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Gender, Sanitation, and Political Leadership in India

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by

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ABSTRACT OF THE DISSERTATION

Gender, Sanitation, and Political Leadership in India

by

Yu Jung Lee
Doctor of Philosophy in Political Science
University of California, Los Angeles, 2015
Professor Miriam A. Golden, Chair

Why do governments sometimes fail to provide essential services that are fundamental to development and the well-being of their citizens? I investigate the role of gender, of both policy makers and of beneficiaries, in the variation of access to sanitation in rural India. I argue that politicians' gender can help explain why some elected officials are more responsive in providing sanitation services than others in terms of the quality and quantity of latrines. Given the close association between latrine quality and water-borne diseases, there is a need to examine the variation in the quality of latrines rather than access to latrines as previous studies do. Using an instrumental variable approach with sub-state level data that exploits the quasi-randomness of the gender of the winner in close elections, I study the influence of female state legislators of fifteen major states in India. When faced with increased electoral competition female politicians act in the same way as their male counterparts do, which is by widening latrine coverage, in order to signal good performance to the voters. However, female state legislators are more likely to improve sanitation services than their male counterparts by increasing higher quality latrines (flush toilets), after controlling for correlates of electoral incentives. Given that women benefit disproportionately from latrines, the role of gender in the decision making process among household members is likely to be relevant. Thus, the second part of my argument examines what influences women, the main beneficiaries of improved sanitation, to make financial investments towards having a household latrine. Drawing from nationwide household level survey data, I find that households are more likely to have latrines not only when women are more informed through mass media, but also when their intra-household status is higher, especially with respect to taking part in the financial

decision making process in households.

The dissertation of Yu Jung Lee is approved.

Tim Groeling

Michael Thies

Miriam A. Golden, Committee Chair

University of California, Los Angeles

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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CHAPTER 1

Introduction

In May 2014, two teenage girls were found raped and hanged from a tree in a rural area in Badaun district of Uttar Pradesh, India's largest state. At first, the crime was reported as an incident of gang rape, but when people found out why these girls were in a remote area at night, they quickly realized the broader fundamental problem. It was discovered that the girls were in the fields at night because no bathroom was available, and they were forced to practice open defecation. The incident sparked public rage across the country, culminating in several mass protests, mostly by women (McCarthy, 2014). While the protests initially appeared to be demanding justice for the victims, they were also questioning the violation of human dignity when women are forced to practice defecation outside (Biswas, 2014). Gender disparities in the consequences of a lack of sanitation are also found in studies that indicate that girls are more discouraged from attending schools without bathrooms (Adukia, 2013), and research that associates higher maternal education with lower child health risks caused by poor sanitation (Esrey and Habicht, 1988). The case in India, along with this research, illuminates how women disproportionately suffer the consequences of today's sanitation crisis in less developed countries.

Beyond the impact of poor sanitation on women, a lack of sanitation is an obstacle to growth in many developing countries, due to its negative impact on human development. Poor sanitation is related to many water-borne diseases such as cholera and giardiasis, and most notably diarrhea. According to the World Health Organization, diarrhea is the second leading cause of death among children under five globally, and the longer term health effects on children include lower intelligence, stunting and other deficiencies in physical and cognitive development (Guerrant et al., 2013). Despite the overall social cost from the loss of potential human capital, 43 percent of people in low and middle income countries are still left without access to sanitation, compared to 4

percent in high income countries.[1] With such clear benefits to sanitation, the general question that motivates this research is: why do governments sometimes fail to provide essential services that are fundamental to development and contribute to the well-being of their citizens?

The political economy literature regarding the role of democracy in the allocation of public goods identifies competitive elections as a key vehicle for government responsiveness in providing basic services. The desire to remain in office motivates politicians to be responsive to their constituents, and where elections are harder to win, politicians tend to strive to perform better. However, the lack of basic services in many democratic developing countries shows that holding competitive elections is not sufficient to explain their provision. The literature offers some explanations based on the structure of political institutions, the number of political parties (Chhibber and Nooruddin, 2004), and the availability of information for politicians about their constituents (Besley and Burgess, 2002; Strömberg, 2004a). Given the gender issues related to poor sanitation, I investigate one mechanism that remains under explored in this literature, which is the influence politicians' gender has on the distribution of sanitation services.

The steady increase in the number of women in national legislatures in many developing countries makes their role in public service provision more pertinent. In fact, Rwanda has the largest portion of women in parliament in the world, followed by Bolivia (Inter-Parliamentary Union, 2014). India has also been following this global trend with a steady increase in female representatives in its national and state assemblies. In 2015, the Parliament of India had approximately 12 percent of its seats filled by women in both the upper and lower houses (called Rajya Sabha and Lok Sabha respectively). At the state level, nationwide, approximately 7 percent of legislators were female during the past decade, with wide variation by state.

My dissertation investigates the role of gender, of both policy makers and of beneficiaries, in the variation of access to sanitation in India. I first analyze how policy decisions by politicians based on gendered preferences are resolved by electoral incentives. I argue that while female politicians generally would like to increase latrine provision, the degree of electoral competition gives female politicians differing incentives for choosing their preferred policies. My empirical

[1] *World Development Indicators 2012*, The World Bank.

analysis shows that female politicians are more likely to improve the quality latrines than their male counterparts, but when faced with increased electoral competition they act in the same way as their male counterparts by widening latrine coverage. I suggest that this is because it is easier for voters to identify changes in the number of latrines and use this information to evaluate the performance of politicians, compared to information on changes in the quality of latrines. Knowing this, female politicians, when faced with increased electoral competition, will act the same way as their male counterparts and increase latrine coverage to signal their good performance, despite their higher preference for improving sanitation. However, the electoral incentives of high competition are not sufficient to entirely eradicate female politicians greater preference for quality latrines (than their male counterparts).

The second part of my argument examines what influences women, the main beneficiaries of improved sanitation, to make financial investments towards having a household latrine. Latrines are a publicly-provided private good in that households must be willing to have them installed; if women benefit disproportionately from latrines, the role of gender in the decision making process among household members is likely to be relevant. I show that households with women who are regular users of mass media channels, and who take part in the financial decision-making process, are more likely to have household latrines. This finding highlights the importance for creating awareness and acceptance of improving sanitation of women's access to information, and the need to consider the social context when studying the role of information in public good provision.

India, despite its impressive economic growth in the past decades, has the largest number of people without access to sanitation in the world today. As a consequence, diarrhea alone is responsible for 1600 deaths per day in the country.[2] The current Prime Minister, Narendra Modi, emphasized sanitation during his election campaigns and promised to build "toilets before temples", but in fact improving sanitation has been on top of every government's agenda since the 1980s. Despite these efforts, over fifty percent of Indian households today are estimated to practice open defecation because they have no access to toilets, even public ones.[3] The situation is

[2]Source: http://water.org/country/india/

[3]Source: Census of India 2011.

far more serious when considering the wide variation among India's states in the level of progress made in improving sanitation coverage.

India, with its long democratic practices, and rising number of women in office, is an ideal case to investigate for the state its basic services. Using various sub-state level datasets, this study examines the activities of state legislators in fifteen major states of India, and of voters nationwide. In order to measure the causal effect of the influence of female politicians, I exploit very competitive elections between male and female candidates, assuming an outcome in which the gender of the winner is quasi-random, in the sense that both candidates essentially had an equal chance of winning. This means that the socioeconomic characteristics that may influence electoral results in areas where a male candidate won in a tight election and where a female won should be nearly identical, so that the only difference is the gender of the politician. This method, derived from Lee (2008), allows us to measure causal effects, correcting for biased estimates that may arise from traditional least squares methods, and accounting for potential omitted variables.

The argument that I present in my dissertation bridges existing theories of identity politics and government responsiveness in providing basic public goods. The literature on identity politics, particularly on gender, has focused on understanding the interests and policy preferences of women leaders without much consideration of other constraints that politicians are under, especially electoral incentives. While we know that there may be gender differences in policy making, we do not know how electoral incentives influence strategic decision making between men and women. Taking India as a case study also allows us to examine gendered preferences in a developing country setting; most of the literature on gender and politics takes the U.S. as its example. As a public service that the citizens rely on the government for, it is important to consider the government's role in the provision, awareness, and usage of sanitation facilities. Although I focus on gender differences among political leaders and citizens, I am concerned more broadly with why elected governments fail to meet essential needs that are fundamental to development and beneficial to everyone.

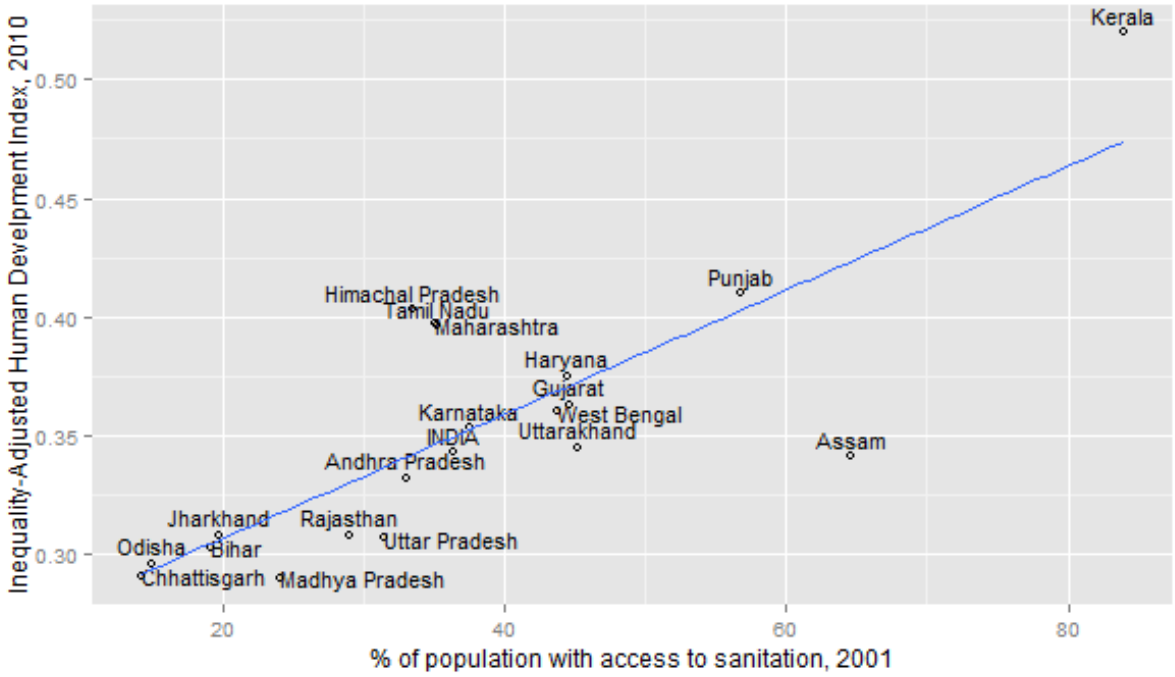
1.1 Motivation of Research: Human Development and Sanitation

Fundamentally, this research is about why we see a lack of basic public services in developing democracies despite their benefits for the population. Focusing on sanitation also allows us to study a specific public good that policy makers have direct influence over rather than aggregate health and education outcomes. The political determinants of having poor sanitation have received far less attention than the impact poor sanitation has on public health. Generally speaking, sanitation is "the process of keeping places free from dirt, infection, disease, etc., by removing waste, trash and garbage, by cleaning streets, etc" (Merriam-Webster, 2015). This is achieved through several public services such as collecting and managing waste, building sewage systems, treating sewers, and safely disposing of human waste, all of which require government involvement. For public health in developing countries, sanitation usually refers to "the provision of facilities and services for the safe disposal of human urine and faeces."[4] Taking this definition, this research focuses specifically on the provision of latrines for the hygienic disposal of human waste.

While it is well-known that latrines prevent the spread of water-borne diseases, more recent studies have shown that the lack of access to sanitation may have critical health effects both in the short and long term. One of the most direct and important effects of improved sanitation on human health is the reduction of diarrhea, a leading cause of mortality (Fewtrell and Colford Jr, 2004). The longer term health effects of poor sanitation are improper development of children caused by malnutrition and child stunting. Child stunting, in turn, has been associated with lower IQ and deficiencies in other human organs (Schmidt, 2014). The negative effects go beyond health – poor sanitation also has a negative impact on educational attainment and personal security. Children are more likely to enroll and stay in school when latrines are available, and the impact is greatest for girls who enter puberty (Adukia, 2013). Since May 2014 when two young girls were killed in Uttar Pradesh, there has been an increasing number of reports in India of violence against women that occur after sunset when women are forced outside due to the lack of latrines (McCarthy, 2014).

[4]Definition used by the World Health Organization. See http://www.who.int/topics/sanitation/en/

Figure 1.1: Human Development and Sanitation in India's States, 2010



Data sources: Agrawal, Suryanarayana, and Prabhu (2011) and Census of India 2001.

Figure 1.1 shows the correlation between the overall level of human capital and the level of access to sanitation in India's states in 2010. The level of human capital is measured by the United Nation's Human Development Index, which captures different aspects of development including health, education, and standard of living. The data is adjusted for inequality within states by Agrawal, Suryanarayana, and Prabhu (2011). Not surprisingly, this graph shows a strong correlation between sanitation and human development: states that had better access to sanitation in 2001 generally have higher scores for the inequality-adjusted Human Development Index in 2010.

What is surprising is the wide variation in progress made on providing access to sanitation among Indian states, despite the positive outcomes in human development that it is expected to have. It has been estimated that the economic and social costs to India of having inadequate sanitation were about USD 53.8 billion in 2006, which was equivalent to 6.4 percent of its gross domestic product (GDP) (Water and Sanitation Program, 2011). Thus, it is puzzling that governments often fail to provide basic public services that would benefit large portions of population, especially the

poor, as well as contribute to economic growth.

Most of the studies of government responsiveness to basic services in democracies focus on the importance of political institutions and incentives. My dissertation extends this research by examining the role of gender in basic service delivery in a developing country. The questions I seek to answer through this research are: Why do some elected officials provide better basic services than others? Does having more women in state legislatures make a difference in improving basic services? How do electoral constraints influence decisions by female politicians on policies they would like to pursue such as improving sanitation? And lastly, what makes women more inclined to invest in better sanitation facilities in their household?

1.2 Argument

The premise of this study is that policy decisions are driven by gendered preferences as well as electoral incentives, so there is an electoral risk in making policy choices solely based on personal preferences. Female politicians are more likely than their male counterparts to provide basic services that directly affect women but not at the risk of losing office. As the literature on gender and politics shows, empirical evidence shows that women are more likely to have stronger preferences for policies related to women, children, or the family. This could be due to the fact that they are more aware of the needs of women and thus more sensitive to what their female constituents demand. Thus, this research examines female politicians' willingness to pursue gender-preferenced policies under varying degrees of electoral incentives.

In this dissertation I analyze the provision of access to sanitation in a developing country setting because, along with access to clean water, it is a basic service in which gender is salient in its consequences when absent. I theorize that the variation in access to sanitation can be explained by the presence of more female politicians as well as the level of electoral risk. Although female politicians would like to choose to improve sanitation at all times, the degree of electoral competition gives them different incentives for choosing policies based on their identity. When faced with higher electoral competition, female politicians are more likely to implement gendered policies in a way that is more certain to have popular appeal. In contrast, when faced with lower electoral

competition, female politicians will choose to pursue their preferred policies.

An empirical implication of this theory is that the overall quantity of latrines provided by politicians will increase when there are more competitive elections. This is because widening latrine coverage is more easily identifiable by voters, so female politicians, much like their male counterparts, have an incentive to provide more latrines of both high and low quality. In contrast, better quality latrines, although more beneficial for human development, are harder to detect by voters because information on latrine construction needs to gathered by the type of latrine, and the higher quality latrines are more costly to construct. Thus, politicians have less incentive to provide them at the risk of losing office in the next election. Instead, female politicians, driven by their stronger prefererence to provide better quality latrines, will increase them.

The findings from this study show that the presence of women in state legislatures in India makes a difference in improving sanitation through the provision of better quality latrines for households, but not necessarily for overall latrine coverage. Considering that the quality of latrines has a direct impact on health, this suggests that having female politicians in office improves basic services that are more closely linked to women, children, and the family. At the same time, however, female legislators are constrained by the same electoral incentives as their male counterparts, and the results show that female legislators respond to these incentives by pursuing their preferred policy in a less electorally risky manner. In particular, female politicians, much like their male counterparts, increase the overall quantity of latrines when faced with higher electoral competition. I suggest that this is because widening latrine coverage is more easily identifiable by voters compared to improving the quality of latrines.

While politicians are responsible for promoting and providing financial incentives for latrine building, the actual construction of household latrines also requires the willingness of citizens to participate. Therefore, the second part of the dissertation examines the role of women as beneficiaries of sanitation policies. I expect that having latrine facilities in households depends on the role of women. Specifically, women who engage more regularly in obtaining information from mass media outlets, and have financial decision making duties within the household are more likely to have latrines.

1.3 Related Studies

1.3.1 Government Responsiveness to Basic Services

At the heart of existing theories on government responsiveness to the need for basic services in democracies are competitive elections. It is the key mechanism through which poor-performing politicians can be punished by having them replaced with good, responsive candidates. At the same time, the fear of losing office should drive politicians to perform better. Cross-national empirical studies find evidence of this claim, showing that more competitive elections often increase government responsiveness in terms of providing more public goods and services (Brown and Hunter, 2004; Lake and Baum, 2001).[5]

A large group of studies examine how other conditions may influence the relationship between higher electoral competition and greater government responsiveness, and offer explanations for when outcomes differ. According to Chhibber and Nooruddin (2004), the party system's composition influences government responsiveness; two party competition will provide more public goods than multi-party systems because two-party systems need to satisfy a larger group of constituents. Some studies formally model how differences in electoral systems may lead to different levels of basic services (Persson and Tabellini, 1999; Lizzeri and Persico, 2001) . Other studies point to other actors, such as interest groups, that influence the decision making process. Thus, the empirical evidence on the positive relationship between electoral competition and government responsiveness is not straightforward, and in fact has been directly challenged by some studies that find no such relationship, and instead argue that other forms of political participation, beyond elections, are a better indicator (Cleary, 2007).

A related topic in this literature is who benefits from the chosen policy. For scholars studying developing countries, an important question is: why do the poor often fail to receive basic goods and services? The low-income group in most developing countries constitute a majority of the population, and yet often times it is the poor that lack government services. Many of these basic services involve health and education, so providing these goods would contribute to human capital

[5] Also see Ashworth (2012) for a survey of this literature.

development.

The most widely studied condition that influences delivery of public goods to the poor in developing countries is the level of access to information. Besley and Burgess (2002) find that states in India with higher levels of mass media penetration are more likely to receive help from the government in times of national emergencies. In low information environments, Keefer and Khemani (2005) suggest the difficulty for politicians in providing to voters credible evidence about their actions once in office that dissuades them from spending on public goods and instead pushes them to resort to providing private benefits. Other studies find that decentralization of political systems within countries has been beneficial to increasing investment for services for the poor, partly because having a smaller size constituency solves the low information problem, so that it is easier for politicians to have closer ties with their voters (Faguet, 2004).

The literature is rich in linking the poor, electoral accountability, and the provision of basic services in developing countries, however there are not many studies of a similarly large but disadvantaged group: women. While there are many studies that show how public policies such as education policies may impact women's attitudes and behavior, these studies overlook the political determinants of policies that favor women. A missing component of the study of government responsiveness for developing countries is when politicians pay attention to women.

Perhaps one may consider studies on the political representation of identity groups, where identities may be formed from ethnicity, social class, or gender, to be closely related. However, Htun (2004) points out that ethnicity and gender as identity groups are different in that "gender tends to be crosscutting, ethnicity tends to be coinciding." Women may belong to different political parties, but ethnic groups usually belong to their own party. And because of this, ethnic parties primarily use this group identity to mobilize votes whereas for gender, this identity alone rarely defines an individual's voting behavior. Thus, when we consider ethnicity, existing hypotheses on electoral competition and government responsiveness fit in nicely. Ethnic parties have an incentive to provide more for their ethnic group in face of increased electoral competition in order to remain in the center (Chandra, 2004). The implications for women are more obscure because both personal and party preferences may play a role.

Instead another way to think about the role of gender on political representation is illuminated by Besley and Coate (1997), who present a formal model of how the politician's gender enters the policy making process. Their model shows that voters choose politicians who best reflect their own policy preferences because politicians cannot credibly commit to policies that differ from their own preferences. According to their model, when there are two candidates, the expected utility from winning an election and implementing one's own policies must be greater than the costs of running for election for both candidates. This means that to offset the costs, the two candidates must have sufficiently different preferred policies, which are shaped by their identities. Therefore, it can be inferred from this model that male and female candidates will have different gender-based policy preferences that voters will base their votes on.

This study implies that politicians' gender, and not just the degree of electoral competition politicians face, is an important indicator of the level of basic services in developing countries. It shows how female politicians act strategically to secure their position in office when faced with highly competitive elections and pursue policies that are favorable for women.

1.3.2 The Gender Dimension of Sanitation

A phenomenon closely related to countries around the world granting women suffrage is the increased share of parliamentary seats occupied by women. At the most fundamental level, this phenomenon brought renewed interest in the concept of representation, raising the question of whether women entering politics is achieving a more democratic representation of the population. Pitkin (1967) provides four distinct yet inter-related concepts of representation, which we can interpret in relation to female political representation. First, when we think of elected representatives in general, we often think of formalistic representation, which means having a political leader authorized to act through elections while being held accountable to the electorate for her actions. In contrast, symbolic representation is when politicians "stand for" the groups they represent and the people"accept or believe" that the political leaders are representing them (p.102). For female representation more specifically, the third notion, descriptive representation, is more relevant. Descriptive representation means that the proportion of female politicians mirrors the proportion of

female population in the electorate. Often juxtaposed with this concept is substantive representation, which is when political leaders are "acting for others, an activity in behalf of, in the interest of, as the agent of"(p.113) their electorate.

Pitkin's (1967) study has generated a large body of empirical work based on these different concepts of representation, especially the latter two concepts, and perhaps the most widely studied question in relation to politicians' gender is whether the increased number of females entering political office influences policy making. Several studies of the U.S. Congress show that women legislators are more likely than men to promote policies related to women, children, and family, which in general are related to health, education, and welfare (Swers, 2001). More specifically, they include issues such as child care, health care, domestic violence, parental leave, equal rights, abortion rights, and teen pregnancy (Carroll, 2001). According to these studies, women legislators are more likely to identify one of these three policy areas as their top priority and take leadership roles to promote them (Carroll, 2001), to introduce and pass bills related to them (Thomas, 1991), and to be in a committee relevant to health and welfare (Thomas and Welch, 1991). Other studies of the U.S. found that women take more liberal positions on some of these issues (Welch, 1985; Diamond, 1977). The advancements of these types of women, children and family-related issues are in part made possible by the increased number of women in legislatures, but also by having a large women's caucus that supports these issues (Thomas and Welch, 2001).

Another group of related studies finds that women have a different "style" of politics. Namely, studies suggest that women are more likely than men to contribute to the funding of public goods (Andersen et al., 2008), interact with a wider group of people in the decision-making process of making investments (Kathlene, 2001), be more socially-minded in their spending (Eckel and Grossman, 2008), and be less likely to engage in corrupt activities while in office (Brollo and Troiano, 2014).

However, much of the literature constitutes studies of the U.S. It is hard to generalize from the U.S. case or other developed countries to the situation in developing countries because of the differences in gender-salient issues and context. What is common in developed and developing countries is that women representatives have a stronger preference for issues related to women, children, and the family. What is different are the specific policies and legislation that commonly

pertain to these issue areas. For example, Bratton and Ray (2002) studied female representation in relation to daycare policies in Norway, a policy highly relevant for women, children, and family. However, child-care policies in developing countries are implemented in a different context and may have different priorities- they could for example focus instead on child nutrition. In developing countries, gender roles are far more pronounced in development issues that are related to health and education. Thus, there is a need to study the impact of gender where health and education policies overlap with policies related to women, children, and family in developing countries.

So far studies of gender in developing countries show that female politicians tend to prioritize funding goods and services that reflect the preferences of women, often related to family health (Chattopadhyay and Duflo, 2004; Brollo and Troiano, 2014), and vote in favor of legislation that increases the economic rights of women such as entitlement to land (Clots-Figueras, 2011). Chattopadhyay and Duflo's (2004) study also shows that the use of quotas to secure a proportion of women in local governments makes a difference in policy outputs.

This research extends the literature by focusing on one type of basic service. Studies that examine the impact of gender differences among politicians in developing countries generally focus on aggregate outcomes such as primary school completion or infant mortality. However, these health and education outcomes involve multiple processes that policy-makers make decisions on. Examining gender differences in individual components within the multidimensional outcomes may result in more accurate estimates of the effect of gender.

Lastly, the women-and-policymaking literature remains largely detached from the wider literature on how electoral incentives shape politicians' behavior. Despite the common electoral constraints that politicians are subject to, the literature on the impact of female politicians seeks answers in socioeconomic differences in the population such as comparing results between rural and urban settings (Clots-Figueras, 2012), and overlooks commonalities among male and female politicians. Because female politicians act within institutional constraints in order to be successful, just as their male counterparts do, it is important to consider these influences in their decisions. Brollo and Troiano (2014) examine the timing of elections and re-elections, however they do not consider electoral competitiveness, which is at the heart of achieving electoral accountability.

1.4 Organization of Chapters

The rest of the dissertation is organized as follows. Chapter 2 explores the influence of female state politicians on access to sanitation in India, with a focus on household and public latrines which are provided with the support of the government in rural parts of the country. I use sub-state level data that differentiates between higher and lower quality latrines in fifteen states in India, in order to test whether the presence of female politicians increases the quantity or quality of latrines. The analysis shows that areas with more female legislators are more likely to improve sanitation through the provision of higher quality latrines, but not necessarily through widening overall latrine coverage. I explain this by showing how the electoral context, or more specifically the degree of electoral competition, can alter decision making strategies on latrine provision.

Chapter 3 explores extensions to the findings in the previous chapter. Three different mechanisms from the wider political context that may support the success of female representatives in improving sanitation are examined: the degree of female politicians' engagement in a nationwide sanitation program, the influence of prior female legislators, and the influence of female politicians in lower levels of government. Each mechanism is tested using appropriate quantitative data in order to gain a better understanding of political factors external to electoral incentives that may increase or decrease the level of access to latrines.

In Chapter 4, I study women in the electorate and their decisions to financially invest in household latrines because latrine provision is in part dependent on the degree to which households are willing to accept and construct them. I empirically test the relationship between the consumption of mass media and having household latrines. The finding shows that women's status in the household is the key link between having high levels of information and having household latrines. This chapter shows the importance of the social context, specifically women's intra-household position, in households being receptive to better sanitation.

Lastly, Chapter 5 concludes with a summary of the findings and discussion of the limitations of the study. Overall, this research makes important contributions to our understanding of gender roles in the distribution of a public good through the analysis of multiple perspectives. By examining gender from both the representative and citizen side, it helps us to understand the slow progress

in the distribution of sanitation that has been an ongoing problem in India, much like many other developing countries. It also carries policy implications, arguing that context does matter whether this means the political or social environment. The chapter concludes with suggestions for future research on the provision of basic services in developing countries, and on the political economy of improving sanitation.

CHAPTER 2

The Impact of Women in State Legislatures

2.1 Introduction: Women Leaders and Sanitation

In democracies, elections play a central role in ensuring that the government meets citizens' basic needs. This is because competitive elections allow voters to choose representatives who are responsive to these types of needs and punish incumbents who do not do a good job. Yet, citizens in developing countries with formal democratic institutions are often left without access to many of these services. The political economy literature on whether competitive elections lead to positive socioeconomic outcomes has pointed to the number of major political parties (Chhibber and Nooruddin, 2004), the degree of media attention (Besley and Burgess, 2002; Strömberg, 2004a), or the strength of interest groups (Grossman and Helpman, 1994) to explain the variation in the level of basic services provided by governments. This paper examines one mechanism that has received less attention: the influence of the gender of the politician on their policy choices.

With the steady increase in women entering parliaments globally, there is a growing need to understand the influence of female politicians. Women occupied 22 percent of national parliamentary seats worldwide in 2013, compared to 11 percent in 1995 (Inter-Parliamentary Union, 2014). This global trend can also be seen in developing countries such as India, where the increased presence of women at the national level has trickled down to state level governments, where as of 2010 approximately 7 percent of state legislators nationwide were women. A central question in the literature on gender and politics is whether female legislators make different policy choices from their male counterparts. So far research suggests that women are more likely to favor policies related to women, children and the family (Thomas, 1991; Chattopadhyay and Duflo, 2004). However, these gender-based preferences have not been considered together with electoral incentives

that, in theory, motivate the degree to which all politicians respond to their constituencies. Existing studies have been focused on finding differences in the socioeconomic settings, such as comparing female policymaking in rural areas to urban ones, to help account for the different policy decisions that female politicians make, but this overlooks commonalities among male and female politicians. Because female politicians, just like their male counterparts, act within institutional constraints in order to be in office, it is important to consider these influences in their decisions. This study therefore bridges the literature on the role of electoral incentives and politicians' gender to investigate whether female and male politicians respond differently to electoral motives when providing a basic service.

This study investigates the role of female state legislators in improving sanitation conditions in rural India, where providing adequate sanitation has been an ongoing challenge. Over 60 percent of the population lacked access to improved sanitation facilities in 2012, which is substantially worse than the average for middle and low income countries of 44 percent.[1] Moreover, sanitation is a basic service in which gender considerations are meaningful. Women are directly affected by its absence in terms of their health and security, as well as child rearing and other productive household activities. Lack of sanitation compromises personal dignity and security for women because it forces the practice of open defecation. It is also the root cause of many water-borne disease such as diarrhoea, which is a leading cause of death in young children. Surveys show that women prioritize water and sanitation over other public goods (Thomas, 1991; Chattopadhyay and Duflo, 2004), suggesting that female politicians may be more likely to respond to sanitation concerns than men.

In order to estimate the causal effects of politicians' gender on sanitation, I exploit the quasi-randomness of the gender of the winner using only women who won in highly competitive elections with a male candidate to proxy for the influence of female state legislators. The analysis includes state assembly elections from fifteen major Indian states from 2006 to 2010.

The main results show that female state legislators have an effect on improving access to up-

[1] *World Development Indicators 2012*, The World Bank. Improved sanitation is defined as "flush/pour flush (to piped sewer system, septic tank, pit latrine), ventilated improved pit (VIP) latrine, pit latrine with slab, and composting toilet."

graded latrines: even after accounting for electoral competition, areas with female politicians tend to have higher quality latrines that hygienically remove waste. However, there is no gender difference in how politicians respond to electoral competition in terms of increasing the coverage of latrines for rural households. I suggest that this is because politicians are more likely to improve sanitation more visibly when faced with more competitive elections to signal their good performance to voters. For sanitation latrine coverage is easier for voters to observe, and thus more preferred by politicians who face high competition in elections, whereas the quality of the latrines being built is more difficult to perceive. This finding is conducive to existing studies on the allocation of public goods depending on their visibility (Mani and Mukand, 2007; Harding and Stasavage, 2014). Extending this analysis, I also find that increased electoral competition positively impacts building new latrines to increase coverage, when using data from a government scheme for improving sanitation. At the same time, having an elected representative from the ruling party does not influence the likelihood of having better sanitation, reinforcing that the concern for improved sanitation is located by politicians' gender, distinct from party affiliation.

This study contributes to our understanding of why there is wide variation in the level of basic services in many less developed countries with democratic systems by examining what difference female legislators make. While the literature on female leaders in developed countries is well developed, there are fewer studies on developing countries despite the increasing presence of women in politics. Yet it is hard to generalize from the research on developed countries to less developed ones since gender-relevant issues and contexts may differ.

India, a long-standing democracy, is a case where basic services such as sanitation are lacking despite long-term government efforts, and has a wide variation in female representation by state. There is also evidence that having reserved seats in local political institutions for women has an impact on policies (Chattopadhyay and Duflo, 2004), yet it is unclear whether women's interests can be promoted through increased female representation when quotas are not in place. By analyzing access to sanitation, we can focus on mechanisms driving a single type of essential service that influences both health and education outcomes for a better understanding of the domestic political process in development.

2.2 Theoretical Motivation

The implications of the influence of women in government can be situated within the larger theoretical framework on representation and the quality of democratic governance. In the study of democratic governance, a central question is understanding the extent to which elected representatives respond to the needs of their constituents. Downs (1957) predicts that in majority rule systems, electoral competition drives policy makers to cater to the preferences of the median voter. However, many factors enter into the decision-making process of policy makers, including the amount of information politicians have about their voters (Besley and Burgess, 2002; Strömberg, 2004a), and the strength of interest groups (Grossman and Helpman, 1994), swaying them from their initial promises to voters once sworn into office. A politician may also be influenced to possibly move away from the median voter's ideal point by their identity, which includes ethnicity, religion, social class, or gender. If these aspects of politician's identity explain behavior, then they may be a more credible signal to voters than their verbal promises.

Regarding the impact of identity politics, this study focuses on the role of gender in an attempt to fill in a missing gap in the literature on government responsiveness in developing countries. The women-and-policymaking literature remains largely detached from the wider literature on how electoral incentives shape politicians' behavior. Despite the common electoral constraints that politicians are subject to, the literature on the impact of female politicians frames comparison across socioeconomic differences in the population, such as comparing results between rural and urban settings (Clots-Figueras, 2012), and overlooks commonalities among male and female politicians. Because female politicians act within electoral constraints in order to be successful, just like their male counterparts, it is important to consider these influences in their decisions. One study by Brollo and Troiano (2014) that examines electoral incentives in a less developed country, Brazil, focuses on the timing of elections and re-elections but does not consider electoral competitiveness, which is at the heart of achieving electoral accountability.

2.2.1 Politicians' gender and policymaking

Among the different notions of representation laid out by Pitkin (1967) as discussed in Chapter 1, there are two views of representation that are most relevant to the discussion of women in politics here. Descriptive representation, or 'standing for' representation, is an "accurate correspondence or resemblance" (Pitkin, 1967: p.60) to the community the government represents such that the composition of the legislature reflects perfectly the characteristics of the whole nation such as race, gender, income, and education level. According to this concept of representation, increasing the percent of women in office is how female preferences will be represented in government. A second view is substantive representation or 'acting for' representation. From this perspective, representation is "an activity in behalf of, in the interest of, as the agent of, someone else" (Pitkin, 1967: p.113). In this sense, representatives, whether male or female, should be serving the interests of their constituents. Either concept of representation results in a divergence of politicians' preferences based on gender: the existence of either an intrinsic gendered preference (i.e. identity politics), or the propensity of communities with certain preferences or concerns to elect a woman to represent them (i.e. particularly given the political lefts greater commitment to and concern for gender equality) may result in gender-based preferences.

A large body of empirical work has emerged from Pitkin's (1967) concepts; perhaps the most widely studied question is in what ways an increased number of women entering political office influences policy making. Several studies of the U.S. focus on the policy areas that women are more likely to prioritize in the legislative process. Empirical studies show that women legislators are more likely than men to promote policies related to women, children, and family, which in general are related to health, education, and welfare (Swers, 2001). These policies cover issues on child care, health care, domestic violence, parental leave, equal rights, abortion rights, teen pregnancy, and so forth (Carroll, 2001). Both attitudes and behavior displayed by women legislators point to these findings. For instance, women legislators are more likely to identify one of these three policy areas (i.e. women, children, and family) as their top priority and to take leadership roles to promote them (Carroll, 2001), to introduce and pass bills related to them (Thomas, 1991), and to serve on committees relevant to health and welfare (Thomas and Welch, 1991). Other studies of the U.S.

also find that women take a more liberal position on some of these issues (Welch, 1985; Diamond, 1977). The advancement of these types of women-, children- and family-related issues is in part possible by the increase number of women in legislatures, but also by having large women's caucus that supports these issues (Thomas and Welch, 2001).

Another way in which the impact of women in politics is studied is their effect on the allocation of public goods. At a general level, evidence suggests that women are more likely than men to contribute to the funding of public goods (Andersen et al., 2008), interact with a wider group of people in the investment decision-making process (Kathlene, 2001), be more socially-minded in their spending (Eckel and Grossman, 2008), and be less likely to engage in corrupt activities while in office (Brollo and Troiano, 2014).

However, much of the literature is focused on the U.S. case, and despite the the growing number of women in office in the developing world, there are fewer studies outside the U.S. that examine gender differences in policy making. It is hard to generalize from the U.S. case or other developed countries to the situation in developing countries because of the difference in gender-salient issues and context. What is common in developed and developing countries is that women are more motivated by, and have a higher preference for, issues related to women, children, and the family. What is different are the specific policies and legislation that commonly pertain to these issue areas. For example, Bratton and Ray (2002) studied female representation in relation to daycare policies in Norway, a policy highly relevant for women, children, and family. However, child care policies in developing countries may have a different meaning, and instead focus for instance on child nutrition. In developing countries, gender issues are far more pronounced in development issues that are related to health and education. Thus, there is a need to study the impact of gender where health and education policies overlap with policies related to women, children, and family in developing countries.

An emerging body of studies on gender differences in policies in developing countries shows that female politicians tend to prioritize funding goods and services that reflect the preferences of women, often related to family health (Chattopadhyay and Duflo, 2004; Brollo and Troiano, 2014), but also related to improving the status of women through more economic rights, such as passing bills on women's entitlement to land (Clots-Figueras, 2011). In many developing countries where

breaking the glass ceiling may be more difficult, Chattopadhyay and Duflo's (2004) study shows that the use of quotas to secure a proportion of women in local governments makes a difference in policy outputs. In sum, regarding the provision of public goods and services, evidence from around the world, whether from developed or developing countries, most consistently shows that women favor spending on women and child-related goods and services.

This is not to say, however, that women always have homogeneous preferences, and in fact the evidence is not always uniform across female politicians in the same country. For instance, studies find that the degree to which female politicians in India seek gender equality in economic rights depends on their social status (Clots-Figueras, 2011) and in primary school completion depends on their geographic location (Clots-Figueras, 2012). These studies suggest the need to make a closer examination of the heterogeneous preferences of women leaders in order to understand the impact of gender differences on policies. In order to do so, this paper examines one type of basic service, sanitation, which women generally care more about, to understand why preferences may vary among female leaders.

2.2.2 Female preferences for quality sanitation

Women are more closely linked to sanitation issues and have higher preferences for sanitation than men for reasons related to personal privacy, security, and family health. Women tend to be the primary users and cleaners of household bathroom facilities compared to other household members. In less developed countries, the likelihood of women using bathrooms located within households is greater not only for privacy concerns but also to avoid being a target of violence: many cases of sexual assault occur when practicing open defecation after sunset (Gosling et al., n.d). More importantly, women are closely linked with higher sanitation concerns because they are the primary caregivers to children, who are most susceptible to water-borne diseases caused by poor hygiene. Because of their role in child-rearing, access to information by women in households, and the level of maternal education are more strongly associated with improving children's health or reducing infant mortality compared to that of men.

Sanitation is one of the most gender salient basic service that is lacking in many developing

countries. Unfortunately, while there is no nationwide survey that shows the relative preference for different public goods by gender, there is some indirect evidence that suggests this. In both districts of Rajasthan and West Bengal in Chattopadhyay and Duflo's (2004) study, drinking water, for which policy making is usually done jointly with sanitation, was the most preferred public good for women. Qualitative evidence suggests that the time and place for the practice of open defecation is segregated by gender, which most gravely inconveniences women (Jha, 2010). Policy analysts have noted that women are more committed to installing latrine facilities compared to men(Water and Sanitation Programme, 2010), and projects to improve access to water and sanitation are more likely to be sustained when women are actively involved in the management of these resources (Wijk-Sijbesma, 1998; Task Force on Gender and Water, 2006). In sum, female politicians are more likely to have a stronger desire to improve sanitation because they are more aware these preferences of women's are more likely to shape policy decisions made by female politicians because they may be more aware of and sensitive to the demands of their female constituents.

The premise of this study is that policy decisions are driven by gendered preferences as well as electoral incentives, so there is an electoral risk in making policy choices solely based on personal preferences. Female politicians are more likely than their male counterparts to provide basic services that directly affect women, but not at the risk of losing office. The existing literature on the influence of electoral incentives on public goods provision identifies electoral competitiveness as a key factor in determining the allocation of resources for basic services. A large literature suggests that elected officials, regardless of gender, are motivated to respond to their constituents because of their desire to stay in office. In particular, politicians are more responsive when elections are competitive. According to the "visibility effect hypothesis", politicians have an incentive to devote resources to public goods and services that are more visible because those who face more competitive elections have an incentive to signal their competence by providing goods that are easier for voters to observe and evaluate (Mani and Mukand, 2007; Harding and Stasavage, 2014). For sanitation, it is easy for voters to observe sanitation facilities being constructed in homes and public schools; however, it is hard for voters to know the quality of latrines. Therefore, men and women politicians facing highly competitive elections are expected to devote more effort in increasing latrine coverage regardless of the type of latrine, in order to raise their constituents' evaluation of

them. However, the quality of sanitation (i.e. providing upgraded latrines) should not necessarily improve even with competitive elections because it is more costly for voters to observe this type of information.

An empirical implication of my argument is that female politicians will provide more latrines in order to broaden the coverage of access to sanitation when there is high electoral competition. This is because widening latrine coverage is more easily identifiable by voters, so female politicians, much like their male counterparts, have an incentive to provide more latrines of both high and low quality. In contrast, better quality latrines, although more beneficial for human development, is harder to detect by voters, so female politicians have less incentive to provide them at the risk of losing office in the next election.

A direct measure of the quality of sanitation is the type of latrine. According to the World Health Organization and the United Nations Children's Fund's Joint Monitoring Programme (JMP) for Water Supply and Sanitation, the main difference between upgraded and non-upgraded sanitation facilities is whether the facility is designed to hygienically remove human waste without human contact to avoid the spread of bacteria.[2] For example, a pit latrine, which is a common low-cost option for many people in the developing country, can be an upgraded type of latrine or a non-upgraded one, depending on whether it has a cement slab as a cover and a ventilation pipe or window to prevent odor that attracts flies, which transport and spread communicable diseases. The most problematic latrines in terms of health hazards are service latrines, which are dry pits with human excreta removed by human (usually from lower caste) or animal (usually pigs) scavengers.[3] The different types of latrines generally used in India are categorized into upgraded and non-upgraded types and summarized in Table 2.1.

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[2]Details on definition of improved latrines by JMP available at:http://www.wssinfo.org/definitions-methods/watsan-categories/ The JMP calls the upgraded forms "improved sanitaton."

[3]In 2013, India passed a law banning manual scavenging by humans in pits due to the widespread medical disabilities people tend to develop with this practice. However, the problem is still rampant.

Table 2.1: Latrine Types

Upgraded Latrines	Non-upgraded latrines
-flush latrines connected to septic tanks or piped sewers -pit latrines with slabs -ventilated improved pits	-pit latrines without slabs - latrines serviced by scavengers (animals or human)

For sanitation in particular, latrine quality is important because it is directly related to health outcomes, especially in children. In a metastudy of seventy developing countries from 1986 to 2007, Fink, Günther, and Hill (2011) find that children in households with flush toilets, which are categorized as high quality sanitation, have about 27 percent lower odds of being stunted compared to households without any access to sanitation. In contrast, in households with intermediate quality sanitation, which includes basic pit latrines and improved latrines (except for flush toilets), children had 12 percent lower odds of being stunted compared to the same baseline. This shows that having upgraded flush latrines reduces the likelihood of child stunting by about half compared to intermediate quality latrines, and they find similar results for child diarrhoea and mortality.

Building on earlier findings on the effect of female legislators on policymaking, this study tests how gender-related preferences are pursued when there is electoral risk. The main hypothesis is stated as follows:

Hypothesis 1. *Areas with more female politicians are more likely to have increased access to higher quality latrines than areas with more male politicians, after controlling for correlates of electoral incentives.*

However, for latrine coverage, which is a more easily identifiable measure of politician's performance, the expectations are different:

Hypothesis 2. *All else equal, areas with more competitive elections will have increased latrine coverage.*

If female politicians are more concerned with improving sanitation, we should see an increase in upgraded latrines even when there is a high level of electoral competition. However, the presence of female politicians is not expected to have an effect on widening latrine coverage, as greater

electoral competition will motivate politicians to improve their performance in ways that are more easily recognizable by voters, which means increasing latrine quantity rather than quality.

2.3 Policy and Institutional Context

2.3.1 India's Sanitation Struggle

Lack of sanitation has been an ongoing struggle for India. It is the root cause of many water-borne diseases such as diarrhea, which is a leading cause of death for young children. The negative consequences of poor sanitation extend beyond health hazards to other aspects of human development, such as educational attainment (Adukia, 2013). Providing latrines for people in rural areas across the country is a core aspect of improving sanitation.

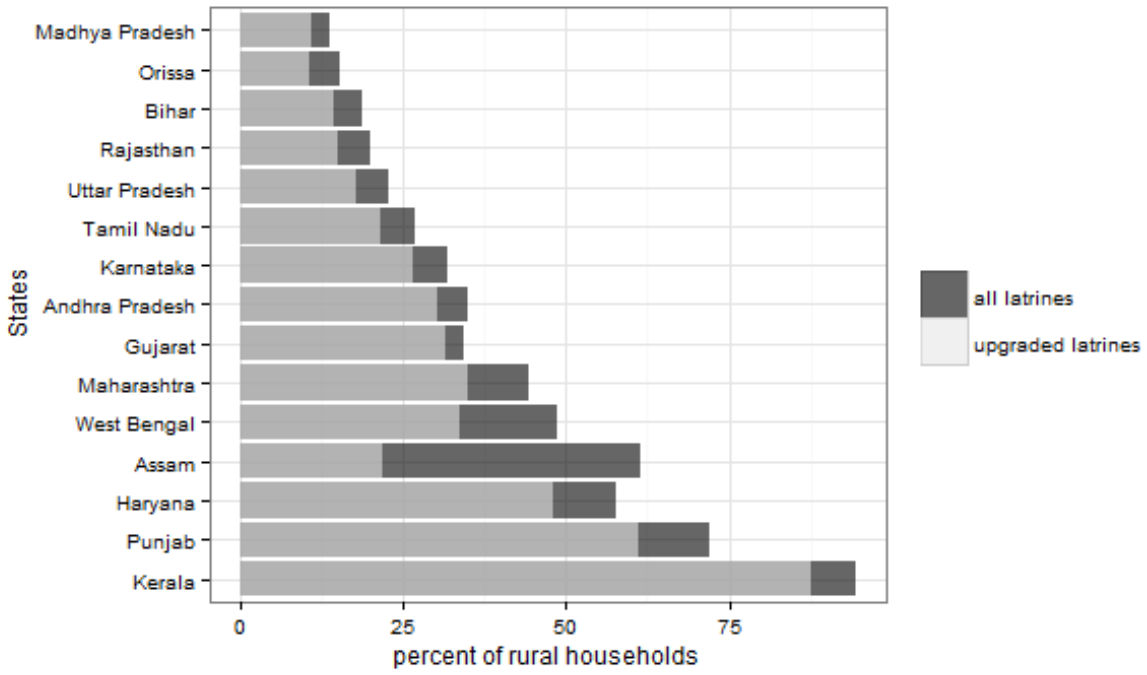
Nationwide, the Indian government has been tackling the sanitation problem by prioritizing the issue in its five-year economic plans and through centrally-sponsored schemes that have allocated investments toward improving sanitation in rural areas since 1986. One example of such a scheme is the Total Sanitation Campaign (TSC) that launched in 1999, to provide subsidies to rural households and public schools for latrine construction.[4] However, the results have been fairly limited, especially when compared to neighboring countries, Nepal and Bangladesh, who have made much more progress at a lower cost.[5]

According to the 2011 Indian Census, approximately half of the households in India still do not have access to latrines. Following the above definitions by JMP, the coverage and proportion of upgraded and non-upgraded latrines at the state level is shown in Figure 2.1. As the figure shows, most states, with the exclusion of Assam, have generally more upgraded forms of latrines than non-upgraded ones, however there is much variation in the level of progress among the fifteen Indian states in this study. Among those with access to sanitation, the most common type of latrine is a flush toilet that is connected to a septic tank.

[4]This program has been revised and renamed Nirmal Bharat Abiyan in 2012.

[5]Sreevatsan (2014) accessed at: http://www.thehindu.com/news/national/costly-sanitation-campaigns-but-very-little-to-show-fo
article6479587.ece

Figure 2.1: Access to Latrines in Rural Areas of Fifteen States, 2011

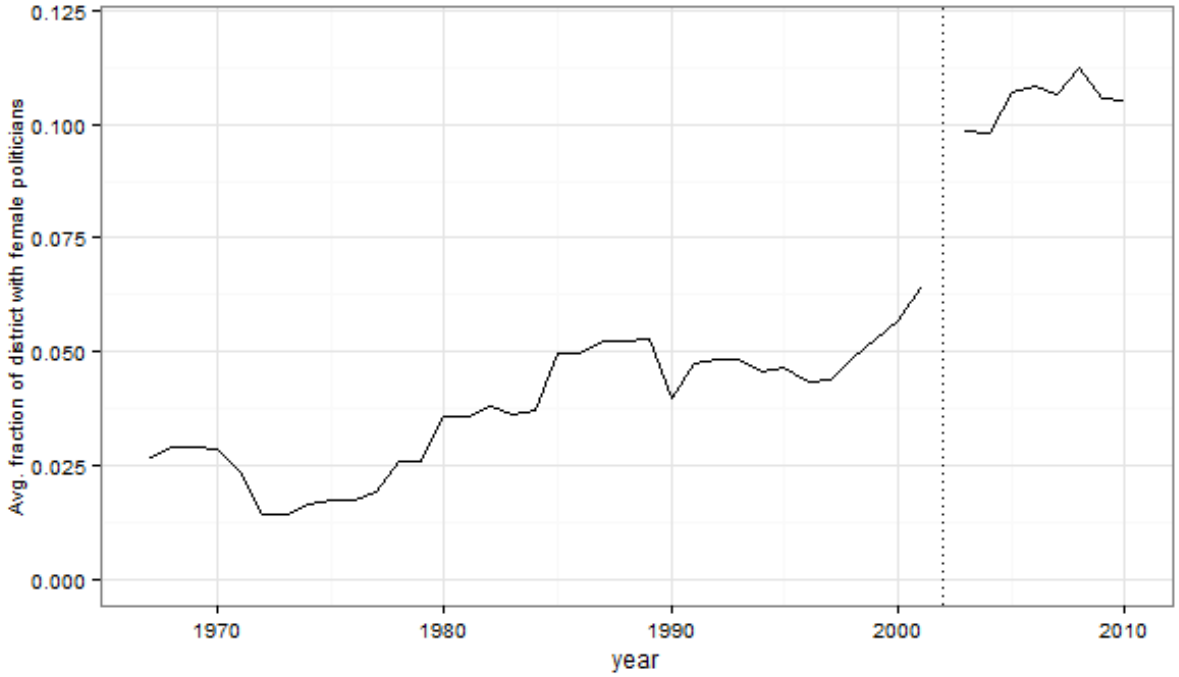


Data: Census of India 2011. In accordance with the definition of improved latrines by WHO and UNICEF's Joint Monitoring Programme for Water Supply and Sanitation, upgraded latrines include flush latrines that are connected to septic tanks or piped sewers, pit latrines with slabs, and ventilated improved pits. Non-upgraded latrines include pit latrines without slabs and various types of service latrines.

One of the main problems that has been difficult to overcome is the social acceptance of open defecation, which is a practice that is still prevalent today. Open defecation is practiced without much community disapproval in India even in places where there is access to sanitation, partly because it has been a common place behavior for a long time and also because there is little awareness about the health problems and environmental impact associated with the practice. Much like many social practices, the rate of change of eliminating open defecation is slow because it requires a collective change in norms and level of knowledge from community members for the practice to carry a shame factor. In recognition of this problem, communication and education about hygiene is a major component of sanitation campaigns today.

2.3.2 Female Representation in India

Figure 2.2: General Trend of Female Members of Legislative Assemblies in 15 of India's States



Notes: Data is from two different datasets so not directly comparable. Data from 1967 to 2001 are replicated from Bhalotra and Clots-Figueras (2014), and data from 2002 to 2010 is compiled by author. For 2002 onwards, fractions are district averages in 15 major states in India, and the unit is election year and district. Close elections are defined as those with a vote margin of 3.5% among the top two candidates. Data: Election Commission of India

The number of women in state assemblies in India has steadily increased.[6] During the past decade, approximately 6.7 percent of state legislators nationwide were female, but with wide variation by state. For instance, West Bengal had about 13 percent women in their state assembly, whereas Tripura had less than 2 percent, and there were five state assemblies out of India's twenty-nine states without any female presence at all. Figure 2.2 shows the general increasing trend of female members in state legislative assemblies. The data from 1967 to 2001 are replicated from Bhalotra and Clots-Figueras (2014), and the data points from 2002 to 2010 are compiled by author.

[6]Since India's independence in 1947, women have had the right to run for political office. Through the passage of the 73rd and 74th constitutional amendments in 1994, India established gender quotas for local governments in villages, which is the lowest level of government in their decentralized system, that reserved one third of seats for village council leader positions for women. There have been attempts to pass a similar bill for state and national level governments, but gender quotas at higher levels of government have not yet been established.

The two data points, however, are calculated from slightly different specifications so they are not directly comparable (marked by the break and vertical dotted line). Bhalotra and Clots-Figueras's (2014) data includes 16 major states in India, whereas the ones in this study (2002 onwards) are from 15 major states. The unit here is election-year and district.

2.3.3 The Role of State Legislators in Improving Sanitation

India is a parliamentary democracy with three tiers of government: central, state, and local, where some responsibilities have been decentralized to lower levels. Each state has its own legislative assembly and the size of the legislative assembly depends on the population of the state. State legislative assemblies, called Vidhan Sabha, are made up of members elected from first-past-the-post systems and represent single-member state assembly constituencies.[7] In other words, voters vote for one candidate in their constituency and the candidate with the highest number of votes wins. The size of a state assembly varies depending on the state's population. State assembly members generally serve for five years, unless the assembly is dissolved earlier, and after that elections are held for all seats in the assembly. Assembly elections are held in different years for different states, and data from each election is available online from the Election Commission of India. At the national level, the Ministry of Drinking Water and Sanitation is primarily responsible for sanitation programs in the country. Under the Constitution of India, sanitation and water supply are state responsibilities, and according to the 73rd and 74th Constitutional Amendments, states may give the responsibility to provide public goods to local governments (called Panchayati Raj). Therefore, the degree of decentralization of sanitation-related responsibilities from state to local governments differ by state.

States play an essential part in improving sanitation through planning and management, funding, monitoring, and providing education on hygiene. In these respects, improving sanitation is dependent on how active state legislators are in these roles. All states have set up State Water and Sanitation Missions in order to carry out sanitation projects in rural areas, which are usually

[7]The Vidhan Sabha refers to the lower house in case of states with bicameral legislatures.

implemented in coordination with district offices.[8] Most of the local projects on sanitation rely heavily on state government funds, which are also partially funded by the central government.

The corresponding district offices, called District Water and Sanitation Missions (DWSM), are headed by the Chairman of the District Council, which is a local government body. State legislators, as well as national parliament representatives, are members of the DWSM. Other members include district officers of departments that are relevant to sanitation such as education, health, local government's engineering department, water resources, information and public relations, etc. DWSMs generally meet quarterly for deliberation of policies and progress updates. At the local government level, DWSM is the highest decision making body on sanitation, and a key office in the planning and implementation sanitation policies.

The most important role of the state government is in public education and communication about hygiene and sanitation. One of the main goals of improving sanitation is to change social norms and behavior around open defecation in order to promote better hygiene practices. At the state level, mass media is often used to raise public awareness about related water-borne diseases and hygienic practices. The state is also responsible for training personnel and providing technical assistance to communities.

The main nationwide sanitation program from 1999 to 2012 was the Total Sanitation Campaign, in which states played an important role.[9] State funds were used to provide partial financial assistance for latrine construction in households below the poverty line, schools, and village centers (anganwadi centers), as well as to build community restrooms.[10] Sanitation project proposals are drafted at the district level and submitted to the state government for review, then passed on

[8]Each state is divided into districts for administrative purposes in India.

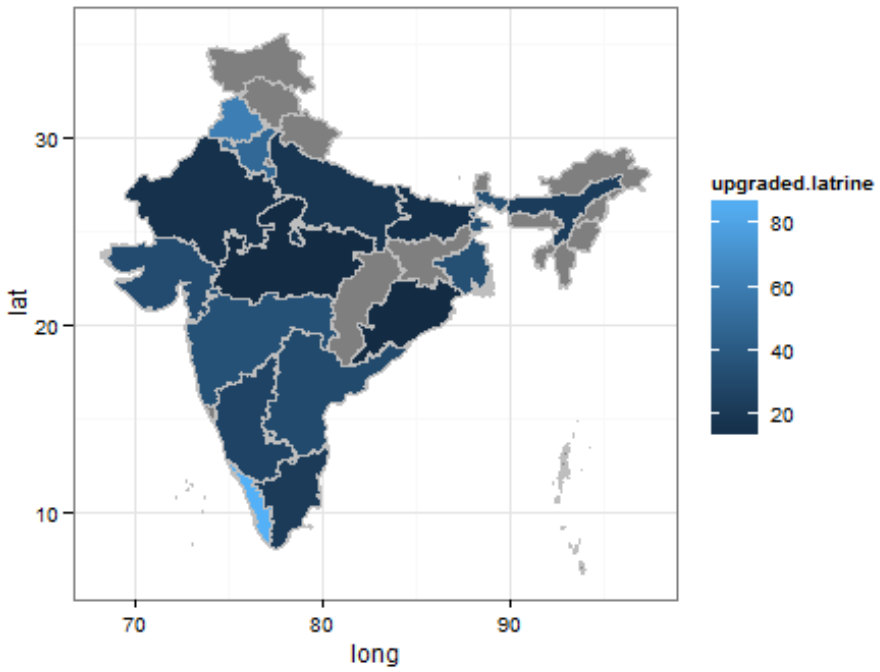
[9]This program has been revised and renamed to Nirmal Bharat Abhiyan in 2012.

[10]The proportion of funds that the state government provides depends on the beneficiary. For poor rural households below the state's poverty line, the central government provides roughly 60 percent of the total costs to build latrines, the state government provides 30 percent, and the rest is fulfilled by the beneficiary. For public institutions such as schools, the central and state governments divide the costs in the ratio of 70:30. For all of these funds, there is a maximum limit for which the central government provides, whereas state governments have the flexibility to provide more as needed. For instance, state governments may provide from their own budget to cover the cost that an individual household needs to pay.

to the central government for final approval. State governments are required to collect sanitation development plans from all districts and are the primary reviewers of these project proposals. They also provided training and technical expertise on latrine construction. The implementation of the program was done through the district office with the support of local governments in villages.

2.4 Data Sources and Description

Figure 2.3: Map of Proportion of Households with Upgraded Latrines in Fifteen States, 2011



Data: Census of India 2011. In accordance with the definition of improved latrines by WHO and UNICEF's Joint Monitoring Programme for Water Supply and Sanitation, upgraded latrines include flush latrines that are connected to septic tanks or piped sewers, pit latrines with slabs, and ventilated improved pits.

The scope of the empirical analysis includes all districts in fifteen major states from 2005 to 2011.[11] These states were chosen because they are generally considered the key drivers of India's economic development by the Planning Commission for their relatively larger population

[11]The states included in this paper are Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajashtan, Tamil Nadu, Uttar Pradesh, and West Bengal. There were 28 states total in India in 2011.

size. Their potential in boosting the economy also means that delivery of infrastructure and basic services such as sanitation is more closely monitored in these states. The map in Figure 2.3 shows the distribution of states with upgraded latrines. As the map shows, the states combined cover about 90 percent of the total population in India with wide variation in access to sanitation.

The dependent variables measure the coverage of upgraded latrines and the coverage of latrines regardless of the quality of the latrine. Each is measured as a proportion of the number of rural households in a district. The data is from the 2011 India Census, which classifies the type of latrine facility in households into nine different categories depending on whether they are a flush, pit, or service latrine, and the method used for waste disposal. I categorize these latrines as upgraded or not, based on the above definitions by JMP.

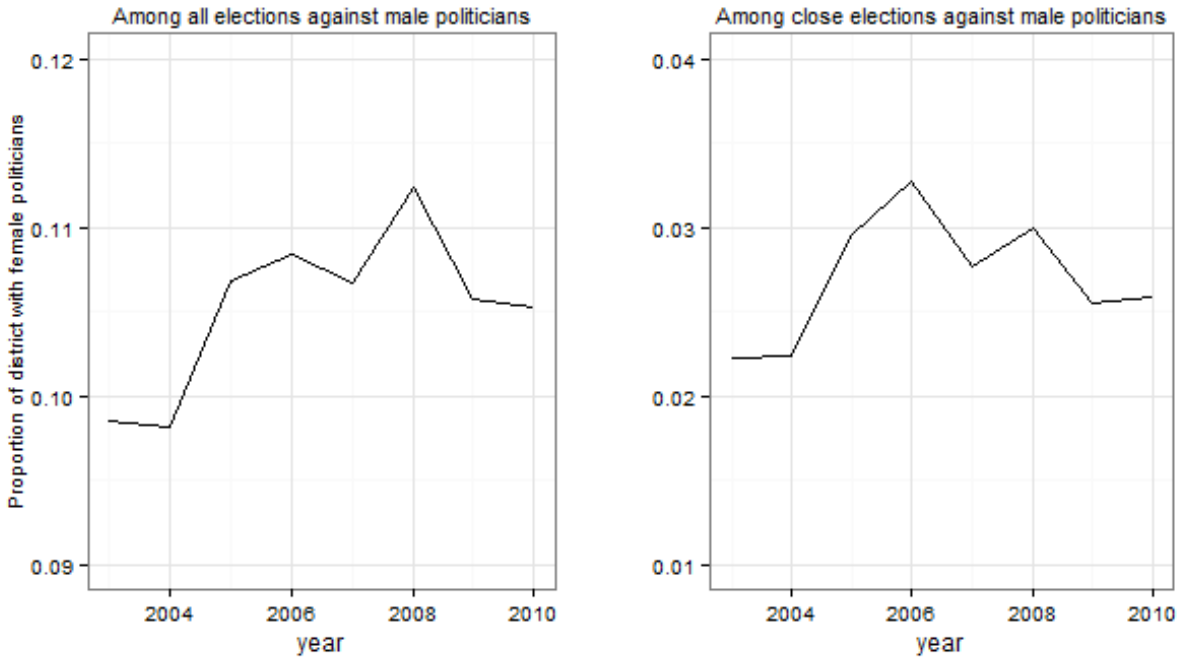
The main independent variables of interest on the presence of female politicians and other electoral factors are from state assembly election data. I use electoral results from 2006 to 2010 for each state legislature, so that the electoral variables are an average from five years prior to the dependent variable. The electoral variables include the gender, party affiliation, and number of votes obtained by the top two candidates in each constituency. During the timeframe of this dataset, each state held at least two state elections. All proportions are based on the total number of constituencies in each district except for the instrumental variable.[12] The proportion of female politicians is averaged across years 2006 to 2010. The identification strategy, which is explained in further detail in the next section, is based on the proportion of constituencies with very close elections in which the top two runners are one female and one male candidate, to construct the instrumental variable. Close elections are defined as those that had a winner by a vote margin of 3.5 percent or less.

Figure 2.4 shows descriptive statistics for the proportion of all female politicians in a district

[12]The states' electoral constituencies were mapped to districts, which is not a straightforward task in India's case. State assembly constituencies are generally smaller units than administrative districts and fit into district boundaries. India implemented the new 2003 Delimitation Act in 2008, in which the political map was reconfigured on the basis of the 2001 Census. Although the total number of seats in State Assemblies did not change, the relevant constituencies that constitute a district as well as their reservation status changed for some political constituencies. For elections prior to 2008, I use Jensenius' "Indian State Assembly Election data 1961 to 2007" from Jensenius (2013) that matches constituencies to districts. In cases where constituencies lay across more than one district, it was included in the district that had the most geographic overlap. For elections after 2008, the matching was done by the author according to the Delimitation Order in 2003.

who won in a race against a male candidate (left panel) and female politicians who won in a close election against a male candidate (right panel). This is part of a trend that shows increasing female representatives in state assemblies in India.[13] During the past decade, approximately 6.7 percent of state legislators nationwide were female, but this female representation varied widely by state. For instance, West Bengal had about 13 percent women in their state assembly, whereas Tripura had less than 2 percent, and there were five state assemblies out of India's twenty-nine states without any female presence at all.

Figure 2.4: Proportion of Female Politician Winners



Notes: Proportions are district averages in 15 major states in India. Close elections are defined as those with a vote margin of 3.5% among the top two candidates. Data: Election Commission of India

Other control variables include socioeconomic and demographic factors. All population figures, including the fraction of the population in a district living in rural areas and the fraction of

[13]Since India's independence in 1947, women have had the right to run for political office. Through the passage of the 73rd and 74th constitutional amendments in 1994, India established gender quotas for local governments in villages, which is the lowest level of government in their decentralized system, that reserved one third of seats for village council leader positions for women. There have been attempts to pass a similar bill for state and national level governments, but gender quotas at higher levels of government have not yet been established.

Table 2.2: Descriptive Statistics

unit of observation:district; scope: 15 major states, 2006-2011; n=295				
	mean	sd.	min.	max.
	A. Sanitation variables (2011)			
Proportion of rural households with upgraded latrines (2011)	0.26	0.204	0.03	0.93
Proportion of rural households with latrines (2011)	0.31	0.239	0.04	0.97
	B. Electoral variables (2006-2010)			
Average proportion of female politicians	0.11	0.104	0	0.50
Average proportion of female winners from close races between one male and one female candidates	0.18	0.343	0	1.00
Average of winner's vote margin	0.11	0.078	0.0004	0.46
Average proportion of politicians from ruling party	0.11	0.123	0	0.67
	C. District Characteristics			
Rural population (%, 2011)	0.74	0.176	0.16	0.97
Female literacy rate (2011)	0.63	0.119	0.34	0.96
SC/ST population (%, 2011)	0.26	0.149	0	0.94
Poverty rate (2005)	0.26	0.187	0	0.87
Population growth rate (2001-2011)	0.18	0.074	-0.019	0.467
Open defecation rate (2001)	0.78	0.192	0.10	0.98

scheduled caste and scheduled tribe population, as well as female literacy are from the 2011 Indian Census. The population growth rate measures change in a district's population from the 2001 to 2011 Census. District-level poverty estimates are from Chaudhuri and Gupta (2009), which are based on calculations using the 2004-2005 National Sample Survey Consumer Expenditure Survey data. The open defecation rates, which are based on the population without access to any type of toilet including community ones, are from the previous decade in Census 2001. Descriptive statistics of all variables are in Table 2.2.

2.5 Empirical Methods

2.5.1 Baseline Analysis

The impact of female representation on latrine provision is estimated first by using the following linear model:

$$latrine_d = b_0 + b_1 * fwin_d + b_2 * X_d + u_s + e \tag{2.1}$$

where $latrine_d$ is the number of latrines per household constructed in district d. The main variable of interest is $fwin_d$, which is the proportion of seats in a district held by women. X_d is a set of control variables such as rural population, female literacy rate and others that are discussed in more detail below. The terms u_s are state fixed effects, and e is the error term. However, there may be endogeneity issues to these estimates due to omitted variables that are not observable but affect $fwin_d$ such as the quality of potential female candidates.

The challenge of empirically testing the impact of female politicians on policy making is that districts where female politicians have won may be systematically different from districts in which they have not won. Therefore, latrine construction in these areas may be caused by factors other than being governed by a female politician. If so, this would mean that regressing the fraction of women representatives on latrine provision in a linear model as shown in equation 2.1 could produce biased estimates. In order to correct for this bias, I use the fraction of female politicians who won in closely contested elections against male candidates to instrument for the fraction of female representatives in each district as my identification strategy.

The underlying idea of using this instrumental variable is that in constituencies where women win in a very close race against a male candidate, the gender of the winner is effectively random in a sense that both the male or female candidates in the top two spots have an essentially equal chance of winning. The outcome of the election is therefore determined not by the gender of the candidates, but instead by random chance, where conditions such as the weather on election day may play a role. This means that other socioeconomic factors such as the attitude of voters towards women should be similar between districts where men won and districts where women won, so that the only factor that is different is the politician's gender.

The intuition behind this instrument is derived from a regression discontinuity analysis by Lee (2008), who analyzes the incumbency advantage in the U.S. case comparing Democrats who "just barely won an election" to those who just barely lost. Because close elections are "as good as randomized variation in treatment," the difference between thes e districts in the prior election is identified as showing the effect of incumbency advantage in the next election. Because constituency level sanitation measures are not available for India, I aggregate to the district level so that it is closer to a fuzzy regression discontinuity design. Recent studies on the impact of identity

politics have emulated this estimation strategy to study its effect on various health or education outcomes. However, in contrast to this study, Rehavi (2007) does not consider vote margins in the analysis; Bhalotra and Iyer (2013) studies the impact of candidates' religion using this estimation strategy; Brollo and Troiano (2014) use a sharp regression discontinuity instead of a fuzzy one, which is what this study is based on due to measures being aggregated from constituency to district levels; and Bhalotra and Clots-Figueras (2014) and Clots-Figueras (2012, 2011) study the impact of female politicians in India on aggregate health and development outcomes during periods prior to this study. Following Clots-Figueras's (2012) work on India, I define close elections with the top two candidates being one man and one woman and with a vote margin of 3.5 percent or less. This is a reasonable threshold to define highly competitive elections that allows a large enough sample size for analysis.

With the instrumental variable, the following two-stage least squares regression analysis, where the first stage is the bottom equation and the second stage is the top equation, is used:

$$latrine_d = \beta_{10} + \beta_{11} * fwin_d + \beta_{12} * X_d + u_s + \varepsilon_s \tag{2.2}$$

$$fwin_d = \beta_{20} + \beta_{21} * fwinclose_d + \beta_{22} * X_d + u_s + \varepsilon_s \tag{2.3}$$

where the dependent variable is $latrine_d$ for district d in 2011. The dependent variable measures the proportion of rural households in district d with latrines depending on type. Depending on the model it can measure upgraded forms of latrines which safely remove human waste from contact or all latrines regardless of whether it is upgraded or not.

The main coefficient of interest is the estimated parameter β_{11}. It captures the effect of the proportion of female politicians on the availability of latrines. $fwin_d$ is the proportion of constituencies won by female politicians of the total number of constituencies in district d. In the first stage (bottom equation), $fwin_d$ is instrumented by $fwinclose_d$, which is the proportion of constituencies with female politicians who won in a close election against a male politician out of the total number of constituencies that held a close election between a male and female can-

didate (regardless of the gender of the winner) in district d averaged across all years since 2006. The denominator accounts for the fact that not all districts have close elections between male and female.

X_d is a vector of control variables that include socioeconomic and demographic characteristics. Female literacy rate is included because literate females are more likely to be aware of the negative health effects of not having latrines and thus be more inclined to construct them. The proportion of SC and ST population in a district are included because they often include the disadvantaged members of the population, so these areas are less likely to have upgraded latrines. District-level poverty rates are included, and the expectation is to see districts with greater poverty having slower progress in improving access to upgraded latrines. I include population growth in the past decade because those areas that experience rapid paces of population growth are more likely to have greater demand for more sanitation facilities than those that do not have population changes. The proportion of rural population in a district is included in consideration of the size of the target population of sanitation efforts, which are mainly focused on the rural population. I also include the open defecation rate in 2001 to control for the level of social acceptance of this practice. Because social norms take a long time to change, districts where open defecation was more prevalent in the past are likely to have communities where this practice is considered less shameful and harder to correct, so the need to construct upgraded latrines would be low. All models include state dummies γ_s to account for unobserved state-specific effects.

2.5.2 Exploring Electoral Competition

The main purpose of the baseline analysis above was to establish a causal effect of the presence of female politicians on access to latrines. This next part of the analysis allows for differential impacts of female politicians on upgraded and non-upgraded latrines depending on electoral incentives. Hypotheses 1 & 2 posit that while greater electoral competition will lead to wider latrine coverage, the presence of female politicians may lead to more upgraded latrines despite these electoral concerns. Using the same instrumental variable approach as above, the second stage equation

is as follows:[14]

$$latrine_d = \beta_{10} + \beta_{11} * fwin_d + \beta_{12} * M_d + \beta_{13} * X_d + u_s + \varepsilon_s \tag{2.4}$$

where $latrine_d$, the proportion of latrines in district d, is the same variable as in the baseline equation 2.2 above. There are two estimated parameters of β_{12}, one for the level of electoral competition (vote margin) and one for ruling party membership. The degree of electoral competitiveness is measured by the difference between the vote share of the winner minus the vote share of the runner-up in a district. We should expect areas with smaller margins of victory and hence greater electoral competition, to have more latrine coverage regardless of the type of latrine. However, the same effect of electoral competition is not expected to be found for upgraded latrines due to that fact that the quality of latrines is harder for voters to realize, and knowing this politicians will not necessarily focus on improving this.

I also include the proportion of seats in a district that are won by candidates in the same party as the Chief Minister's party of the state. This is because the ruling party has an incentive to display their competency for re-election, and thus make it easier for ruling party members to divert funds to their constituencies. Being a member of the party in government is also believed to have an advantage, because ruling party members are likely to have access to greater resources that can widen latrine coverage and be able to reap the benefits of being in government.

One possible concern of equation 2.4 is that the variables *fwin* and *vote margin* are correlated because they are both derived from vote shares. Therefore, I also measure the reduced-form equation where the outcome is regressed on the instrumental variable:

$$latrine_d = \beta_{10} + \beta_{11} * fwinclose_d + \beta_{12} * M_d + \beta_{13} * X_d + u_s + \varepsilon_s \tag{2.5}$$

As Angrist and Krueger (2001) note, the reduced-form equation is useful in deriving unbiased estimates that may be used to derive a reasonable guess of the magnitude of the causal relationship

[14]The first stage equation remains the same as the first stage equation in the baseline model 2.2, except that any controls added to the second stage model here is also added in the first stage.

Table 2.3: Baseline Results: Effect of Female State Legislators on Access to Sanitation by Latrine Type

DV: Latrines per rural household, 2011	Upgraded Latrines		All Latrines	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Fraction of female legislators	0.02	0.39**	−0.01	0.30*
	(0.034)	(0.194)	(0.034)	(0.179)
Rural population (%)	−0.01	0.00	0.06	0.07
	(0.091)	(0.088)	(0.075)	(0.075)
Female literacy (%)	0.43**	0.44***	0.37**	0.38***
	(0.173)	(0.161)	(0.144)	(0.139)
SC/ST population (%)	−0.06	−0.06	−0.08	−0.09
	(0.058)	(0.054)	(0.052)	(0.049)
Poverty (%)	−0.10 **	−0.10 **	−0.09 **	−0.09 **
	(0.046)	(0.049)	(0.043)	(0.044)
Population growth (%, 2001-2011)	0.12	0.16	0.17	0.21
	(0.197)	(0.181)	(0.188)	(0.173)
Open defecation rate (%, 2001)	−0.58 ***	−0.62 ***	−1.00 ***	−1.04 ***
	(0.121)	(0.094)	(0.061)	(0.059)
intercept	0.60**	0.51***	0.77***	0.87***
	(0.201)	(0.150)	(0.168)	(0.125)
	First Stage IV			
Fraction of female legislators who won		0.08***		0.08***
in close election against a man		(0.013)		(0.013)
N	295	295	295	295

Notes: OLS estimates from equation 1. IV estimates from equations 2-3. District level observations in 15 states. State fixed effects included in all models. Robust standard errors clustered at the state level in parentheses.
* p¡0.10; ** p¡0.05; *** p¡0.01

between the outcome variable of interest.

2.6 Effects of Female Politicians on Latrine Provision

2.6.1 Baseline Results

The first hypothesis posits that the presence of female politicians will have a positive impact on sanitation through increased latrine coverage of all types. Table 2.3 shows the results that test the influence of female politicians on latrine availability using both the linear model and instrumental variable approach. The main dependent variable is the fraction of households with upgraded

latrines in rural areas. For comparison, the results on the fraction of households with any type of latrine (columns 3-4) are also displayed. The OLS estimates in column 1 and 3 do not show statistically significant results on the relationship between female state legislators and having access to household latrines. The estimates using the instrumental variable approach in column 2 and 4 correct for possible bias in the OLS estimates and show robust results.

After using the fraction of female winners in very close races against males to proxy for the influence of female politicians in the state legislature, the results show that the presence of female state legislators has a larger impact on increasing upgraded latrines in households than increasing any type of latrine. An increase in female state legislators by 1 percentage point results in a 0.0039 unit increase in upgraded latrines per rural household, which is 1.5 % of the average. For all types of latrines, a 1 percentage point increase in female state legislators causes a 0.003 unit increase in latrines, which is 0.96% of the average, at the 90 percent confidence level. While there is a positive impact of female legislators for both upgraded and all types of latrines, the coefficient for upgraded latrines is both higher in magnitude and stronger in statistical significance than the coefficient for all latrines.

Most of the socioeconomic factors show a similar trend between female politicians' impact on upgraded latrines and all latrines. The most robust effect is the difficulty in overcoming the social norm of practicing open defecation. Districts that had higher proportions of people without latrines and instead practicing open defecation have a negative effect on having latrines a decade later, even after controlling for population growth rates during that time. On the other hand, districts with higher female literacy rates are more likely to have higher proportions of latrines, in terms both of latrine coverage in general and of upgraded ones. In addition, there is negative relationship between latrine ownership and poverty or the size of SC/ST population. This shows that there is less progress in improving sanitation in districts with poorer, more disadvantaged households.

2.6.2 Results on Electoral Incentives

The baseline results show that the presence of female politicians has a greater impact on increased access to upgraded latrines but, as Hypotheses 1 and 2 suggest, the impact might be obscured

when considering electoral incentives that politicians face. Table 2.4 reports the results that test the influence of female politicians in consideration of electoral competitiveness. Columns 1 and 2 are results of the reduced form estimation as shown in equation 2.5 and columns 3 and 4 are the results from using the instrumental variable approach, which corrects for potential bias. Each estimation process has two columns the first one for upgraded latrines and the second for all types of latrines.

The results from columns 1 and 3 show that female legislators have a positive impact on increasing access to upgraded latrines, even after controlling for electoral factors such as electoral competitiveness (winner's vote margin variable) and ruling party membership (results not shown in table). This suggests that the gender of the politician plays a role in ensuring better sanitation through higher quality latrines. This could be reflective of the stronger preferences female legislators have for better sanitation and their greater sensitivity to the issue.

The effect of female legislators on overall latrine coverage, in columns 2 and 4, shows a different picture. Female legislators act similarly to male legislators and do not have a statistically significant effect on overall latrine coverage. Instead, the result, although with lower statistical significance, is driven by the degree of electoral competitiveness. Districts with politicians elected from more competitive elections on average (measured by the winner having lower margins of victory), are more likely to have increasing overall latrine coverage. These results together support the visibility effect mechanism by suggesting that politicians increase latrine coverage, regardless of the type of latrine, when faced with increased electoral competition, because it is an easier way to show voters about how they are performing in office in order to gain positive recognition.

In sum, the results suggest that female politicians have a positive influence on the provision of higher quality latrines, even after considering electoral factors that politicians face. On the other hand, general latrine coverage, regardless of the quality of the latrine, is more likely to be improved in districts where the electoral competition is higher.

Table 2.4: Effect of Electoral Incentives and Female State Legislators on Latrines

	Reduced form		IV	
Estimation:	OLS		2SLS	
Dependent variable:	% of latrines		% of latrines	
latrine type:	upg	all	upg	all
	(1)	(2)	(3)	(4)
Fraction of female legislators			0.31*	0.19
			(0.166)	(0.153)
Fraction of female legislators who won in close election against a man	0.03*	0.02		
	(0.015)	(0.015)		
Winner's vote margin	−0.03	−0.08	−0.08	−0.11 *
	(0.068)	(0.071)	(0.060)	(0.060)
N	295	295	295	295
Full covariates	Y	Y	Y	Y

Notes: Upg=upgraded latrines. Estimates from models 2.4 and 2.5. District level observations in 15 states. Full covariates are indicators of ruling party members, rural population, female literacy, SC/ST population poverty rates, population growth and open defecation rates of 2001.
Robust standard errors clustered at the state level in parentheses.* p<0.10; ** p<0.05; *** p<0.01

2.7 Robustness and Validity

2.7.1 Testing the Effectively Random Assumption

In this section, I conduct tests on the validity of the instrument. The main concern with the quasi-random assumption used in my identification strategy is that districts with large portions of very close elections may have systematically different characteristics from other districts. In order to check the external validity of the effectively random assumption, I compare electoral and socioeconomic characteristics of different types of districts. All districts in the 15 major states with at least one election where there was a male and a female candidate in the top two positions were included in the sample. The unit of analysis is electoral year and district, including any elections held between 1999 to 2010. This ensures that the electoral conditions during the election year of the representative from the timeframe of this study, which is from 2006 to 2011, are reflected. For socioeconomic characteristics, both the Census of 2001 and 2011 were used by matching them to the closest electoral year.

I compare the characteristics of districts by gender of the winner from close elections. I compare characteristics where there was at least one female winner from a very close elections to all other districts which had the two top candidates that were one male and one female, including those that didn't have close elections (where the winner could be male or female). And finally, I examine the characteristics of districts with male winners from very close elections to all other districts in the sample as well. The results in Table 2.5 show that characteristics related to the electorate and other socioeconomic factors are not significantly different between the two groups being tested.

Table 2.5: Balance test: Characteristics of Districts with Close Elections by Gender of Winner

unit: electoral year and district, 2003-2010		Districts with female winners from close elections	Districts without female winners from close elections	P-value of difference	Districts with male winners from close elections	Districts without male winners from close elections	P-value of difference
Fraction of female candidates	mean	0.182	0.190	0.3846	0.183	0.189	0.4927
	obs.	125	573		102	596	
Male turnout	mean	0.734	0.719	0.7572	0.705	0.724	0.7140
	obs.	125	573		102	596	
Female turnout	mean	0.646	0.651	0.8931	0.639	0.652	
	obs.	125	573		102	596	
Fraction of ruling party members	mean	0.102	0.110	0.5212	0.094	0.111	0.2038
	obs.	125	571		102	594	
Male literacy	mean	0.776	0.771	0.6226	0.777	0.771	0.6135
	obs.	118	529		93	554	
Female literacy	mean	0.572	0.566	0.6773	0.574	0.566	0.5974
	obs.	118	529		93	554	
Rural population	mean	0.735	0.762	0.1025	0.765	0.756	0.6210
	obs.	118	529		93	554	
SC/ST population	mean	0.241	0.264	0.1251	0.247	0.262	0.3821
	obs.	114	525		91	548	
Initial level of latrines per hh (2001)	mean	0.223	0.223	0.9831	0.225	0.223	0.9242
	obs.	118	529		93	554	

Samples are from districts in the 15 major states with at least one election with the top two candidates being one male and one female candidate. Close elections are those where the winner's margin of victory is 3.5% or less. P-value is the statistical significance of the difference between means.
Data sources: Election Commission of India, various years. India Census 2011, 2001.

2.7.2 Model Specifications

In this section, I test the robustness of the original models through different specifications of the instrumental variable, with additional controls, and through checking for outliers. First, I test the robustness of the results using an alternate specification of the instrumental variable that uses a different denominator to calculate it. Clots-Figueras (2011) specifies the instrument by using female winners from close elections between men and women out of the total number of constituencies in the district, instead of out of the total number of constituencies with close elections in the district as used in this paper. With this measure, the information captured by the instrumental variable is different in a sense that the mean of the instrumental variable is reduced since the denominator (i.e. total number of seats in a district) is larger, and has the advantage of allowing more straightforward handling of zeros (since the denominator can never be zero).

The results using the alternative instrumental variable specification are in Table 2.6 and 2.7. The alternative measure of the instrumental variable remains highly significant in the first stage of the regression. The result for the impact female legislators have on upgraded latrines is still positive and robust although with lower magnitude and statistical significance (significant at the 90 percent level). The covariates in the results remain in the same direction and significance level as the results from the original model. In Table 2.6, the coefficient for the fraction of female legislators is now significant at the 90 percent confidence level, still showing the causal impact of female legislators on providing upgrade latrines. In addition, the direction of the coefficient remains the same and estimates for the covariates also remain robust.

When considering electoral variables, the results for analysis on all latrines in Table 2.7 show that the magnitude of the coefficient on winner's vote margin is similar to the original results but the statistical signifiance is reduced to the 90 percent confidence level. The coefficients for upgraded latrines lose their statistical significance. Although with lower statistical significance, the results are consistent with the implication that politicians, both men and women, increase the quantity of latrines when faced with competitive elections. It is also reassuring to see that the OLS results for all latrines show similar statistical associates as the instrumental variable approach. Although not shown in the table, the other covariates also remain robust.

Table 2.6: Robustness of Baseline Results Using Alternative IV Specification

DV: Latrines per rural household, 2011	Upgraded Latrines		All Latrines	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Fraction of female legislators	0.02	0.21*	−0.01	0.12
	(0.034)	(0.194)	(0.121)	(0.107)
Rural population (%)	−0.01	0.00	0.06	0.06
	(0.091)	(0.088)	(0.075)	(0.072)
Female literacy (%)	0.43**	0.44***	0.37**	0.37***
	(0.173)	(0.160)	(0.144)	(0.135)
SC/ST population (%)	−0.06	−0.06	−0.08	−0.08 *
	(0.058)	(0.053)	(0.052)	(0.048)
Poverty (%)	−0.10 **	−0.10 **	−0.09 **	−0.09 **
	(0.046)	(0.046)	(0.043)	(0.042)
Population growth (%, 2001-2011)	0.12	0.14	0.17	0.19
	(0.197)	(0.178)	(0.188)	(0.171)
Open defecation rate (%, 2001)	−0.58 ***	−0.60 ***	−1.00 ***	−1.02 ***
	(0.121)	(0.101)	(0.061)	(0.055)
intercept	0.60**	0.52***	0.77***	0.88***
	(0.201)	(0.149)	(0.168)	(0.120)
	First Stage IV			
Fraction of female legislators who won		0.57***		0.57***
in close election against a man		(0.078)		(0.078)
N	295	295	295	295

Notes: OLS estimates from equation 2.1. IV estimates from equations 2.2 and 2.3. District level observations in 15 states. State fixed effects included in all models. Robust standard errors clustered at the state level in parentheses.
* p<0.10; ** p<0.05; *** p<0.01

Table 2.7: Robustness of Results on Electoral Incentives Using Alternative IV Specification

DV: Latrines per rural household, 2011				
	Upgraded Latrines		All Latrines	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Fraction of female legislators	0.02	0.15	−0.02	0.04
	(0.033)	(0.097)	(0.034)	(0.084)
Fraction of female legislators who		0.69***		0.69***
won in close election against a man		(0.110)		(0.110)
Winner's vote margin	−0.08	−0.08	−0.11 *	−0.11 *
	(0.068)	(0.071)	(0.060)	(0.060)
Ruling party members (%)	0.04	0.02	0.06*	0.05
	(0.035)	(0.046)	(0.027)	(0.035)
N	295	295	295	295
Full covariates	Y	Y	Y	Y

Notes: IV estimates from equations 2.4. District level observations in 15 states. State fixed effects included in all models. Robust standard errors clustered at the state level in parentheses. * p<0.10; ** p<0.05; *** p<0.01

The second robustness test I perform is with an additional control variable. Diarrhea caused by a lack of sanitation most negatively impacts the health of young children, and often leads to death. I run the model with the fraction of the population of children aged 0 to 6 to account for the fact that households with young children may have a greater desire for latrines. The covariate measuring the proportion of young children population is not significant for when the dependent variable is upgraded latrines or all latrines. Otherwise, the model remains robust to this specification. The results are in Table A1 of the appendix.

Lastly, as shown in Figure 2.1, Assam is the only state where there are significantly lower portions of households with upgraded latrines compared to all latrines. To ensure that the results are not being driven by an outlier, I run the analysis without including Assam. The results remain robust and comparable to the original results. The results significance of the fraction of female winners coefficient is reduced, but remain robust and comparable to the original results. The results are in the same table as above.

2.8 Discussion

The results show that female state legislators in India have a positive influence on the provision of upgraded latrines but not necessarily on broadening latrine coverage. Their impact on increasing upgraded latrines remains robust in the face of electoral incentives that politicians face, including electoral competitiveness and ruling party affiliation. Together with the finding that the gender of legislators does not have an impact on increasing latrine coverage, these results extend existing research that shows that politicians facing competitive elections are more likely to increase public goods that are more easily noticed by the voter in order to signal their good performance. Increased latrine coverage, whether it is in private households or in public settings such as community clinics or schools, is acknowledged by voters and the community as a whole. On the other hand, the type of latrine provided is not easily noticed, especially when information and knowledge on sanitation is scarce. The fact that ruling party affiliation does not influence access to latrines supports the finding that it is the gender of the politician and not the party affiliation that is driving the results.

The findings suggest that the presence of female legislators may positively influence the level

of upgraded latrines because they are more receptive to the demands of their female constituents. Existing studies have shown that female legislators are more likely to spend on issues that are most relevant to children, which are also the issues that the female electorate are more tuned into. Positive health outcomes from increasing access to latrines are only realized with upgraded latrines that hygienically remove waste from human contact. Perhaps realizing these benefits, the findings here suggest that female politicians are more likely to commit to upgraded latrines that can deliver these positive health outcomes for children. The second explanation potentially suggests that female legislators are catering to the more educated women of the society since constructing upgraded latrines requires understanding their benefits. Almost all sanitation programs around the world involve communicating with and educating the public about proper hygiene and the benefits of having sanitation facilities. In India's case this is primarily a responsibility at the state level. Therefore, the results could imply sustained engagement by female politicians on supporting investments in upgraded latrines.

2.9 Conclusion

This paper examines the impact of female politicians on the provision of sanitation services in rural India with consideration of electoral incentives that all politicians face. The results show that female state legislators improve sanitation through increasing upgraded latrines for households, which safely remove waste from human contact such as flush toilets. These results are robust to political factors such as electoral competitiveness and ruling party membership. However, there is no evidence that politicians' gender influences wider latrine coverage. Instead, the results show that politicians, regardless of gender, are influenced by the degree of competition in elections they face. An explanation for this is that politicians will increase more visible public goods when faced with competitive elections, in order to signal their good performance to their voters. Latrine coverage is easy to observe for voters, whereas the quality of the latrine provided is not. Other factors that influence the availability of higher quality latrines include female literacy and open defecation rates which points to the difficulty in overcoming social norms and behavior in a short time period.

This study highlights the importance of the political environment and socioeconomic context in understanding the slow progress on improving sanitation. It also points out the need to integrate gender politics in studies that examine the allocation of public services, especially those that affect women the most. For future research, it would be useful to study the obstacles in providing other infrastructure related to improving sanitation such as sewerage systems, access to clean water, and waste disposal. This would be a more holistic approach to understanding the political economy of basic services that influence human capital development in less developed countries.

CHAPTER 3

Exploring Mechanisms in the Broader Political Context

Chapter 2 showed that the presence of female politicians, all else equal, is more likely to increase higher quality latrines, even after controlling for the degree of electoral competition. However, when faced with higher electoral competition, women state legislators act the same as their male counterparts through more publicly noticeable actions, which is supported by my empirical evidence of wider latrine coverage. An important question here is: in what ways or under what conditions can women's presence in legislators be more successful in improving sanitation? This chapter explores three possible mechanisms from features of the wider political context. First, I explore whether efforts by female politicians are more pronounced in a nationwide government program on sanitation. Second, I test whether having a longer history of female state legislators has a cumulative influence on improving sanitation. Third, I examine the relationship between state and sub-state level (local level) government in terms of the influence of female politicians at both levels of government on sanitation provision.

The three mechanisms may be separate questions large enough for complete research projects on each issue, but they are still meaningful to address as extensions of the previous chapter. By examining mechanisms in the context of the larger political environment, we have a better understanding of what conditions underlie the activities of female legislators in order for them to have more impact. In contrast, it also helps the understanding of when female leadership does not necessarily make a difference, which is an aspect less focused on in the gender and politics literature. The next three sections explore each mechanism in turn with empirical analyses and then the chapter concludes with a discussion of the results.

3.1 Engaging through a Government Program

India's central government has launched a series of nationwide sanitation programs since 1986 to eradicate the practice of open defecation. The main nationwide sanitation program from 1999 to 2012 (which includes the time frame of the analysis in Chapter 2) was the Total Sanitation Campaign (TSC), where states played an important role. State funds were used to provide partial financial assistance for latrine construction in households below the poverty line, schools, and anganwadi centers, as well as to build community restrooms. Female legislators can take advantage of this program and advance their preferred policies by educating the public about the availability of this program and the advantages of having household latrines. The main question raised in this section is: Do we see greater efforts in improving sanitation through this program in areas with more female legislators?

There are several different roles that the state plays under the TSC including budgeting, overall planning and management, education on hygiene, and providing technical expertise on latrine construction. The proportion of funds that the state government provides depends on the beneficiary. For poor rural households below the state's poverty line, the central government provides roughly 60 percent of the total costs to build latrines, the state government provides 30 percent, and the rest is fulfilled by the beneficiary. For public institutions such as schools, the central and state governments divide the costs in the ratio of 70:30. For all of these funds, there is a maximum limit for which the central government provides, whereas state governments have the flexibility to provide more as needed. For instance, state governments may provide from their own budget to cover the cost that an individual household needs to pay.

Sanitation project proposals are drafted at the district-level and submitted to the state government for review and then passed on to the central government for final approval. These proposals stipulate target sanitation coverage rates, the state's allocated budget and estimated fund release dates, schedules for education and communication activities, and specific development plans for villages. State governments are required to collect project proposals from all districts and are the primary reviewers of these project proposals.

The implementation of the program was done through the district office with the support of

local governments in villages. Under the TSC, villages create sanitary marts with the support of state funds in order to provide affordable latrine hardware options for community members and to have a single point from which citizens can purchase materials and inquire about latrines. These sanitary marts provide a "menu" of different latrine options available and allow citizens to purchase the parts needed to construct household latrines. They also offer technical assistance by state-trained mechanics in constructing and using latrines. Through these measures, households are encouraged and advised to build latrines that help sustain a sanitary environment.

Finally, most importantly, states are primarily responsible for educating their citizens on the benefits of having latrines at home, and promoting a sanitary living environment. Most states resort to mass media channels to publicly advertise these advantages and to raise awareness of the program.

These different state responsibilities suggests various channels through which female state legislators who have higher preferences for sanitation make greater efforts to provide household latrines. Because the aim of the program is to eradicate the practice of open defecation by accelerating sanitation coverage in rural areas, we should expect to see that the efforts of state legislators be a key component in increasing latrine coverage. Considering that politicians use increasing sanitation coverage as a way to signal their performance to voters, we should expect to see:

Hypothesis 1. *All else equal, districts with higher electoral competition are more likely to have an increase in latrines constructed through the Total Sanitation Campaign than districts with lower electoral competition.*

3.1.1 Analysis

I use data from TSC to see if the findings on the effect of female politicians on increasing latrine coverage in rural areas through this program. Here, latrine coverage is measured by the number of latrines provided under the TSC per rural household in a district. It is calculated by taking the number of latrines constructed in households, schools, and village health clinics divided by the number of rural households in a district.

There are advantages and disadvantages of using this dataset, compared to the Census data used

in the analysis in Chapter 2. Unfortunately, the TSC data does not classify the latrines constructed under the program by the quality of the latrine, so we can only measure latrine coverage from it. The advantage of using this dataset, however, is that it measures sanitation coverage by the *annual* addition of new latrines in communities including latrines not only in households but also in public institutions.

The unit of analysis is district-year, from 2003 to 2012. Year 2003 is when the TSC program started to be implemented for many states. For estimating the effect of female legislators, the same strategy is used as in Chapter 2, which uses an instrumental variable. The fraction of female winners from close elections (defined as winning from a 3.5% vote margin or less) is used to instrument for the fraction of female legislators in a district. The dependent variable is measured by the number of latrines constructed in households, public schools, and village clinics per rural household under the TSC:

$$TSClatrine_{dt} = \beta_{10} + \beta_{11} * fwin_{d,t-1} + \beta_{12} * M_{dt-1} + \beta_{13} * X_{dt} + u_s + \varepsilon_s \tag{3.1}$$

where d denotes district and t is year. The main parameters of interest are β_{11}, which measures the fraction of female legislators, and β_{12}, which measures the winner's vote margin. The political variables $fwin_{d,t-1}$ and those in vector M have been lagged by one year so that in an election year, the effects of the presence of a female politician from the previous term is measured, instead of the newly elected candidate. This accounts for the time that it may take for members of the new government to implement policies, and for the fact that states hold elections during different months of the year. We should see politicians who faced greater electoral competition increase the addition of new latrines in both public and private spaces under the TSC.

Because the TSC program is targeted to poorer rural households, districts with a larger rural population should have greater latrine provision. A baseline measure of the extent of latrine coverage prior to the start of the program is added. The initial level of latrines in 2001 at the start of the TSC program is included because we should expect to see more latrines constructed in districts where they have very few at the start of the program. Other control variables included in the model are female literacy rates, fraction of rural population, fraction of SC/ST population, a

dummy variable for election years and the fraction of ruling party members. Descriptive statistics of all variables are available in Table A2 in the appendix.

Table 3.1: Effect of Female State Legislators on Latrine Provision under TSC

DV: TSC Latrine Provision per rural household from 2003-2012		
	OLS	IV
	(1)	(2)
Fraction of female legislators	0.33	0.42
	(0.338)	(1.150)
Fraction of ruling party members	−0.09	−0.11
	(0.321)	(0.425)
Winner's vote margin	−1.05 **	−1.05 **
	(0.426)	(0.413)
Female literacy rate (%)	3.63***	3.64***
	(0.844)	(0.821)
Rural population (%)	0.69**	0.69**
	(0.272)	(0.272)
Initial level of latrines per rural household	−0.13	−0.13
(log, 2001)	(0.117)	(0.110)
Fraction of SC/ST population	0.59**	0.59**
	(0.016)	(0.017)
Election year dummy	0.21	0.21
	(0.200)	(0.190)
intercept	−7.62	−6.37
	(0.745)	(0.617)
First Stage IV		
Fraction of female legislators who won		0.09***
in close election against a man		(0.014)
N	1952	1952
Adj. R^2	0.15	0.15

Notes: Estimates from model 3.1. State fixed effects included in all models. Unit of analysis is district and year. * p<0.10; ** p<0.05; *** p<0.01 Robust standard errors clustered at the state level in parentheses.

Table 3.1 shows the results for the effect of female state legislators on the provision of latrines under the TSC, using both the linear regression model (column 1) and the instrumental variable approach (column 1). Similarly to the results from Table 2.4 on all latrines, the results here show that the gender of the state politician is not a significant causal determinant of constructing latrines under the government program. Instead, latrine provision under the TSC is driven by the degree of electoral competitiveness. In addition, we see other socioeconomic variables having an influence. Higher female literacy rates have a statistically significant and positive impact on latrine coverage in both models. As devised by the program, areas with larger rural population and larger portions of SC/ST population are more likely to construct latrines under this program. In sum, the results from Table 3.1 suggest that the government's program on latrine construction seems to be influenced by electoral incentives rather than the presence of female politicians.

3.2 Considering Prior Female Politicians' Influences

The second possible explanation for conditions that increase the success of improving sanitation for female state legislators is the duration and size of female presence in the previous legislature. In the previous chapter, the variation in latrine provision was explained by the influence of female politicians in the past five years. However, longer histories of the government having elected women in office, and the larger the number of elected women, are likely make a difference in how active female politicians are in pursuing their policies. It may be easier for female legislators to implement their preferred policies in areas where there were previously a female leader, who have already faced and lowered psychological or cultural barriers that hinder women from pursuing policies in office. Having a noticeable continuation of women in power may be necessary for enabling women legislators to successfully implement their preferred policies. Hence,

Hypothesis 2. *All else equal, districts with more female politicians in the previous government are more likely to have a larger share households with access to latrines.*

Table 3.2: Effect of History of Female MLAs on Access to Sanitation by Latrine Type

DV: Latrines per rural household, 2011		
Upgraded Latrines	AllLatr ines	
Estimation:	IV	IV
	(1)	(2)
Avg. fraction of female legislators	0.28**	0.21*
in past two govt.	(0.136)	(0.129)
Rural population (%)	0.02	0.08
	(0.090)	(0.078)
Female literacy (%)	0.47***	0.38**
	(0.178)	(0.154)
SC/ST population (%)	−0.07	−0.10 **
	(0.047)	(0.043)
Poverty (%)	−0.09 *	−0.09 *
	(0.051)	(0.047)
Population growth (%, 2001-2011)	0.16	0.22
	(0.188)	(0.178)
Open defecation rate (%, 2001)	−0.65 ***	−1.04 ***
	(0.117)	(0.073)
	First Stage IV	
Fraction of female legislators who won	0.08***	0.08***
in close election against a man	(0.015)	(0.015)
N	265	265

Notes: District-level observations in 15 states. State fixed effects included in all models. Robust standard errors clustered at the state level in parentheses.
* p<0.10; ** p<0.05; *** p<0.01

3.2.1 Analysis

The same model from the baseline analysis using the instrumental variable in the previous chapter is used (model 2.2). The only difference is how the main independent variable of interest, the fraction of female politicians, is measured: instead of relying on the number of years as in the previous chapter, I use the average percent of female politicians in the past two governments to 2011 for each state.

The results in Table 3.2 show that a history of female legislators has a positive influence on latrine provision and the results are significant at the 95 percent level for upgraded latrines and at

the 90 percent level for all types of latrines. The coefficient estimating the impact on the average fraction of female legislators in the past two governments is 0.28 which is attenuated compared to the results in Chapter 2 that measured the influence of female legislators in the past five years. This is reasonable since this analysis spans a longer number of years.

3.3 The Support of Local Female Politicians

The last mechanism explored is whether having more female politicians in local governments increase the success of state female legislators in improving sanitation. There are two arguments in the literature that help explain how female politicians at two different levels of government may increase access to basic services. First, decentralization is expected to increase the overall level of public goods because local politicians are responsible for a smaller group of constituents about whom they have more information. Local representatives are likely to have closer ties to their citizens and be more accessible to them. Therefore, local politicians are more likely to hear of peoples' concerns to issues related to latrine construction and offer more individualized responses.

Second, having female leaders at the local level increases the overall share of female politicians. Thomas and Welch (2001) find that female politicians are more successful in passing legislation with the support of women's caucus. This suggests that it is easier to implement gendered policies when the group supporting a common policy is larger, because it makes it more likely to have a greater impact. State legislators supported by female leaders at the local level produces a synergistic effect. Perhaps, female leaders feel more comfortable discussing their priorities knowing that there is a larger support group.

Under the 73rd and 74th Constitutional Amendments in India, state governments could decentralize responsibilities of providing public goods to local governments, called Panchayati Raj. In reality, the degree to which decentralization has occurred varies by states and by the type of public good. In India, local governments reserve 33 percent of its seats, which are assigned randomly, for female representatives. Chattopadhyay and Duflo (2004) exploit this random assignment to measure the impact female quotas in local governments have, and find that local female representatives are more likely to provide public goods that are more highly preferred by their female constituency.

However, their study does not consider higher levels of government. This analysis extends this by considering the relation between state and local governments in the provision of latrines.

The local government in rural India has a three-tier system at the district (Zila Parishads), block (Panchayat Samities), and village level (Panchayats). There are separate elections for each level of local government and there are different constituency boundaries for the district and block level. The analysis in this section focuses on two states, Rajasthan and Andhra Pradesh. Rajasthan has 32 districts with 1008 constituencies, each with one elected member, and Andhra Pradesh has 22 districts with 1096 elected members. Local elections are generally held every five years. Rajasthan's local elections for the Zila Parishad was held in 2005 and Andhra Pradesh was held in 2006.

States have formed committees on sanitation (sometimes referred to as Apex Committees) in order to discuss local progress on sanitation. The committee is chaired by the chairman of the District Council, and is attended by members of the state assembly as well as members of parliament. During Apex Committee meetings, local representatives have a chance to deliberate on how state-guided sanitation policies are being implemented and share obstacles i n the process.

3.3.1 Analysis

A nationwide analysis at the local level is beyond the scope of this chapter, so instead I analyze two larger states (Rajasthan and Andhra Pradesh) with data available on local candidates' gender that had elections during the same timeframe as the original analysis. A simple regression analysis using ordinary least squares is used for analysis. The main independent variables of interest are the fraction of female politicians at the state level, and the fraction of female District Council members (Zila Parishad).[1] The same covariates as in Chapter 2 are used. The results in Table 3.3 show that the coefficients for both female presence in state and local governments are statistically insignificant.

[1]Local election data are available from the respective State Election Commission.

Table 3.3: Effect State and Local Female Politicians on Upgraded Latrines

DV: Upgraded latrines per rural household, 2011	
Fraction of female state legislators (2006-2010)	−0.07
	(0.131)
Fraction of female politicians in District Council	−0.02
	(0.280)
Covariates	Y
N	42
R_sq	0.70

Notes: District level observations.State dummy included.
Robust standard errors in parentheses.
* p<0.10; ** p<0.05; *** p<0.01

3.4 Discussion and Conclusion

Complementing the findings on the impact of female state legislators on sanitation from the previous chapter, this Chapter explores three different possibilities in which the wider political context may help increase the likelihood of state legislators in being successful in their sanitation efforts. Empirical evidence shows that having a longer history of female representation in the state may help improve sanitation. In contrast, there is no evidence that female state politicians engage more in sanitation-promoting activities through the Total Sanitation Campaign or through cooperative work with district-level local female politicians.

The finding suggests that a longer history of female presence in state legislators makes it easier for women to pursue their policies. Indian elections are found to have incumbency disadvantages (Aidt, Golden, and Tiwari, 2011), so it is unlikely that the same female leaders are being reelected in the two governments studied. This suggests that it is not an individual level effect, but a gender influence. There are many ways having a longer history of female legislators may make it easier for newly elected female politicians to pursue their preferred policies. It can help enhance the willingness, assertiveness, and effectiveness of female politicians to carry out their agenda. In short, the continuation of having elected female officials reduces the gender gap in state assemblies even when women take a small proportion of seats.

A surprising result is that we do not see an effect of the presence of female politicians on the

construction of latrines through subsidies provided by the TSC. It is difficult to tell whether the effect is not captured due to the lack of upgraded latrines built through the TSC because data on the type of latrine constructed through this government scheme is not available. However, reports that evaluate the TSC provide evidence that this may be the case. Although the TSC encourages the construction of upgraded latrines and the conversion of dry latrines to flushable ones, one reason that this is difficult to achieve is that the subsidies provided by TSC are not sufficient to construct upgraded latrines, despite the increases in the size of subsidies to households throughout the years. Evaluation studies show that rural sanitary marts, which are the center point for providing supplies to citizens for latrine construction, were selling products that matched the size of subsidies provided to households so that they would be affordable to the community members (Robinson and Raman, 2008a). This could mean compromising the quality of latrines. In addition, in a study of two districts in Madhya Pradesh there was only one type of pit latrine available for people to choose from (Robinson and Raman, 2008b).

Another issue is that some types of latrines require larger and more complex infrastructural changes in the community. For instance, flush toilets need to be connected to pipes that cannot be constructed by a single household. Therefore, many households being subsidized through TSC may not have the option to build these types of flush toilets unless support by the local government is given.

It is also noteworthy that the results show a statistically significant negative relationship between the initial number of household latrines in the district prior to the implementation of TSC and the provision of latrines under the TSC. This means that more latrines are being constructed in areas that started off with lower levels of sanitation facilities, suggesting that the TSC is being targeted in areas that the program was initially designed for, regardless of the politician's gender.

Lastly, the results show a lack of synergistic effect from females at state and local levels. This finding reminds us that the heterogeneity of women's interest cannot be ignored. There are likely to be differences in the interests of women in the state and in the local government. Local politics operates different from state level politics, and in this case an institutional difference is that there are reserved seats for women at the local level. Having a secure proportion of seats could mean altering legislative behavior for both men and women.

Another characteristic to note here is that local governments in India are three-tiered. This analysis only considers the upper level of local governments, which is the district head. Decentralization of sanitation-related responsibilities could mean that decision making is going towards the most local village level. Thus, the results here should not be assuming the influence of the entire local government.

CHAPTER 4

The Importance of Women in Households

4.1 Introduction: Informing Women and Improving Sanitation

While close to 90 percent of the population in developing countries has access to clean water, only 57 percent of the developing world has access to sanitation, and the situation is far worse in rural areas.[1] The lack of sanitation in many developing countries has resulted in continuous cycles of water-borne diseases such as such as diarrhea, polio, giardiasis, and hepatitis A, and poses a serious threat to serious threat to human security and economic growth. Women are most negatively affected by the lack of sanitation because they are more likely to compromise their dignity and become victims of violence when participating in open defecation and because they are usually the primary caregivers of children who are most susceptible to sanitation-related diseases. Therefore, the purpose of this study is to examine the possible pathways that link gender to improved sanitation.

Specifically, this study addresses the question of whether a lack of information is the main barrier to access to sanitation by women through the case of rural India, which has the largest number of open defecators in the world.[2] Nearly a quarter of young children worldwide who died of diarrhea were in India.[3] In many developing countries, women are constrained in effectively demanding government services due to several factors including lower levels of education or societal attitudes towards women. In terms of sanitation, there is also considerable public resistance to the

[1]Source: Figures are from *World Development Indicators 2012*, The World Bank used in the following report: http://data.worldbank.org/sites/default/files/wdi-2014-book.pdf (accessed Feb. 1, 2015)

[2]Figures are from the *World Development Indicators 2010*, The World Bank.

[3]UNICEF and WHO (2000)

use of indoor flush toilets in countries such as India, and cultural preferences for practicing open defecation far away from home. Thus, information can play a key role in the government's distribution of sanitation services with respect to educating the public on hygiene in order to correct traditional practices, increasing exposure to latrine usage that the public may largely be unfamiliar about, and maintaining awareness about the benefits of hygienic practices in order to generate continuous demand for sanitation.

Previous studies on how gender influences the provision of public services such as sanitation have focused on the role of female political representatives, but this literature overlooks the influence of women in households on receiving these services. While studies show that women politicians are more likely to spend on policies that are relevant to them (Chattopadhyay and Duflo, 2004; Clots-Figueras, 2011), there is much to understand about why and when women in households decide to make sanitation investments. A factor that is most likely to influence these decisions is access to information, and for the government to reach out to women, the most easily accessible source of information for them is the mass media. Therefore, mass media may play a critical role in disseminating information about the benefits of sanitation and being an effective way to improve health outcomes. However, despite the fact that individuals rely mostly on mass media for information in their daily lives, little is known about its influence in developing countries. By focusing on the role that information plays in women gaining access to toilets, this study contributes to a small but growing literature that tests the effects of mass media on basic public services provided by the government (Besley and Burgess, 2001, 2002; Strömberg, 2001; Snyder Jr and Strömberg, 2010). A related group of studies examine the influence of female empowerment on health outcomes such as child stunting (Spears, 2013) and malnutrition (Smith, Ruel, and Ndiaye, 2005) without looking at underlying mechanisms that influence access to water and sanitation such as the role of women. Because health outcomes such as infant mortality are caused by several factors, studying the role of subgroups of the population, such as women, separately can provide a more accurate picture of the surrounding health environment.

The empirical strategy in this paper is in two parts. The first part examines the link between informing women through mass media and improving sanitation using a nationwide dataset of India. Because the degree to which women are informed depends not only on the availability but

the accessibility of mass media outlets, which in turn is dependent on public infrastructure such as electricity or postal service, the next part of the paper examines the media environment and how it influences sanitation provision. In order to test for this, the second part examines the relative effectiveness of access to different mass media channels (e.g. radio, television, and newspapers) on household latrine construction using sub-state level data for the state of Uttar Pradesh.

Overall, this study implies that improving sanitation depends on having informed women and the socioeconomic context of the communities they live in. The findings from this study show that households are more likely to have latrines when women in the households are more informed as well as when their intra-household status is higher. The results show that latrine ownership in the household is associated with women's regular mass media usage, their knowledge of basic health, and their role in making decisions for purchases of household goods. Moreover, in poor rural areas where the lack of sanitation is most acute for women, an improvement in women's health knowledge and an increase in household radios both increase latrine provision, whereas household ownership of other media outlets such as televisions or newspapers do not.

This paper is organized as follows. Section 2 reviews relevant literature in order to generate testable hypotheses. Section 3 provides background information on women, sanitation, and mass media markets in India. Section 4 describes the data and section 5 presents the empirical models used for analysis. Section 6 summarizes results from robustness checks. And the last section offers a discussion of the results as well as concluding remarks.

4.2 Relevant Literature and Hypotheses

In developed countries, water borne illnesses are relatively rare and can be easily contained through hygienic measures. In fact, providing adequate sanitation may reduce death from diarrhea by as much as 37.5 percent (UN Millennium Project, 2005), but progress in the developing world has been slow. Diarrhea is the most common disease associated with poor sanitation and is the second leading cause of child death by infectious diseases worldwide (after pneumonia), accounting for 9.2 percent of child deaths in 2013 (Liu et al., 2014). Surveys in rural areas of developing countries show that there is a lack of understanding of sanitation in general and how it relates to diseases

such as diarrhea. For example, surveys in rural India show that people do not associate causes of diarrhea with open defecation, but instead with hot weather and spicy food. And there is a dearth of knowledge regarding personal hygiene practices such as washing hands, boiling water, or using latrines (Banda et al., 2007; Vivas et al., 2010). Therefore, there is a lack of information about the consequences the practice of open defecation has on human health.

When provided more information, women are more likely to have higher preferences for household latrines over other desirable household goods than men because the risks posed by the absence of toilets go far beyond the health-related aspects of open defecation. Without access to toilets, women are forced to practice open defecation after dark, which also makes them a target of violent crimes or rape. Moreover, maternal knowledge on the general causes of diarrhea and proper sanitation is found to have an impact on the rate of young children having diarrheal diseases (Bertrand and Walmus, 1983). Thus, for women the privacy and security issues with open defecation coupled with being primary caregivers to children, access to information is likely to have a greater impact on improving sanitation.

While information educates the public about the need for improved sanitation, it can also inform citizens about how well their government is performing with respect to sanitation provision. As Besley's (2007) principal-agent model shows, information is a key factor for explaining the quality and governance sanitation because citizens rely on their governments for the provision of such public services in developing countries. Citizens use information to monitor their representatives, to coordinate on making clear demands to the government, to engage in public policy-making, and to evaluate their elected officials during elections by deciding on whether or not to re-elect the incumbent. As a result, government officials in electoral constituencies with better informed citizens are more likely to be held accountable and be responsive to their citizens needs if they want to stay in office (Ferejohn, 1986; Besley, 2007; Adsera, Boix, and Payne, 2003). Thus, having more informed women should produce a larger effect on improving sanitation since women have a stronger preference for sanitation than men.

Empirical studies have tested whether access to information by citizens explains the variation of public services across localities (Reinikka and Svensson, 2005; Svensson and Björkman, 2009). Methodologically, this recent body of literature commonly conducts field experiments that dissem-

inate report cards or flyers on the performance of politicians to identify the impact of information on voter behavior.[4] They find that information campaigns which, for example, disclose government corruption or announce the launching of a new public service, can positively influence voter turnout and even election outcomes (Banerjee et al., 2011; Chong et al., 2013). However, few studies focus on the role of mass media, which is a common source of information for women, in delivering information to the public. While studies using information campaigns are useful in establishing causality between the "treatment" effect of exposing voters to information on public service delivery, they may be only measuring the effects of temporary spikes in information. Based on a survey experiment in Uganda that disseminated parliamentary scorecards, Humphreys and Weinstein (2012) show that the scorecards distributed in 2008 did not have an impact on voting behavior in 2011, and conclude that the effect of these information campaigns are short-lived.

In contrast, this study investigates the dynamics of longer term shifts in the information environment by focusing on the cumulative effects of mass media. In the literature, there are only a few studies that examine the influence of mass media on the quality of public services in developing countries (Keefer and Khemani, 2011; Snyder Jr and Strömberg, 2010). A study by Besley and Burgess (2002) finds that Indian states with higher newspaper circulation, especially those in local languages, receive more government support for recovery from large scale natural disasters. Strömberg (2004b) shows that households with more radios received more New Deal relief funds in the U.S. in the 1930s. Unlike these studies that focus on government responsiveness to natural disasters or shocks, this study looks at the role of mass media as an ongoing information provider for daily public services such as health care, education, and sanitation.

Because most citizens, even the ones harder to reach such as rural women, rely on mass media for information, it remains an important source at the individual level, especially for information on public services that directly affect the quality of life. When considering access to sanitation, citizens may not understand the gravity of health risks posed by unhygienic settings, and therefore require the government to be active in citizen learning through the media so that the public familiarize themselves with good sanitary practices. This, in turn, may also create demand for latrines.

[4]For a survey of the studies that use field experiments see Pande (2011).

Therefore, the first hypothesis is:

Hypothesis 1. *Households with women who regularly use mass media are more likely to have latrines than those with women who do not regularly use the mass media.*

In addition, those who obtain information from the mass media regularly are more likely to have better knowledge about protection from sanitation-related diseases in general. An example of this would be knowledge on the proper treatment and prevention of diarrhea such as keeping hydrated or hand washing (WHO, 2011). This type of health knowledge does not necessarily have to come only from formal school education, but may also come from mass media. Thus, I also examine the following:

Hypothesis 2. *Women who have basic knowledge on diarrhea treatment are more likely to have household latrines, compared to women without such knowledge.*

This study also extends the literature that examines why public services, often designed to alleviate poverty, do not reach the poor (Khemani, 2007; Keefer and Khemani, 2005), by focusing on women instead of the poor in general. Women in rural areas are often one of the most disadvantaged groups in developing countries, and yet their inability to receive good services has been less studied compared to other socially disadvantaged groups such as ethnic groups in Africa or caste members in India. Instead of treating households as unitary actors as much of the political economy literature does, this study focuses on the role of an individual within the household by considering factors that influence household women differently from men.

In many countries where women have a lower social status than men, the decision to construct household latrines may not necessarily be made by women despite their greater preference for it. This means that women not only need to be informed about sanitation policies but also need to be able to participate in household decisions for latrine upgrades. Keefer and Khemani (2011) find that villages with community radios in Benin improved children's literacy rates not because it increased the ability of citizens to demand greater government accountability, but because households with greater radio access were willing to spend more on children's education. Similarly, mass media's influence on having household latrines involves *changing household behavior* through the

increased influence on decision making by women as well as educating them. Therefore, the main hypothesis of this paper is:

Hypothesis 3. *Households with more informed women are likely to have household latrines when women also have higher status in their household.*

4.3 Background: Women, Sanitation, and Mass Media in India

Although women in India were granted suffrage in 1949, they have been traditionally disadvantaged in society and gender inequality remains a serious issue. According to the United Nations Development Programme, India ranked 127 out of 152 countries on the Gender Inequality Index in 2014, worse than countries that have lower levels of human development than India such as Nepal and Bangladesh.[5] Gender inequality is evident in many aspects of India's society today such as the phenomenon of "missing women",[6] the prevalence of violence against women, the continued practice of dowry and child marriage, and the existence of laws that prevent women from certain economic rights such as inheriting land.

Therefore, studying India can help answer why developing countries, even with formal democratic institutions such as elections, fail to provide better health and education services for women. Considering social factors that strengthen government accountability, such as media access by women and their household status, could help explain some of the discrepancies we see between India's rapid economic growth and poor service delivery.

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[5]The Gender Inequality Index is calculated based on indicators of women's reproductive health, women education levels and women in the labor market. For more information please see `http://hdr.undp.org/en/content/gender-development-index-gdi`

[6]"Missing women" refers to the phenomenon of the decreasing number of girls compared to boys. According to the India Census, the sex ratio among children under seven in India fell from 976 girls for every 1,000 boys in 1961 to 914 girls in 2011.

4.3.1 Sanitation in India

Improving sanitation has been an ongoing struggle for India, where over 70 percent of the rural population still practice open defecation. This causes widespread health problems such as diarrhea and stomach worms, which are also the leading causes of death among children under five in developing countries.[7] The spread of water-borne diseases are compounded by poor sewage systems and lack of personal hygiene practices such as hand washing.

Sanitation is a particularly sensitive issue for women not only for their personal dignity but also because the lack of toilets is a direct threat to their personal security. Recently, there have been numerous accounts of rape and violence against women while being outside due to the lack of indoor latrines, which has sparked protests across the nation.[8] In response, there have been grassroot initiatives that encourage women to demand better sanitation in India such as the "no toilet, no bride" movement that ensures that their future son-in-law's house has a latrine before they allow their daughter to be married to him. These movements seem to have an impact: Stopnitzky (2012) estimates a 15 percent increase in indoor latrines in households with marriageable boys in Haryana where this movement is active compared to other states that do not have this campaign. However, the benefits are limited to small localities.

At the national level, the Indian government in 1999 launched the Nirmal Bharat Abhiyan, also known as the Total Sanitation Campaign (hereinafter TSC). The objective of the program is to achieve universal sanitation in rural India by providing government subsidies for latrine construction to households below the poverty line and key public facilities such as primary schools and public centers (called Anganwadi). The TSC program takes a community-driven approach, meaning that the main responsibility for implementation of the program is at the district level with support from local governments (PRIs), which are the governments at the district, block, and village level. Latrine construction projects are proposed at the district level, then examined at the

[7]The World Health Organization provides more facts on diarrhoeal diseases: `http://www.who.int/mediacentre/factsheets/fs330/en/`

[8]`http://www.npr.org/blogs/parallels/2014/06/09/319529037/indias-rape-uproar-ignites-demand-to-end-open-defecation`

state level and ultimately submitted to the Department of Drinking Water and Sanitation of the Ministry of Rural Development at the central level for funds. Local leaders are responsible for mobilizing all citizens to construct toilets and for maintaining safe waste management systems in their localities. The program is jointly funded by the central and state governments. Apart from funding, the central and state governments play a secondary role of capacity building and monitoring. Although the launch of the program was officially announced in 1999, latrine constructions started in 2002-03 for many states, so year 2002 is the starting point I use for data analysis.

4.3.2 Mass media access in India

Table 4.1: Change in ownership of media sources by households in India and UP, 2001-2011

	TV			Radio			Newspaper		
	2001	2011	change	2001	2011	change	2000	2010	change
India (%)	31.6	47.2	+15.6	35.1	19.9	-15.2	na	na	+23.0[i]
Uttar Pradesh (%)	25.0	33.2	+8.2	39.6	24.7	-14.9	2.9	8.8	+5.9[ii]

Notes: TV and radio data from 2001 and 2011 India Census. [i] Data from *The Economist* July 9, 2011. Measures total number of newspapers. [ii] Data from Household Consumer Expenditure Surveys of 2000 and 2010, and based on newspaper consumption.

India's mass media market, mainly comprised of the television, radio, and newspaper markets, is relatively well developed and is still expanding in some areas. As Table 4.1 shows, television usage is increasing most rapidly with a 15.6 percent increase from 2001 to 2011, whereas radio usage is decreasing (by 15 percent in the same time frame), which are similar to global trends. India is also one of the few countries around the world where the newspaper market has been expanding in the past decade. In fact, it is one of the fastest growing markets for daily newspapers in the world with a 23 percent increase from 2001 to 2011.[9] Their mass media market is considered relatively independent of government influence. India has scored 3 on the civil liberties ratings by Freedom House for over a decade, in which 1 is considered most free and 7 is least free.[10] Freedom

[9]Sources: (Economist, 2011). (Economist, 2013)

[10]The civil liberties score is measured by surveys that specifically include questions on the independence of the media.

House also considers India the freest country in South Asia. The vibrancy and competitiveness of this market makes it ideal for this study.

In this paper, I examine India in general and then focus on one of India's largest states, Uttar Pradesh.[11] Uttar Pradesh is India's most populous state with about 16.5 percent of India's total population. Its population of 200 million makes it comparable to Brazil's total population. Uttar Pradesh is considered relatively poor and lags behind in most health and education indicators. It ranked 18 out of 23 major Indian states in 2007 in terms of their Human Development Indicators.[12] As one of the worst performing states in terms of having adequate sanitation, the state government has been active in attempting to improve the situation.

As Table 4.1 shows, Uttar Pradesh follows a similar trend as the rest of India in media access, but with slower growth of television usage than the nation's average. According to the 2011 census, about 33 percent of households in Uttar Pradesh have televisions, an increase of 8.2 percent since 2001. This growth rate is only about half of the growth rate that India as a whole is experiencing in the television market (which is about 15.6 percent during the same time frame). In Uttar Pradesh, about 25 percent of households still owned radios in 2011, and its usage seems to be more common in rural areas.

The main function of mass media regarding public health issues is to create awareness about health risks that may be unknown to the public, in order to promote behavioral changes for a healthier lifestyle. In India, health programs funded by the government or by international organizations are usually the only ones that have the resources to conduct health campaigns through the mass media. An example of an aggressive public health awareness campaign conducted by the government would be regarding AIDS, which was launched since 1992. According to the National Family Health Survey of India, television was the most common source of information for learning about AIDs for men and women in both urban and rural areas as well as for all subgroups of the population in India including women in rural areas (70%), and women with low education. For

[11] India is organized administratively into 29 states (excluding union territories) that are further divided into districts.

[12] Source: United Nations Development Programme in India, "Uttar Pradesh Economic and Human Development Indicator" available at `http://www.in.undp.org/content/dam/india/docs/uttar_pradesh_factsheet.pdf` accessed on Jan. 13, 2014.

women in rural areas, the next popular sources of information was the radio (41%), friends and relatives (36%), and newspapers (19%).[13]

Although comparable figures are not available for sanitation campaigns, the Information, Education, and Communication component of the TSC, which was initiated at the start of the program, makes mass media a prime source of information for citizens. A maximum of 15 percent of the total budget for TSC is allocated exclusively for Information, Education, Communication activities, which involves conducting sanitation campaigns to create and sustain a demand for latrines. This component aims to create demand for latrines by making the issue of latrine construction more approachable, particularly because it involves convincing those without much awareness of the benefits of toilets to install them in their households. Mass media is the key medium used by state and local governments to achieve this, for example sanitation promotions take the form of regional campaigns using newspaper or radio advertisements. These mass media campaigns are usually conducted at the regional, state, or district level, rather than the community level. Case studies on some of the Indian states by the World Bank has shown that expenditure on Information, Education, and Communication as well as program management improves the performance of the sanitation campaign.[14] Mass media could therefore play a significant role in the provision of latrines for women in rural households.

4.4 Data Description

This paper uses two datasets for which the main outcome variables are based on the India Human Development Survey (IHDS) and the Total Sanitation Campaign data. The first part of the analysis uses the rural subsample of the 2004-2005 IHDS survey, which includes 26,734 rural households across 33 states and union territories of India.[15] This survey includes detailed questions for women

[13] Other sources of information in this survey question include cinema, posters, health workers, schools and teachers, and others.

[14] See World Bank (2005).

[15] See Desai, Vanneman, and National Council of Applied Economic Research (2005) for details on the sampling procedure for this survey

about the type of household latrine they own, their use of mass media as well as their role in the financial decision making process in households.

The IHDS survey asks whether a household has a traditional pit latrine, a ventilated improved pit latrine or a flush toilet if any. The main outcome variable of interest is coded as 1 if the household has a flush toilet and 0 otherwise. For mass media usage, the original survey question asks for the frequency of usage (i.e. regularly, sometimes, or never) by either the men and/or women of the household for the three main mass media outlets separately. Here, these answers were recoded as dichotomous variables that indicate regular usage by a woman of at least one of the three mass media outlets as 1 and 0 otherwise. For women's knowledge on diarrhea treatment, the question asks how much water should be given to children when they have diarrhea compared to when they do not. It is 1 if the respondent correctly answered that children should be given more water when they have diarrhea and 0 if they answered incorrectly or replied that they don't know. Women who are aware of basic home remedies for diarrhea should be more likely to take part in practices that prevent diseases that open defecation causes such as having latrines. For household financial decision making, the survey asks who the main decision maker in purchasing expensive household appliances such as televisions or refrigerators is in the household. It is coded as 1 if the woman is and 0 otherwise.

In the second part of the empirical analysis, I use data from the Total Sanitation Campaign (TSC), which shows the number of latrines constructed for rural households under this program and is available online.[16] I use this to calculate the number of latrines available per rural household in a district by dividing the number of latrines constructed under the TSC program from 2002 to 2012 by the total number of rural households in a district according to the 2001 census.

For the independent variables in the second dataset, I use additional surveys. Newspaper ownership data comes from the Household Consumer Expenditure Survey conducted by India's National Sample Survey Organisation, which is under the Ministry of Statistics and Programme Implementation. The surveys included here for analysis are the "thick sample" surveys conducted roughly

[16] See http://tsc.gov.in.

every five years.[17] For the timeframe used in the analysis, the relevant Household Consumer Expenditure Surveys used are the ones conducted in 1999-2000 (55th round) and 2009-2010 (66th round). The original question in the survey asks how much in rupees a household uses for the purchase of newspapers or periodicals during the last 365 days. I converted the responses to this question into an indicator variable where 1 is any amount of rupees spent per household, and 0 otherwise.[18] Then, these were converted into proportions of households that purchased newspapers within a district using the sample weights (called multipliers) provided in the original data. TV and radio ownership data are from the 2001 and 2011 Census of India. It measures the percent of households that own a TV or radio by district. The data for literacy and initial level of latrines are also from the Census. The Census keeps track of households with access to a latrine, so the 2001 Census is a more objective measure of the initial level of latrines at the start of the program, rather than using data from the TSC. India's Census data is available online.[19]

For women's knowledge on diarrhea treatment, the second dataset uses the District Level Household & Facility Survey from 2002-04 (DLHS-2)and 2007-08 (DLHS-3) by the International Institute for Population Sciences that covers 601 districts nationwide. The question asks women if they used oral rehydration solution for their children if their child had diarrhea in the past two weeks. Because dehydration is the largest cause of death among children with diarrhea in India, the government has been encouraging the use of oral rehydration solutions since the 1970s when the World Health Organization recommended a standard formula for this solution, and today it is the most highly recommended remedy for diarrhea treatment together with continued food con-

[17]Household Consumer Expenditure Surveys are conducted annually nationwide with smaller samples (thin samples), and then with larger sample sizes (thick samples) every five years. Thick samples survey approximately 120,000 households nationwide, whereas the thin samples survey approximately 30-40 percent of this. District-level measures can be taken because of this larger sample size.

[18]This variable was coded as a binary variable because the cost of newspapers in India vary widely depending on many factors such as the location of publication, type of newspaper, number of pages etc. There may be concern that the low threshold used to code this as an indicator variable may potentially overestimate the effect of newspaper ownership because only spending a few rupees a year are unlikely to have an informational effect. However, the descriptive statistics from the original Household Consumer Expenditure Survey helps alleviate this concern. Among households who purchased newspapers or periodicals, the average money spent annually is around USD 15-19 per household in Uttar Pradesh, which is reasonably well above a minimum threshold.

[19]http://censusindia.gov.in

sumption (UNICEF and WHO, 2000). The oral rehydration solution packets are available at local clinics and information on home-made solutions have also been widely disseminated. The objective of the oral rehydration therapy movement is to educate mothers about the causes, symptoms, and treatments of diarrhea. The government has relied heavily on mass media to promote these diarrhea treatments, and studies show that women with more exposure to mass media are more likely to use oral rehydration salts to treat diarrhea (Rao, Mishra, and Retherford, 1998).

Summary statistics for all variables are in Table 4.2. For both datasets, only rural household are considered.

4.5 Empirical Strategy

The empirical strategy is in two parts. The first part uses nationwide survey data to examine the association between latrine ownership in households and the degree to which women are informed. Because the degree to which women are informed depend on the accessibility of mass media outlets, the second part examines access to different mass media channels (e.g. radio, television, and newspapers) on household latrine construction using sub-state level data for the state of Uttar Pradesh.

4.5.1 Part 1: Logit model

The first part of the empirical analysis is to identify mechanisms that link how informed women are to household latrine ownership using the following model:

$$latrine_i = \beta_0 + \beta_1 media_i + \beta_2 health_i + \beta_3 decision_i + \beta_4 media_i health_i + \beta_5 health_i decision_i + \beta_6 media_i decision_i + \beta_7 media_i health_i decision_i + \beta_8 X_i + u_s + \varepsilon_s \quad (4.1)$$

where i denotes a household. The outcome variable, $latrine_i$ is a dichotomous variable that indicates whether household i has a flush toilet.

Table 4.2: Descriptive Statistics

	Obs	Mean	Std. Dev.	Min.	Max.
Variables for model 1 (scope: all India 2005, unit of observation: household)					
Ownership of flush toilet in HH	26577	0.12	0.31	0	1
Women's regular mass media usage	26734	0.36	0.45	0	1
Women's knowledge of diarrhea treatment	21411	0.52	0.47	0	1
Women as main decision-maker for household purchases	21191	0.14	0.32	0	1
Men's regular mass media usage	26734	0.36	0.45	0	1
Govt. program on sanitation	26734	0.35	0.45	0	1
HH literacy	26655	0.73	0.42	0	1
HH consumption per capita (log)	26704	6.33	0.57	1.37	10.58
SC/ST/OBC	26734	0.76	0.40	0	1
Variables for model 2 (scope: Uttar Pradesh 2002-12, unit of observation: district)					
Change in no. of latrines per rural HH (BPL, 2002 to 2012)	71	0.31	0.133	0.04	0.63
Change in no. of latrines per rural HH (APL, 2002 to 2012)	71	0.37	0.136	0.07	0.87
Change in no. of latrines per rural HH (total, 2002 to 2012)	71	0.68	0.174	0.16	1.30
Change in newspaper ownership (2000 to 2010)	70	0.02	0.045	-0.05	0.24
Change in radio ownership (2000 to 2010)	70	-0.13	0.055	-0.24	-0.01
Change in tv ownership (2000 to 2010)	70	0.08	0.040	0.03	.21
Fraction of initial level of latrines (2001)	71	0.22	0.135	0.08	0.60
Change in literacy rates (2001 to 2011)	70	0.12	0.080	-0.01	0.39
Change in knowledge of diarrhea treatment (2001 to 2011)	70	0.03	.026	-0.01	0.10

The main variable of interest is the interaction term of three dichotomous variables, $media_i$, $health_i$, and $decision_i$. $media_i$ is a variable that indicates whether the female adult in the household uses some form of mass media (e.g. radio, television, or newspaper) on a regular basis. Women who use mass media regularly are more likely to have better knowledge about symptoms and remedies of diseases than those who do not use mass media regularly, and thus be more likely to understand the health benefits of having indoor latrines. $health_i$ is a measure of a woman's basic health knowledge on diarrhea treatment. Lastly, $decision_i$ indicates whether the woman is the main decision maker in purchasing expensive household appliances. Latrines are considered expensive for rural households, so the decision to install one is not trivial. Because women have higher preferences for latrines than men, households where women take part in decisions for similar expensive household purchases are more likely to invest in latrines. The interaction of these three variables, $media_i * health_i * decision_i$, are taken in order to account for information usage by women together with their household role. Women who are well informed and have higher status in the household as a decision-maker are likely to have latrines. Thus we should expect to see a positive association between the three-way interaction and the outcome.

A vector of control variables X, is included to account for household characteristics and socio-economic factors. *Household literacy* is included as a minimum level of education because it may influence the degree to which the household is more receptive to sanitation-related information or to information on well-being in general, thus influencing preferences for latrines. *Household wealth* or the standard of living is another factor controlled for in the model. Households with higher standards of living are more likely to afford latrines, so household wealth is measured by an index provided in the IHDS dataset that is based on household consumption of forty-seven items ranging from food to education. I include an indicator of whether a household belongs to *scheduled castes, scheduled tribes, or other backward classes*. This is because different socio-economic groups may have different attitudes or preferences towards sanitation. I also use state-level fixed effects, u, to control for variation within states s, and ε is the error term.

4.5.2 Part 2: First-differenced model

Because the degree of how informed a woman is in part dependent on the accessibility of mass media, the purpose of the second part of the analysis is to examine the relative effectiveness of different mass media channels on latrine provision. Due to the wide variation in the media environment in each state, this section uses district-level data in one of India's largest states, Uttar Pradesh. The dependent variable reflects latrine construction from 2002 to 2012, whereas the variables that measure the accessibility of mass media and the degree to which women are informed refer to changes from 2000/01 to 2010/11. The time difference eliminates simultaneous causation and allows for a time lag that there might be between having information and the actual construction of latrines.

In order to address the possibility that unobserved time-invariant characteristics of a district could influence latrine ownership, I use the first difference estimator. Because there are only two time periods in the data, this estimator is the same as using district fixed effects. The advantage of the first difference estimator is that it eliminates district-specific and time-invariant unobserved heterogeneity (Liker, Augustyniak, and Duncan, 1985; Greene, 2011).

Because different types of mass media outlets follow different trends in usage and popularity, in this section we estimate the effects of the three types of mass media separately. The model used is specified as follows:

$$\begin{aligned}\Delta TSC\_latrine_d = \alpha_0 + \beta_1 * \Delta newspaper\_ownership_d + \beta_2 * \Delta tv\_ownership_d + \\ \beta_3 * \Delta radio\_ownership_d + \beta_4 * \Delta health\_knowledge + \delta * X_d + \varepsilon_d \end{aligned} \tag{4.2}$$

where Δ shows a change in time t_1 to t_2 for district d.

The dependent variable, $TSC\_latrine_d$, is the change in the number of latrines per rural household provided under the TSC from 2002/03 to 2011/12 in district d.[20] It is calculated by the total number of rural households with latrines constructed under the TSC program divided by the

[20]Strictly speaking, the change is from April 2002 to March 2003 and so forth, which matches the Indian government's financial year.

number of rural households in a district. The latrines constructed through TSC can be classified according to whether they are for households above or below the poverty line in rural areas.

The main coefficients of interest are the ones that estimate the effects of access to different media outlets and the level of women's health knowledge. The Δ *newspaper _ ownership* measures the change from 2000 to 2010 in the portion of rural households in a district that have purchased a newspaper within the past year. Δ *tv ownership*$_d$ and Δ *radio ownership*$_d$ measure the change in the portion of rural households from 2001 to 2011 who owned a tv or radio respectively. $\Delta health\_knowledge$ is a measure of women's knowledge on government recommended diarrhea treatment for children. It is measured by the change in the fraction of women who used oral rehydration supplements when their children had diarrhea.

X_d are control variables used in some models to include demographic characteristics that vary by district. *Literacy* controls for the proportion of rural households in a district that have a literate member in 2001, which should have a positive effect since a minimum level of education may help understand the health benefits of latrines. The *initial % of rural households with latrines* controls for the share of latrine coverage in rural areas at the start of the program in 2001. Areas that start out with very low coverage of latrines are more likely to see a larger increase in the change of TSC latrines perhaps because they are prioritized over districts with more latrines since there is simply more room for improvement. Lastly, ε is the random error term.

There are some data limitations to this model compared to the first logit model that need to be addressed before presenting the results. Mass media usage is based on ownership data so it is hard to differentiate usage by gender. However, districts with increased mass media ownership are more likely to have higher information flows on news and sanitation-related topics that lead to greater acquisition of knowledge even by women. In this model, women's role in the household (e.g. as the main financial decision-maker) is not included because district level measures are unavailable. However, I argue that the model still reflects the influence of women's role as a whole because health knowledge reflects a more stringent measure. This measure includes the use of oral dehydration supplements as a measure of women's health knowledge which requires both the acquisition of knowledge about diarrhea treatment as well as independent action.

4.6 Results

4.6.1 Links between informing women and improving sanitation

Figure 4.1: Estimates of Women's Informedness and Intrahousehold Position on Latrine Ownership, India 2005

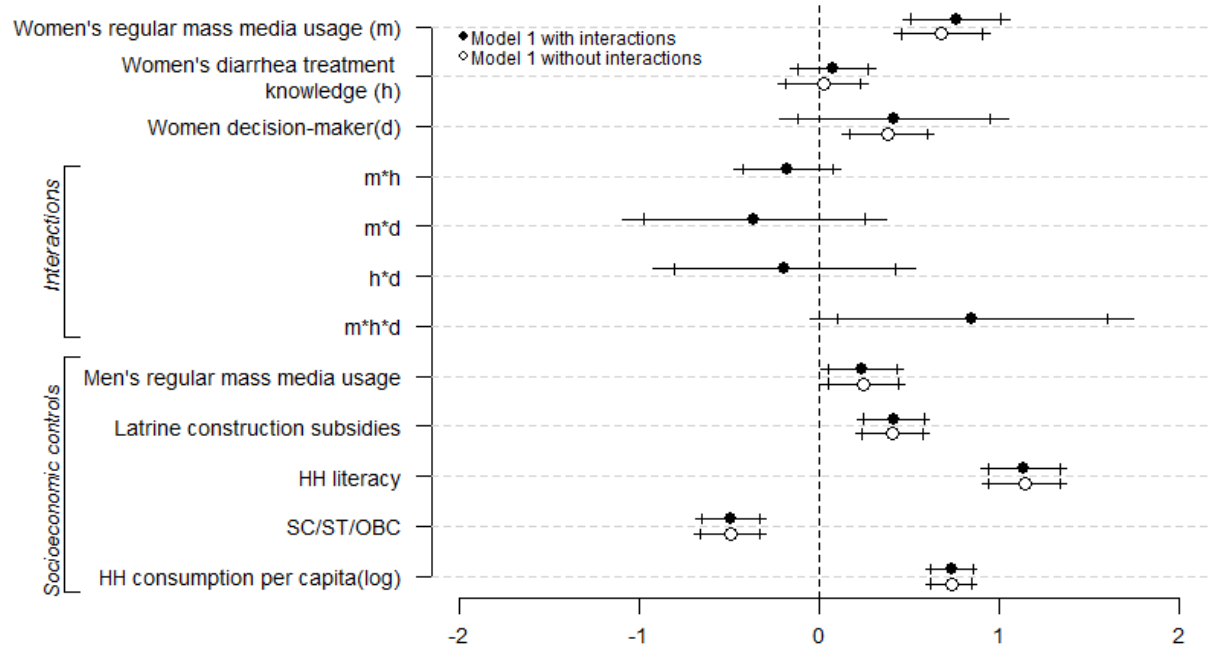

Figure plots estimated coefficients generated from the logit model in equation 1. Dependent variable is owning a flush toilet at home. Black points are for the full model with interactions, white points are without interaction terms. Horizontal bars through each data point are confidence intervals at 95 percent and the vertical tick marks on each side are 90 percent confidence intervals. All models include state fixed effects. n=20959.

The main results from the first part of the empirical strategy that examines the link between informing women through mass media, their status within the household, and improving sanitation are shown in Figure 4.1.[21] The white points are estimates from model 4.1 without interaction terms, and the black points are from the full model including the three-way interaction as well as all lower order interaction terms. Each data point is graphed with a horizontal bar through it which shows the 95 percent confidence level for the estimates, and with vertical tick marks on each side of the bar which shows the 90 percent confidence level.

The most robust result is that women's regular mass media usage is positively associated with

[21]The same results in table form are in appendix Table A3.

household latrine ownership. This result is highly statistically significant in both models with and without interactions. However, there are some interesting results when comparing the two models.

Without interaction terms, the results shows that women being the main decision-maker for expensive household appliance purchases is statistically significant and positively associated with having a household latrine. On the other hand, women's health knowledge of basic diarrhea treatment is not statistically significant. Together, this suggests that women's health knowledge alone is not translating into better sanitation outcomes, and instead both women's regular mass media usage and intra-household status have a positive association with latrine construction.

The full model (black points in Figure 4.1) shows that the three-way interaction of regular mass media usage by women, women having the role of a household decision-maker, and women having health knowledge is positively associated with having a household latrine and is significant at the 90 percent confidence level. These results suggests similar findings as the model without interactions, that gender and latrine ownership are linked by how informed women are of sanitation in general and their role in the household as the main purchaser of household goods.

The results for the control variables show informative characteristics that are associated with household latrine ownership. Men's regular mass media usage is also positively associated with latrine usage, suggesting that access to information through the mass media regardless of the gender of the user, has a positive association with having latrines. However, the magnitude of the coefficient for men's mass media usage is far less than women's mass media usage, suggesting that there is a greater effect of informing women than men. Households with higher consumption per capita and with basic literacy are more likely to have household latrines. Also, households that receive government subsidies to build latrines are associated with having more latrines. On the other hand, households of historically disadvantaged groups (SC/ST/OBC) are less likely to be associated with having a household latrine.

4.6.2 Influence of the media environment on latrine provision

Table 4.3: First-differenced linear estimates of the effect of the accessibility of mass media on TSC latrine provision in Uttar Pradesh

DV: Change in TSC Latrine Provision per household from 2002-2012			
	BPL	APL	Aggregate
	(1)	(2)	(3)
Δ in fraction of rural newspaper ownership	-0.27	0.06	-0.21
	(0.260)	(0.346)	(0.426)
Δ in fraction of rural radio ownership	0.97***	-0.15	0.82
	(0.238)	(0.316)	(0.389)
Δ in fraction of rural tv ownership	-0.47	0.90*	0.43
	(0.343)	(0.456)	(0.561)
Δ in fraction of women's health knowledge	1.01**	0.21	1.21
	(0.472)	(0.627)	(0.773)
initial fraction of rural households with latrines(2001)	-0.30***	0.07	-0.23
	(0.103)	(0.136)	(0.168)
Δ in literacy rate	0.15	-0.26	-0.11
	(0.150)	(0.199)	(0.245)
intercept	0.50***	0.29***	0.79***
	(0.048)	(0.064)	(0.079)
n	70	70	70
Adj. R^2	0.48	0.07	0.10

Notes: Linear estimates from model 2. District level observations. BPL=below poverty line, APL=above poverty line, Aggregate=BPL+APL.

The next step is to estimate the effect of the accessibility of mass media on TSC latrine provision in the state of Uttar Pradesh. Because there is wide variation of media access within states in India, studying this effect at the district level within a state will provide more accurate estimates on the impact of the mass media environment. The results are in Table 4.3. The dependent variable is the change in TSC latrine provision per household from 2002 to 2012 for households below the poverty line (BPL) in column (1), and households above the poverty line (APL) in column (2), and the aggregate of BPL and APL households combined in column (3).

The results show different effects for the rural poor (BPL) and non-poor (APL). For poor rural households (in column 1), a change in radio ownership is statistically significant and has a positive effect on changes in latrine provision. In particular, a one percent change in radio ownership is expected to increase TSC latrine provision by 0.97 latrines per BPL household over ten years, and this coefficient is strongly significant. In addition, the results also show that a one percent change in women with health knowledge on proper diarrhea treatment is also associated with increased latrine provision. These results reflect what was shown in the first part of the empirical analysis, that the degree to which women are informed influence changes in latrine ownership. Other media outlets, newspaper and television ownership, do not have statistically significant associations with TSC latrine provision for poorer rural households.

In addition, the result shows that the TSC program is being directed towards its intended beneficiaries, which are the rural poor. The initial level of latrines in 2001 has a negative relationship with the change in TSC latrine provision, meaning the areas that severely lacked toilets at the start of the TSC program are more likely to experience a faster increase of TSC latrine provision compared to those that initially started out with more latrines in the area. Other control variables such as literacy rates and the proportion of rural households are not significant.

Column (2) shows parallel results for latrine provision for above-poverty-line households as the dependent variable. Here, a change in rural television ownership has a positive relationship with TSC latrine provision but is weakly significant with 90 percent confidence. A one percent increase in rural television ownership is associated with a 0.90 increase in latrines per APL household over a ten year period. Unlike the results for BPL households, the results do not show a significant relationship with newspaper ownership in rural areas. In the last column we find that a change in

rural radio ownership increases aggregate TSC latrine provision (i.e. APL and BPL households combined), but other media outlets such as newspaper and television do not have a strong effect. From the breakdown of households by income, we know that this result is largely driven by poorer households.

4.7 Robustness

This section shows the robustness checks of both models to support the validity of the main results in this paper. The results are available in the appendix.

4.7.1 Model 4.1

In this section, I test the robustness of the results by including different covariates. The results in Tables A4 and A5 of the appendix show estimates from the following specifications without interactions and then with them.

In the results from model 4.1, the paper demonstrates that household literacy has a strong positive effect on latrine ownership. However, household literacy captures any adult member of the family being literate. In order to separate the effect of women's education from the men's, I use the highest level of education attained by men and women that is measured by the number of years for schooling for each individual of the household instead of literacy. This is because the higher the level of education women have, the more likely they will be receptive to information about sanitation and more independent of their decisions in the household. The coefficient for highest level of women's education is strongly significant and positively associated with latrine ownership. For all variables except for the three-way interaction term, the coefficients of interest remain similar and statistically significant to the baseline model. The three-way interaction term loses its statistical significance but it is the same direction as the original results. This shows that higher levels of female education is important for latrine ownership, perhaps because they have a stronger voice in the household. The results are reassuring because they provide additional

evidence of the positive influence of female empowerment on latrine ownership.

The paper also demonstrates from model 4.1 that household consumption, which measures the standard of living, has a strong positive association with latrine ownership. I also run model 4.1 with other measures of household wealth. I use a measure of poverty, which is a dichotomous variable that indicates whether the household is considered below India's national poverty line. I include a measure for households that have access to electricity and households that own cell phones. Access to electricity is a key measure of living standards that allows for a cleaner living environment i.e. through having hot water, light, or refrigerators, so it should have a positive association with latrine ownership. Cell phone ownership is included as a control because it is a trend in India that radio content is consumed through the cell phone, so it could influence having latrines. The sign of the coefficients and their statistical significance remain the same and the estimates are very similar to the original model.

In order to control for daily hygiene habits, I include a measure of whether the respondent washes her hands after defecation. Those that practice hand washing are more likely to have latrines because it demonstrates awareness of daily hygienic activities. Lastly, I also include religion dummies (Hindu, Muslim, and other religions), for different religious groups may have different attitude towards sanitation. Reassuringly, the estimates remain similar to the original model and statistically significant in these specifications as well.

4.7.2 Model 4.2

One of the main obstacles in sub-state level analyses in India is the lack of adequate district-level measures of economic growth. Districts with faster economic growth are likely to see faster improvements in standard of living, which improved access to latrines is a key part of. Thus, to proxy for this I use a variable that measures the fraction of households in districts without any major assets such as automobiles, bicycles, telephones, radios, and televisions. I add it as an additional variable even if it is correlated to existing variables in the model as a control for standard of living for this exercise. The results are in Table A6 of the appendix. The main coefficients of interest

remain significant and robust.

4.8 Interpretation & Conclusion

This paper demonstrates that the degree to which women are informed should be considered in the link between access to information and having better sanitation. Women's regular usage of mass media, even more so than men's media usage, is found to have a strong association with having latrines at home. However, in addition to being informed, the results show that women's role as a household decision-maker is an important factor in having household latrines. When considering the accessibility of different media channels for the rural poor where the lack of sanitation is most acute for women, a change in radio ownership, together with a change in women's basic health knowledge, have effects on increasing latrine provision while other media outlets such as television or newspapers do not.

The results show how factors that are overlooked in traditional models of government accountability, such as the social context and media environment, may be important factors in the delivery of certain public goods or services for developing countries. The result that the degree to which women are informed is positively associated with having latrines is in line with models of government accountability that show how information for voters is key for public goods provision. At the same time, the findings show that households with women taking more active roles in household decision making may also improve sanitation. Considering cultural factors may help explain struggle for improving sanitation in some rural areas despite long term government efforts.

The results also show evidence of an important relationship between the relative accessibility of different mass media outlets and the government provision of latrines for rural households of different income levels over time. In particular, radio accessibility still remains an important source of information among the rural poor (BPL households), which is where women are usually the most disadvantaged. Other studies on developing countries have also shown radios being instrumental in transmitting information on public goods and services in rural areas. For example, Keefer and Khemani (2011) show that villages with access to community radios in Benin are more likely to have higher literacy rates among school children. Despite the declining trend of radio availability,

this suggests the effectiveness of radios, perhaps through the easier approachability of this medium compared to others for disadvantaged groups in rural areas.

In India's case, there are several plausible explanations for the strong positive effect of radio ownership on sanitation. First, the most obvious explanation is that unlike newspaper usage, radio usage does not require households to be literate, and unlike television usage, it is much more affordable. Thus, the radio appears to be the most "accessible" medium for the rural poor, so from a policy-maker's perspective, this could be the most effective method for educating illiterate citizens about public health and hygiene. Second, it could be that there are more local radio broadcasting stations as opposed to local television channels that are more likely to report on local news related to latrine provision. For instance, DD1 (Doordarshan) has the highest TV channel share in Uttar Pradesh taking 51 percent of the market, and it is a national broadcaster.[22]In contrast, radios are more commonly known to be the vehicles for communicating local issues and concerns. For instance, some stations, such as Noida Radio, encourage community participation on the channel so that citizens can voice their opinions. Therefore, radios may carry more localized content relevant to daily issues that the community has that may be more effective in creating awareness of the need for issues such as household latrines. Lastly, it is common for people to access the radio through their mobile phones, which has a wide coverage rate in rural Uttar Pradesh compared to other media outlets. Approximately 55 percent of rural households in Uttar Pradesh have a mobile phone (Ganju et al., 2010), and it is much more affordable for BPL households compared to other durable goods. Thus, despite the fact that radio ownership is generally decreasing, radio stations may still remain an important source of information.

This paper suggests that it would be more useful to tailor communication strategies for sanitation to the local context, in terms of using the most effective mass media channel given the demographic and social characteristics of the locality. In particular, the results suggest that efforts to target women may prove to be particularly effective for improving sanitation. As a next step to this study, it would be useful to examine the content of different information sources on sanitation. Other sources of information commonly used in developing countries include posters, flyers, and

[22]Source: http://www.popcouncil.org/pdfs/2010India_PolicyBrief10.pdf

even school teachers and health practitioners, therefore it would be useful to not only compare access to these types of information sources to mass media but also the types of information people receive in them.

CHAPTER 5

Concluding Remarks

Research on the allocation of basic services in developing countries most often focus on political and institutional factors, such as electoral or party systems, that influence the distribution of these goods and services. What these studies overlook is the characteristics of the politicians that could influence their decisions. Yet identity politics, which is politics based on a group characteristic such as gender, could be influential if these characteristics carry to voters certain expectations for a group. Recognizing the gap in the literature between government responsiveness to basic service delivery This dissertation takes the identity politics perspective in order to account for the lack of basic services we see in many less developed countries today, and attempt to answer the question: Why are some elected officials more responsive to the allocation of basic services than others? Taking a key feature of democracies, electoral competition, together with the influence of politicians' gender, this dissertation studies the allocation of sanitation in 15 states in rural India. The findings are summarized as follows.

First considering the relationship between politicians' gender and sanitation, my research finds that, all else equal, districts with more female politicians are more likely to have better sanitation both in terms of quality of latrines and quantity of coverage. This shows that female politicians are more likely to focus on policies that are of greater concern for women and children compared to male politicians. The numerous accounts of gender salience found in the consequences of the lack of sanitation supports this finding. Women are more likely to be subject to violence when forced to practice open defecation after sunset and they are primary caregivers to children who are most negatively impacted by diseases caused by poor hygiene. This finding is also consistent with empirical evidence from studies on gender and politics that finds most consistently that women leaders tend to focus on policies about women, children, and family.

Second, however, female politicians are no different from their male counterparts in that they also need to consider electoral constraints when making policy decisions. The results show that districts with female politicians are more likely to have higher quality latrines even after controlling for the degree of electoral competition. On the other hand, when faced with more competitive elections, male and female legislators act alike in increasing the quantity of latrines. I suggest that this is due to the fact that latrine coverage is easier to identify by voters compared to latrine quality. When faced with increased electoral competition, female politicians tend to increase the number of overall latrines, much like their male counterparts, because it is a clearer signal to voters of their performance. On the other hand, it is more difficult and costly to gather information about improvements in latrine quality, so it is unlikely that voters will use this information when evaluating politicians. Thus, the divergence in outcomes between male and female politicians when explaining the variation in upgraded latrines becomes clear. Female politicians are more likely to upgrade latrines, even with competitive elections because they have a higher preference for better sanitation, compared to male politicians. My findings are related to studies on the visibility of public goods and their allocation. While existing studies define visibility by the type of good, this study defines visibility by contrasting the quality and quantity of a single type of good.

Third, the study also examines the attitudes of the female electorate because the decision to construct latrines in households involves their willingness and participation. I find that women who are regular users of mass media and take part in making financial decisions within households are more likely to have latrines. This implies that having more access to information makes women more open and accepting towards improving the sanitation facilities in their household. Considering the fact that state legislators are in charge of communication and education on hygiene, the level of information received my households is an important component in understanding the level of improved sanitation.

5.1 Limitations of this Study

The findings from this study are from sub-state level analysis of 15 states of India, and thus may not be directly generalizable to other countries. However, the study has implications for other scholars

who aim to understand the political context of public service delivery in less developed countries. It suggests that the role of gender in the allocation of resources is more complicated than what a simple framework of "women versus men" would suggest. Therefore, it is necessary to consider political, institutional, and social factors that political actors are influenced by and study the role of gender within the appropriate context.

While this study has focused on electoral competition, there are other political and institutional factors that may influence the distribution of basic services. Chapter 3 attempts to probe into some of these factors by exploring different aspects of the wider political context that would influence the success of female state legislators' ability to implement their policies on upgraded latrines. One factor that has not been explored here is party politics. There were two reasons for this. First, basic services such as sanitation is not a main source of contestation among parties of different ideologies at the state level. Instead, the question of whether there are electoral returns of sanitation investment is more relevant. Second, previous studies on the influence of female legislators in India on policy making found that political parties did not influence the outcome. Thus, following these previous studies, compounded with the fact that sanitation provision is a policy that is less debated among parties, my study includes a measure of being member to the governing party instead of a measure for different party ideologies. With the measure I include, the analysis focuses on who gets more resources to improve sanitation rather than who is for or against sanitation provision, in which the latter is a less relevant question for basic services.

5.2 Future Studies

This study points to a number of paths for future research. One aspect that needs further investigation is how state and local governments interact to improve latrine provision. In this dissertation, I examine the relationship between state legislators and the highest level of local governments, which is the District Council. However, India has a three-tier local government system and because sanitation is a local issue, it would be useful to examine the politics of policy implementation from the highest level of government, the district, to the lowest, which would be the village.

An important question that remains in the study of sanitation in India is how many of the la-

trines provided are actually used. After all, health benefits may only be realized when the latrines provided are actually used. Currently, there is no nationwide or large scale survey on latrine usage. However, this type of information may help us have a deeper understanding of the efforts to improve sanitation, for instance how various messages and activities by state and local governments influence sanitation-related attitude and behavior.

Despite the large literature, the role of gender is usually separated from the studies on the political economy of public goods allocation. However, for policy makers who design projects to improve water and sanitation, gender is a central component in devising a sustainable strategy that guarantees the continuous provision and management of sanitation facilities. For instance, the United Nations emphasizes the need to incorporate women in the management of sanitation facilities for the long term sustainability of their policies. This research is an attempt to fill the need for a systematic study of gender roles and access to sanitation. The important question is not necessarily whether women are different from men, but ultimately how to most effectively achieve universal sanitation.

APPENDIX A

Appendix

A Chapter 2 Appendices

Table A1 reports the results of robustness checks through various model specifications as explained in section 2.7 of the chapter. A discussion of the results are included in the main text.

B Chapter 3 Appendices

Table A2 shows summary statistics for variables used in section 1 of Chapter 3.

Table A1: Robustness Check Tables

DV: Latrines per rural household, 2011				
Estimation for:	Young Children effect		Dropping "Assam" effect	
Latrine type:	Upgraded Latrines	All Latrines	Upgraded Latrines	All Latrines
	(1)	(2)	(3)	(4)
Fraction of female legislators	0.34*	0.27	0.30*	0.24
	(0.198)	(0.198)	(0.180)	(0.164)
Rural population (%)	0.03	0.09	0.02	0.07
	(0.107)	(0.089)	(0.830)	* (0.073)
Female literacy (%)	0.39**	0.26*	0.45***	0.38***
	(0.171)	(0.147)	(0.160)	(0.141)
SC/ST population (%)	−0.07	−0.10 *	−0.07	−0.09 *
	(0.058)	(0.053)	(0.050)	(0.05)
Poverty (%)	−0.09 *	−0.09 *	−0.10 **	−0.09 **
	(0.052)	(0.046)	(0.048)	(0.044)
Population growth (%, 2001-2011)	0.27	0.34	0.23	0.24
	(0.251)	(0.238)	(0.174)	(0.180)
Open defecation rate (%, 2001)	−0.57 ***	−1.03 ***	−0.67 ***	−1.06 ***
	(0.092)	(0.068)	(0.108)	(0.060)
Young Children population (%, 2011)	−0.93	−1.00		
	(-0.843)	(0.726)		
N	251	251	281	281

Notes: District level observations in 15 states.State fixed effects included in all models.
Robust standard errors clustered at the state level in parentheses. * p<0.10; ** p<0.05; *** p<0.01

Table A2: Descriptive Statistics for TSC data

B. Latrine coverage dataset unit of observation:district-year; scope: 15 major states, 2003-2012; n=2231	man	S	m in.	max
TSC latrines per rural household	0.076	0.085	0	0.997
Proportion of female politicians	0.107	0.112	0	0.667
Proportion of female politicians who won in a close election against a man (out of close elections between a man and woman in district)	0.172	0.372	0	1
Proportion of politicians from ruling party	0.109	0.129	0	0.667
Female literacy rate	0.592	0.140	0.207	0.963
Rural population (%)	0.751	0.170	0.091	0.967
Availability of latrines per rural household in 2001	0.225	0.198	0.024	0.903
Proportion of SC/ST seats	0.081	0.117	0	0.667
Election year dummy	0.095	0.293	0	1
Child population (%, 2011)	0.130	0.030	0.082	0.209

C Chapter 4 Appendices

Table A3: Logit model results: Association of women's role on latrine ownership

DV: ownership of flush toilet	Base model (1)	without interactions (2)	with interactions (3)
Women's mass media usage (M)	1.25***	0.68***	0.76***
	(0.094)	(0.134)	(0.152)
Women's diarrhea treatment knowledge (H)	0.14	0.02	-0.11
	(0.117)	(0.127)	(0.128)
Women decision maker(D)	0.31***	0.38***	-0.15
	(0.120)	(0.130)	(0.422)
Interactions:			
M*H			0.18
			(0.151)
H*D			0.20
			(0.372)
M*D			0.36
			(0.376)
M*H*D			0.85*
			(0.458)
Socio-Economic Characteristics:			
Men's mass media usage		0.24**	0.24**
		(0.118)	(0.117)
Latrine construction subsidies		0.40***	0.41***
		(0.104)	(0.103)
HH literacy		1.14***	1.13***
		(0.120)	(0.121)
SC/ST/OBC		-0.50***	-0.50***
		(0.100)	(0.100)
HH consumption per capita (log)		0.73***	0.73***
		(0.071)	(0.071)
intercept	-2.34***	-7.70***	-7.75***
State FE	Y	Y	Y
Obs.	20959	20959	20959

Notes: HH=households. All models include state dummies. Estimates from model 4.1. Robust standard errors in parentheses.Data is from India Human Development Survey. * p<0.10; ** p<0.05; *** p<0.01

Table A4: Robustness of results for model 4.1

DV: ownership of flush toilet				
	Education		Income	
	(1)	(2)	(3)	(4)
Women's mass media usage (M)	0.45***	0.57***	0.66***	0.75***
	(0.128)	(0.156)	(0.135)	(0.151)
Women's diarrhea treatment knowledge (H)	-0.11	-0.03	0.01	0.08
	(0.116)	(0.122)	(0.117)	(0.119)
Women decision maker (D)	0.40***	0.44	0.47***	0.49
	(0.146)	(0.299)	(0.119)	(0.325)
M*H		-0.20		-0.20
		(0.156)		(0.150)
M*D		-0.38		-0.33
		(0.407)		(0.379)
H*D		-0.06		-0.19
		(0.365)		(0.375)
M*H*D		0.62		0.81*
		(0.523)		(0.430)
HH literacy			1.08***	1.08***
			(0.119)	(0.120)
Highest female education in HH	0.09***	0.09***		
	(0.010)	(0.010)		
Highest male education in HH	0.09***	0.09***		
	(0.012)	(0.011)		
HH consumption per capita (log)	0.53***	0.53***		
	(0.072)	(0.072)		
Income level			0.30***	0.30***
			(0.029)	(0.029)
Men's mass media usage	0.18	0.17	0.24**	0.24**
	(0.119)	(0.118)	(0.120)	(0.116)
Latrine construction subsidies	0.45***	0.45***	0.37***	0.37***
	(0.106)	(0.105)	(0.101)	(0.100)
SC/ST/OBC	-0.34***	-0.34***	-0.53***	-0.53***
	(0.097)	(0.097)	(0.099)	(0.099)
intercept	-7.43	-7.46	-4.59	-4.61
	(0.553)	(0.551)	(0.325)	(0.310)
Obs.	19987	19987	20970	20970

Notes: HH=households. All models include state dummies. Estimates from model 4.1. Robust standard errors in parentheses.Data is from India Human Development Survey. Results are discussed in Section 4.7.1 of Chapter 4.
* p<0.10; ** p<0.05; *** p<0.01

Table A5: Robustness check results for model 4.1 (continued)

DV: ownership of flush toilet				
	HH Amenities		Handwashing	
	(5)	(6)	(7)	(8)
Women's mass media usage (M)	0.49***	0.56***	0.68***	0.76***
	(0.136)	(0.142)	(0.135)	(0.152)
Women's diarrhea treatment knowledge (H)	-0.01	0.05	0.02	0.07
	(0.134)	(0.123)	(0.127)	(0.120)
Women decision maker (D)	0.38***	0.34	0.39***	0.42
	(0.132)	(0.327)	(0.130)	(0.324)
M*H		-0.19		-0.18
		(0.150)		(0.151)
M*D		-0.22		-0.37
		(0.364)		(0.376)
H*D		-0.16		-0.19
		(0.379)		(0.373)
M*H*D		0.75*		0.86*
		(0.456)		(0.458)
HH literacy	1.00***	1.00***	1.13***	1.13***
	(0.121)	(0.121)	(0.120)	(0.121)
Men's mass media usage	0.23*	0.23**	0.23**	0.23**
	(0.114)	(0.111)	(0.118)	(0.117)
Handwashing	2.96***	2.98***		
	(0.745)	(0.748)		
Access to electricity	1.07***	1.07***		
	(0.150)	(0.151)		
Cell phone ownership	0.96***	0.96***		
	(0.136)	(0.133)		
Latrine construction subsidies	0.40***	0.40***	0.40***	0.41***
	(0.105)	(0.104)	(0.104)	(0.103)
SC/ST/OBC	-0.46***	-0.46***	-0.49***	-0.49***
	(0.099)	(0.099)	(0.100)	(0.100)
HH consumption per capita (log)	0.55***	0.56***	0.73***	0.73***
	(0.073)	(0.073)	(0.071)	(0.071)
intercept	-8.33	-8.34	-11.63***	-11.66***
	(0.574)	(0.569)	(0.975)	(0.973)
N	20779	20779	20932	20932

Notes: HH=households. All models include state dummies.
Robust standard errors in parentheses. Data is from India Human Development Survey.
Results are discussed in Section 4.7.1 of Chapter 4.
* p<0.10; ** p<0.05; *** p<0.01

Table A6: Robustness check results for model 4.2

DV: Change in TSC Latrine Provision per household from 2002-2012			
	BPL	APL	Aggregate
	(1)	(2)	(3)
Δ in fraction of rural newspaper ownership	-0.33	0.14	-0.19
	(0.257)	(0.342)	(0.429)
Δ in fraction of rural radio ownership	0.86***	-0.02	0.84**
	(0.238)	(0.317)	(0.398)
Δ in fraction of rural tv ownership	-0.70*	1.22**	0.52
	(0.354)	(0.471)	(0.591)
Δ in fraction of HH without assets	-0.48	0.61	0.13
	(0.291)	(0.388)	(0.487)
initial fraction of rural households with latrines(2001)	-0.34***	0.13	-0.21
	(0.092)	(0.123)	(0.154)
Δ in literacy rate	0.10	-0.20	-0.10
	(0.150)	(0.199)	(0.250)
Δ in fraction of women's health knowledge	0.99**	0.22	1.21
	(0.460)	(0.612)	(0.769)
intercept	0.47***	0.33***	0.80***
	(0.048)	(0.064)	(0.081)
N	70	70	70
Adj. R^2	0.50	0.11	0.10

Notes: Linear estimates from model 4.2. District level observations. BPL=below poverty line, Results are discussed in Section 4.7.2 of Chapter 4. APL=above poverty line, Aggregate=BPL+APL.

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