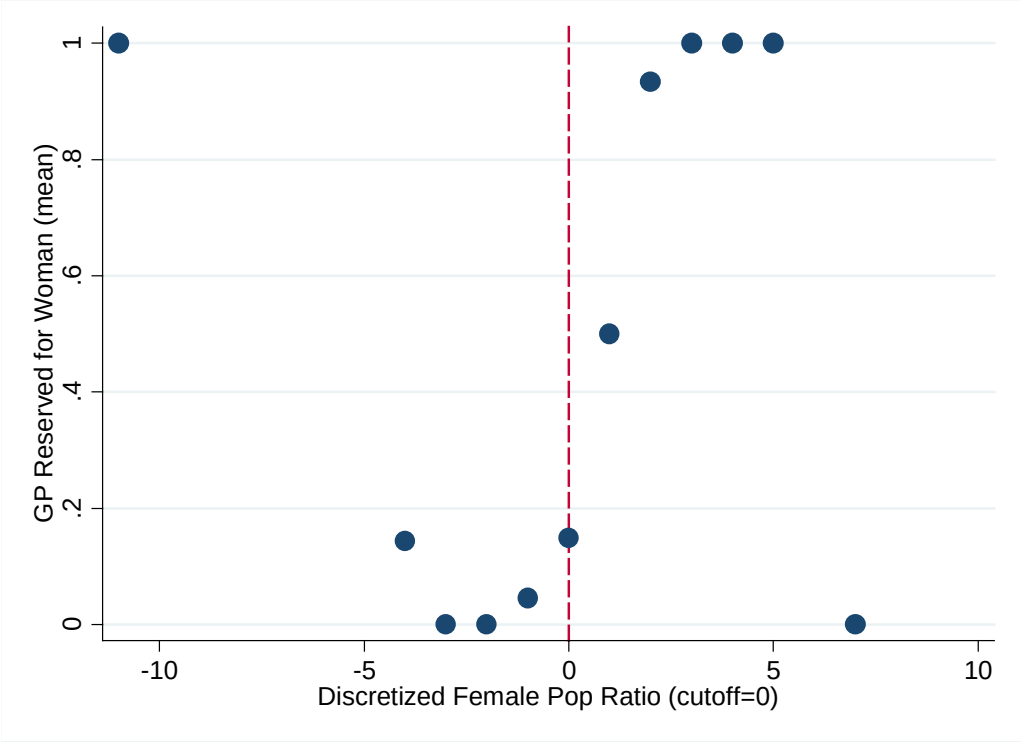
Population ratios strongly determine whether a GP received a reservation (Figure S3.1) and the RD analysis is generally supportive of our DID findings (Figure S3.2). In particular, the

[28] We need village-level population data for *all* GPs in each block to do a full RD analysis. We were unable to attain this data due to differences in how the Census measures village-level population and how GPs are actually formed. Our population data come directly from GP office records.

[29] Sharp RD is when a threshold value clearly defines the treated and untreated, with no crossovers. Fuzzy RD is used when there is a high probability of being treated or untreated based on which side of the threshold value an observation falls, but that probability is not equal to one.

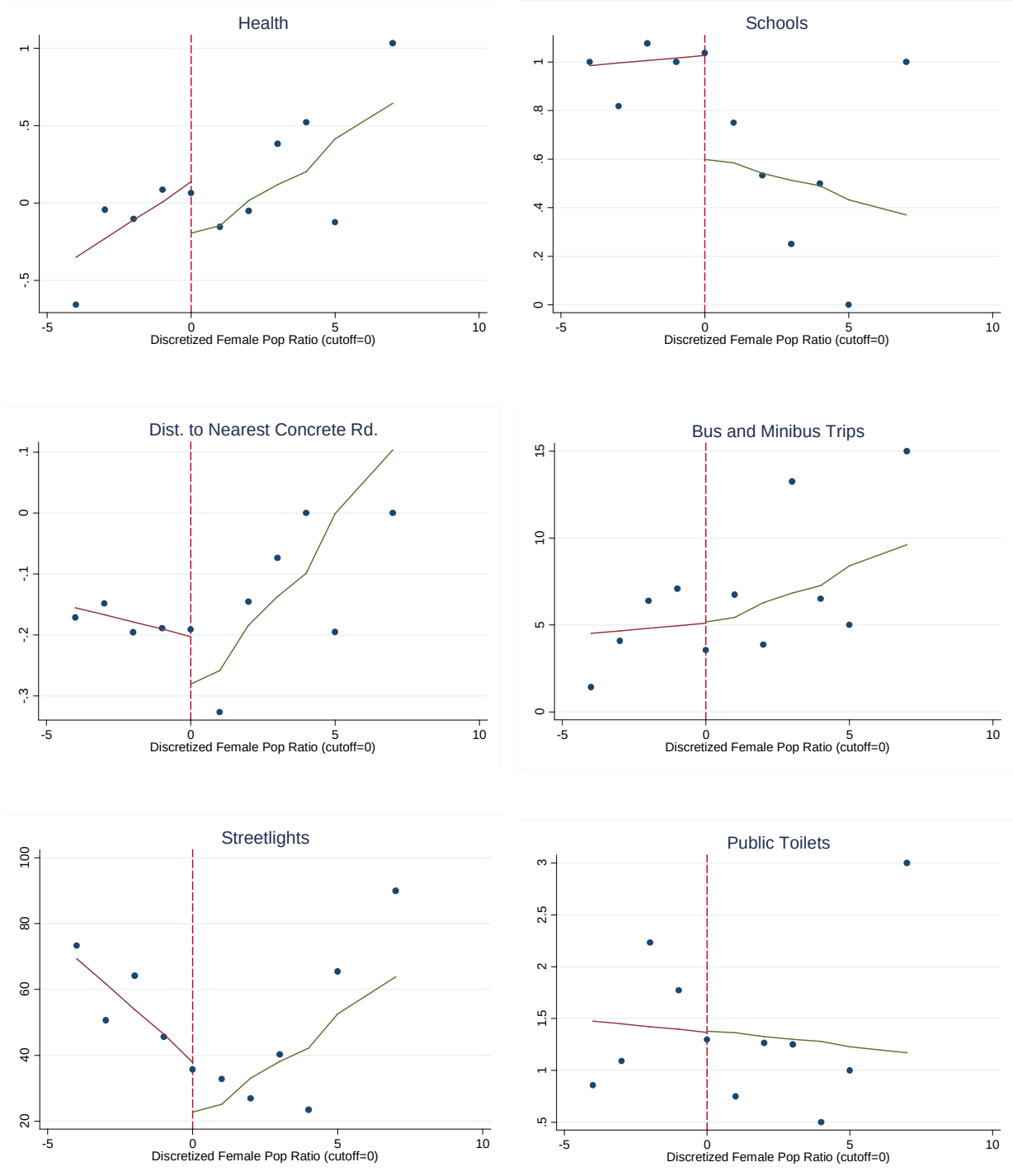
"jump" at the discontinuity shown in the top right graph (Figure S3.2) indicates that fewer schools were added in women-reserved GPs. None of the discontinuities is statistically significant, as shown in Table S3.1, though the large standard errors are likely due to the small sample size. (One exception is public toilets in the small bandwidth estimates, but this is likely due to a high-leverage observation in the very small sample size.)

Figure S3.1: Reservations and RD (bin width==0.005)

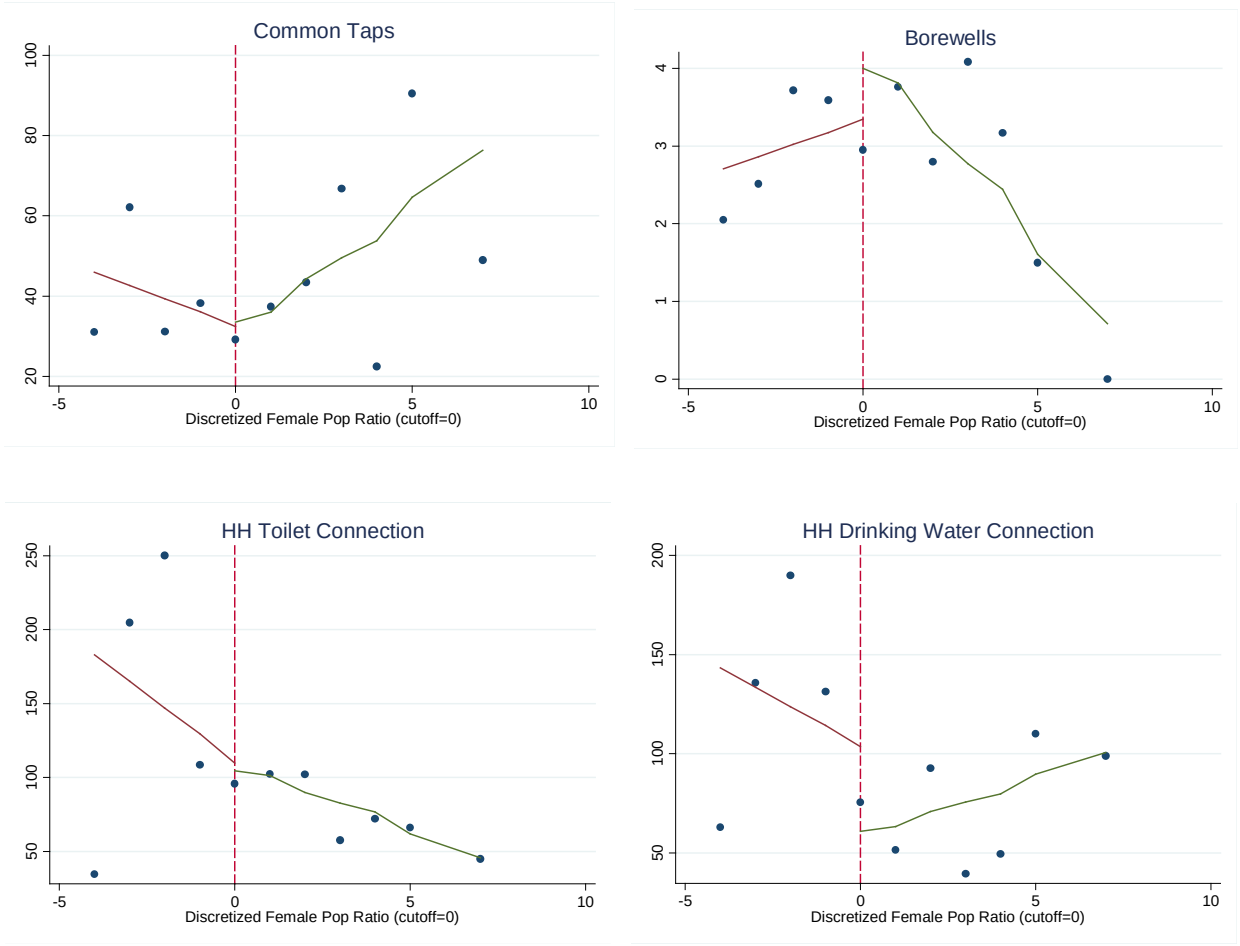


Note: Values below zero indicate GPs that should not have been reserved (they were below the 66.67 percentile 'cutoff' female population ratio). Those above zero should have been reserved. Our 117 GPs have been lumped into equally sized groups by choosing a binwidth and on the y-axis we see the 'average' reservation value of that bin. Those with y=0 and y=1 indicate all GPs in that bin had the same reservation status. Values in-between illustrate the reservation errors. However, we clearly see that, overall, GPs below the cutoff were not reserved and those above the cutoff were reserved.

Figure S3.2: RD Graphs by Outcome Variable (bin width = 0.005)



(Figure S3.2, continued)



Note: These graphs were constructed by omitting outliers—i.e., GPs with female-population ratios more than four percent higher or four percent lower than the 66.67 percentile cutoff—and estimating a linear regression line on each side of the cutoff.

Table S3.1: Estimates of Discontinuities

	Health (Composite Measure)	Schools	Distance (km) to Nearest Concrete Road	Bus and Minibus Trips	Streetlights	Public Toilets	Common Taps	Number of Borewells	HH Toilet Connection	HH Drinking Water Connection
Bandwidth=0.005										
	-0.365	-0.786	-0.160	-0.454	-7.670	1.886**	-7.090	1.204	-26.548	-37.528
	(0.553)	(0.814)	(0.238)	(3.637)	(12.220)	(0.764)	(23.190)	(1.856)	(82.580)	(45.965)
N	39	39	39	39	39	39	39	36	39	39
Bandwidth=0.050										
	-0.371	-0.433	-0.074	0.022	-12.691	0.018	2.178	0.603	0.534	-39.534
	(0.240)	(0.423)	(0.102)	(2.352)	(12.493)	(0.556)	(14.905)	(0.868)	(68.254)	(39.591)
N	116	116	116	116	116	116	115	111	116	116

Standard errors in parentheses; ** p<0.05