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To invest or not to invest in sanitation: the role of intra-household gender differences in perceptions and bargaining power

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To invest or not to invest in sanitation: the role of intra-household gender differences in perceptions and bargaining power[*]

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Abstract

We exploit novel data collected within a randomised controlled trial of a sanitation microcredit intervention to study how intra-household gender differences in perceptions of costs and benefits of sanitation impact investment decisions. We show that – as long as the wife is involved in household decision-making – the intra-household differences in perceptions we document influence borrowing and investments: uptake of the sanitation loan is higher among households where the wife has higher benefit perception, whereas successful conversion to a toilet depends on differences in monetary cost perceptions. The estimated effects are consistent with the predictions of a model of intra-household decision-making.

JEL codes: O16, J16, D14, I12
Keywords: sanitation, perceptions, intra-household bargaining, microfinance, gender

1 Introduction

Several household investments are thought to confer higher benefits to one gender (Miller and Mobarak, 2013; Stopnitzky, 2017). However, seeing investments through, particularly if large, such as a household toilet, usually requires cooperation from multiple household members, who each have their own perceptions of costs and benefits. At the same time, liquidity constraints form a major impediment to investments, especially in low-income settings (Guiteras et al., 2015; Augsburg et al., 2021), where available resources are more often than not controlled by males. Providing women with control over resources and access to financial tools is promoted as a means to achieve investments believed to be preferred by women, motivated by evidence showing that providing women with control over resources or financial tools can, at times, improve outcomes such as female micro-enterprise investment (Riley, 2020), female labour supply (Field et al., 2021), and nutrition (Armand et al., 2020; Duflo, 2003).

However, simply providing women with financial tools will not impact outcomes if they are unable to exercise agency over how funds are used. Differences in intra-household perceptions, and the distribution of bargaining power, are thus likely to influence the decision to adopt an investment, and consequently the success of interventions seeking to increase targeted investments by alleviating liquidity constraints for women.

In this paper, we use novel data on perceptions of the costs and benefits of a household toilet, an important investment that requires significant outlay – collected within a cluster randomized controlled trial (cRCT hereon) of a sanitation microcredit intervention in rural India to answer two questions. First, to what extent do perceptions of costs and benefits of safe sanitation differ by gender, overall and within the household? Second, do intra-household differences in perceptions and bargaining power influence the take-up of sanitation loans and investment?

To shed light on the first question, we make use of unique, and to date unexplored, data on perceptions of several dimensions of costs and benefits of a standardized toilet collected from a male and female adult during the baseline survey. We answer the second question by combining this novel data with exogenous variation from the cRCT to test predictions from a theoretical model of intra-household decision-making in which a couple bargains over borrowing, investment and consumption choices.

The study context is rural Maharashtra, India, where a large microfinance institution (MFI) made a new sanitation loan product available to its exclusively female clients. Though safe sanitation is recognised as a key factor in primary health (e.g. Declaration of Alma-Ata), at the onset of the study in 2014 only 27% of client households had a toilet, with financial constraints cited as the major reason for not having one. The loan was intended to finance the construction of a new toilet, or the repair or upgrade of an existing one. While only women could avail the loan, the MFI in principle required written

consent from the client's spouse before disbursement. The loan was simply labelled for sanitation, and the MFI provided no guidance or advice on the toilet model, procurement of materials or a mason.

Augsburg et al. (2021) draw on the cRCT, which made available the sanitation loan in 40 of 81 Gram Panchayats (GPs) where the partner MFI operated, to show that two and a half years after intervention roll-out, around 18 percent of clients took the loan. This resulted in a 9 percentage point increase in toilet ownership, with only few loans used to repair or upgrade existing toilets. We build on that paper by studying the roles of intra-household differences in perceptions and bargaining power in driving these impacts.[1]

Constructing a toilet is costly and complex. The average cost of constructed toilets in our study setting accounts for around 50% of the average household's annual income. Such a significant outlay frequently necessitates the use of financing instruments such as savings and loans. Once funds are secured, households need to choose a toilet model, identify skilled labour (mason, carpenter), procure materials, and oversee the construction. Prevailing strong gender norms necessitate the cooperation of a male household member to complete this process (Goetz and Sen Gupta, 1996; van Tassel, 2004). Rural India is strongly patriarchal. Women move from their natal village to her husband's village on marriage, and their mobility outside the household is often severely restricted, especially for newly married brides (Kandpal and Baylis, 2019; Andrew et al., 2020; Anukriti et al., 2020). Even in the absence of strong mobility restrictions, rigid gender roles may discourage women from visiting markets or seeking out information on construction materials and home improvements. Moreover, women typically have very little agency in household investment and financial decisions within her marital household – which is often shared with extended family members such as parents-in-law and the siblings of her spouse and their families. In the case of large household investments, such as a toilet, men play a dominant role in making decisions (Routray et al., 2017).

We confirm the limited agency for women in household financial and investment decisions in our data: on average, women in our sample of micro-credit client households report being involved in making large financial and investment decisions only two-thirds of the time. However, they rarely make any such decisions on their own: husbands or other household members (such as in-laws) are usually also involved. In almost one-third of households, women report rarely being involved in making these decisions.

Consequently, it is likely that cost and benefit perceptions of both female and male household members matter in the sanitation investment process, and that the differences in these perceptions will influence intervention impacts on take-up and conversion of the sanitation loan.

We start by documenting how perceptions of costs and benefits of a safe toilet vary

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[1]We pre-registered our intentions to analyse these heterogeneous treatment effects with the AEA Registry prior to the analysis of the endline data (https://doi.org/10.1257/rct.1955-2.0).

by gender and within households. The perceptions were elicited by showing the selected female and male adult respondents, typically spouses, the same picture of a standardized toilet and asking a series of questions related to the costs (monetary and non-monetary) and benefits of such a toilet.[2] We combine the responses to construct measures of perceptions of monetary costs, non-monetary costs and benefits of the toilet.

Literature indicates that the costs and benefits of a household toilet will vary by gender. On the one hand, women stand to benefit more since a private household toilet provides access to a safe and convenient place to relieve themselves, thereby eliminating the need for behaviours such as controlling bodily functions which may worsen their health (Caruso et al., 2017; Saleem et al., 2019; Mahajan and Sekhri, 2021). On the other hand, however, women – who do the housework – face additional burdens in fetching water and cleaning the toilet.

In line with this literature, we document that across the whole sample, women perceive higher benefits of the toilet than men. The distributions of non-monetary cost perceptions also vary by gender: women have a bi-modal distribution, with a small proportion of women perceiving higher costs than men, and a larger proportion perceiving lower costs. For monetary costs, we find that women perceive similar costs to men on average, though this masks variation across the distribution. Comparing the elicited costs with the actual costs (based on GP-level median costs for households with toilets) incurred by households with toilets of a similar model, we document that a substantial fraction of both men and women (74% and 67%, respectively) *over-estimate* the cost of the toilet by more than INR 5,000 (perceived cost of INR 33,000 on average vs INR 20,000 average actual cost).

Within households, however, we document significant variation in intra-household differences in perceptions. While there is a significant proportion (38%) of households in which women perceive higher benefits of the toilet than men, there is a large share of households (32%) where the woman and man have similar perceptions (within 0.5 standard deviations), or where men perceive higher benefits than women (30%). We document similar variation in intra-household differences in perceptions of costs (monetary and non-monetary): in particular, in 34% (40%) of households, men (women) believe that a toilet is less costly than women (men) do. Thus, the distributions of perceptions of costs and benefits by gender for the whole sample capture variation *across* and *within* households. In other words, gender differences in perceptions documented in the sample as a whole need not generalize to within households.

To understand better how perceptions of costs and benefits of sanitation interact with decision-making power within the household and access to credit, we develop a theoretical model of intra-household decision making in which a couple bargains over

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[2]The toilet, a picture of which was shown to respondents, was a twin-pit toilet similar to those recommended by the Government of India, and desired by households in the context.

borrowing, investment and consumption choices. This exercise builds on models of intra-household bargaining in which non-cooperative behaviour by household members serve as the threat point (Lundberg and Pollak, 1993; Kanbur and Haddad, 1994; Chen and Woolley, 2001), as well as previous models of intra-household bargaining that include borrowing and investment decisions (Ligon, 2002; van Tassel, 2004; Ngo and Wahhaj, 2012).

The model confirms the intuition that sanitation investments are more likely when the household member with greater decision-making power has a higher net perceived benefit from the investment. However, it also reveals that improved access to credit has a larger effect on loan uptake and investments when the household member with less decision-making power has the higher net perceived benefit. In a context such as the one we study, where women have lower decision-making power, the model would therefore support the strategy of making sanitation loans available to women, assuming that they indeed perceive higher returns from the investment than their spouses. The intuition behind this result is that improved credit access increases the surplus generated by borrowing and investment, and thus increases the scope for compensating the spouse with greater bargaining power when he also has the lower net perceived benefit from the investment.

Building on predictions from the theoretical framework, and exploiting the random allocation of the micro-credit program to GPs, we then estimate how the documented intra-household differences in perceptions, and bargaining power impact household decisions at the borrowing and construction stages of the sanitation investment process. We document two core results.

First, we find that intra-household gender differences in benefit and cost perceptions matter for borrowing and sanitation investment decisions, but at different stages of the process. Intra-household gender differences in benefit perceptions affect *demand for the sanitation loan*: in particular, households where the woman perceives the benefit of the toilet to be similar or higher than the man are around four times more likely to take a sanitation loan compared to households where the woman's benefit perception is lower than the man's. Intra-household differences in cost perceptions (either monetary or non-monetary), by contrast, do not have any statistically significant differential impacts on sanitation loan take-up. Uptake of a toilet, on the other hand, is significantly influenced by intra-household differences in perceptions of monetary costs. Though loan take-up is not statistically significantly different in households where the woman has similar or higher cost perceptions as the man, it is only in households where she has a lower cost perception than the man that the sanitation loan results in a new toilet. We show that this is because women with lower cost perceptions than their spouses were over-estimating the toilet cost by a lower amount, and thus had relatively more accurate cost perceptions. Put together, these findings highlight the importance of not just considering the influence

of benefit but also cost perceptions in seeing an investment through.

Second, we shed light on the role of female bargaining (or decision-making) power in shaping borrowing and investment decisions. We find that while the distribution of this measure does not, on its own, generate differential impacts of the intervention on sanitation loan take-up or toilet ownership, differential impacts of costs and benefit perceptions are observed only in households where the woman has a certain level of bargaining power (at least medium, as per our measure). These are households where the woman is involved – often with other household members – in making decisions on borrowing and investments. In households where women have no final say in decisions, intra-household differences in perceptions of costs and benefits do not influence loan or toilet take-up.

Interestingly, in line with the theoretical predictions, the effect of the intervention on sanitation loan take-up and sanitation investment is largest in the households where the woman has relatively moderate bargaining power, and has relatively higher benefit perceptions (for sanitation loan take-up) and relatively lower monetary cost perceptions (for sanitation investments). These were the households that the model identified would be most affected by the sanitation micro-credit intervention. Thus, our results show that intra-household differences in perceived costs and benefits interact with bargaining power to influence decisions to make large sanitation investments, and thereby affect the success of programs providing access to financial tools to women.

These findings shed new light on how intra-household factors influence borrowing decisions, how they interact with microfinance (Pitt and Khandker, 1998; Holvoet, 2005), and with the adoption of goods and practices for which women may have higher private returns than men, including cookstoves (Miller and Mobarak, 2013), contraceptives and reproductive health (Ashraf et al., 2014; Cassidy et al., 2021; Ashraf et al., 2020), and some preventive health investments (Meredith et al., 2013). We show that there is wide variation in intra-household perception differences across households, and that these differences in perceptions of costs and benefits interact with bargaining power to influence decisions at different stages of the investment process for a different large, durable household investment – a household toilet.

2 Context and Study Design

2.1 Context

Our study takes place in rural areas of Latur and Nanded districts in Maharashtra, India. Maharashtra, with its capital Mumbai, is one of the largest, and richest, Indian states. However, incidence of poverty remains close to the national average, implying severe inequalities within the state (GoM, 2012). Latur and Nanded are relatively disadvantaged

districts in Maharashtra, ranking close to the bottom of the state in the 2011 Human Development Index (GoM, 2018). The main economic activity is agriculture, engaging over 70 percent of the population (GoI, 2011a,b).

At the onset of the study in 2014, close to one billion people defecated in the open globally, with 60% of those located in India. In our study districts, only 27% of households owned a toilet, with the remaining mainly defecating in the open.

Gender dynamics play an important role in sanitation investment decisions in this context. As with most of India, our study context is highly patriarchal. Women have limited decision-making power and face significant restrictions on their mobility and behaviour (Kandpal and Baylis, 2019). Men are considered to be the main bread-winners, and control household resources. Recent experimental evidence also shows that Indian men place little weight on information held by their wives (Conlon et al., 2021). As we show in Section 3.5, and consistent with other studies, decisions on making large household purchases are overwhelmingly taken by males (husbands, fathers-in-law). In the case of sanitation specifically, studies such as Routray et al. (2017) document that beyond the decision to construct a toilet, women are rarely consulted or involved in construction activities, or decisions such as where to place the toilet, purchase of materials, choice of mason, etc. Decisions to engage with sanitation construction programs are also often deferred to men (Routray et al., 2017).

Moreover, returns and costs of having a household toilet are also likely to be different by gender. On the one hand, women stand to benefit more from a household toilet. They find it more challenging to find a safe and private place to relieve themselves, and are more subject to harassment and sexual assault (Saleem et al., 2019). Internalising these costs, women take costly actions such as going out to defecate in the dark, and controlling their body functions to avoid having to relieve themselves during the day, leading to health problems (Caruso et al., 2017). Girls also benefit from sanitation investments in male-biased societies where they are disadvantaged in obtaining health care, since these can help reduce illnesses such as diarrhoea – a leading cause of infant mortality globally (Augsburg and Rodriguez-Lesmes, 2018). On the other hand, however, women – who usually do the housework – also face the burdens of fetching water and cleaning toilets. We document the gender differences in perceived benefits and costs in detail in Section 3.3.

2.2   Intervention

We study how differences in intra-household bargaining power and perceptions of the costs and benefits of household toilets affected the effectiveness of a sanitation microcredit intervention. A large MFI active in 5 states in India made available a new sanitation

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loan product to its existing female clients.[3] The sanitation loan product could be used to finance construction of a new toilet, or the repair or upgrade of an existing one. The loan was disbursed in cash terms and no information on, or assistance in choosing a toilet model, or acquiring the necessary materials and labour were provided. Further, actual loan use was weakly monitored and not enforced or incentivized by the MFI. Following Augsburg et al. (2021), we refer to this loan product as a labelled loan.

Product details are listed in Table 1. The maximum loan amount was INR 15,000 (USD 225) with an average interest rate of 20% per annum over the study period at a declining balance with a 2-year maturity. Although clients could choose between weekly or biweekly repayments, all chose to the weekly option. The loans were collateral-free, but provided on a joint-liability basis within groups of 5-10 clients. Clients could take a sanitation loan only once. However, they could take it along with other loans offered by the MFI (business, education, emergency), within borrowing caps set by the Reserve Bank of India.[4]

Though the sanitation loan is offered to its female clients, the MFI requires agreement from her spouse before any loan application is processed. In our sample, when asked who takes the decision whether or not to take a loan, 79% of women responded either their husband solely or both of them jointly (breakdown in Appendix H1).

Table 1
Sanitation loan characteristics

Amount:	Up to INR 15,000
Interest rate:	22% (later 18%) per annum on a declining balance
Loan maturity:	2 years
Payment frequency:	Weekly/Bi-weekly basis
Collateral:	None, but joint-liability
Cost of the loan:	19.9% - 24.1 % of the amount disbursed depending on interest rate
Other costs:	Processing fee of 1.1% of principal and INR 306 for life insurance premium

As appears in Augsburg et al. (2021)

2.3 Experimental design

The sanitation loan product was rolled out in the study areas from February 2015, on a staggered basis across 5 participating branches. In order to evaluate its effectiveness, the product was initially only offered in 40 randomly selected Gram Panchayats (GPs) out of

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[3]To be eligible for the sanitation loan, clients must have been a member of the MFI for at least one year.

[4]Augsburg et al. (2021) report very high rates of repayment (virtually 100%) of this loan, suggesting that the loan's features (e.g. label) and the MFI's processes (e.g. women need to be a client for at least one year before they can take a sanitation loan; joint liability and provision of larger loans conditional on successful repayment of current loans) succeeded in ensuring that it was clients intending to make sanitation investments, and who could afford loan repayments who took the loans.

81 GPs where the MFI had existing operations. This unit of randomization of the cRCT is the smallest administrative unit in India, and is charged with the implementation of numerous programs including the Government's sanitation policy. The remaining 41 GPs formed part of a control group which continued to receive all other services from the MFI as usual. The random allocation was stratified by the MFI branch and size of the GP in order to boost power.

As described in Augsburg et al. (2021), care was taken to avoid contamination of control GPs. This was very successful with only 21 loans given out in control areas, mainly due to clients asking for loans rather than loan officers (mistakenly) offering loans in control GPs.

3   Data

3.1   Study sample

Our analysis draws on two rounds of survey data collected from a sample of households with clients of the MFI – a baseline survey with approximately 15 MFI client households per study GP in December 2014/January 2015, and an endline survey collected between August and September 2017, around 2.5 years after intervention roll-out in February 2015. Households were sampled from a list of partner MFI clients active in November 2014. We over-sampled clients from households with children aged less than 2 years, which we control for in the analysis. At endline, we successfully re-interviewed 94% of the baseline sample, balanced between treatment and control.

Our analysis focuses on 1,134 households surveyed at both baseline and endline. For this sample, we have baseline information on perceptions of safe sanitation collected for an adult male and female respondent, and within-household decision-making power. We also collected data on sanitation ownership and behaviour (baseline and endline). This survey data is combined with administrative data from the MFI on loans taken from it by clients in the study GPs.

Table 2 provides descriptives on household characteristics (panel A) and the head's characteristics (panel B) for this sample. On average, sampled households had 5.5 members, 71% of households primarily earned income from agriculture-related activities (22% as cultivators, 36% as agricultural wage laborers and 13% from allied agriculture); 71% of households were Hindu with Islam the second most common religion (15% of households); 29% and 46% of households were from the Other Backwards Caste (OBC) and Scheduled Caste (SC) or Scheduled Tribe (ST) respectively. 24% of households owned a toilet at baseline, 87.5% of which were functioning (21% of households). Household heads were predominantly male (92%) with an average age of 43 years of age and 6 years of education.

Table 3 focuses on characteristics of the individual survey respondents - usually the mother of the youngest child aged under 6 years and her spouse.[5] The average female respondent was 30.6 years old with nearly 5.7 years of education; 35% contributed to household income in the week prior to the survey. 68% of women were married to the household head and had been married for 13 years. 39% were living with their mother-in-law and 22% were part of a loan group. While 84% of female respondents could visit a neighbour on their own, mobility to go to local markets or to visit friends outside the village on their own was much more limited, with only around 50% reporting being able to do so.

The male respondent was older, with an average age of 35.9 years, and had 7.53 years of education. They were much more likely to contribute to household income in the week prior to the survey – 86% – relative to the female respondent. 73% were the household head.

The sample is well balanced between treatment and control communities, with a small imbalance detected (at the 10% level) only on whether or not the household is from an other backward caste, and on whether the male respondent had contributed to household income in the week prior to the survey.

3.2 Outcomes

Our analysis focuses on two core outcomes: whether a household took a sanitation loan over the course of the study, and whether or not it owned a toilet or had one under construction at endline.[6]

We measure sanitation loan uptake from administrative data from the MFI. These data, which we can link to our survey data, provides objective and complete information on study households' borrowing behaviour with the MFI over the course of the study (February 2015 - September 2017).

Toilet uptake is measured through a detailed sanitation module collected at baseline and endline, including information on toilet ownership, the type, functionality and construction costs. If a household reported having a toilet, the interviewer asked to observe it. We use this interviewer observed measure of toilet ownership as our main measure of sanitation investment.

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[5]If no child under the age of 6 years was present in the household, then the household head and his female spouse were surveyed. Since the majority of respondents were couples, we refer to the male and female respondents interchangeably as 'husband' and 'wife' in the text.

[6]In principle, the sanitation loan could have been used to repair or upgrade an existing toilet. In practice, Augsburg et al. (2021) finds that loans were primarily used to fund new toilet construction, with only a small proportion of loans used for repairs or upgrades. Thus, we focus on toilet ownership as our main measure of sanitation investments.

Table 2

Descriptive statistics and treatment-control balance (household survey)

	All	Control group			SL-Control
	(1)	(2)	(3)	(4)	(5)
	N	N	Mean	SD	Difference
Panel A: Household characteristics					
No. of HH members	1134	589	5.49	2.11	-0.08
Extended household	1134	589	0.49	0.50	-0.03
Primary activity: Cultivator	1134	589	0.22	0.42	0.01
Primary activity: Agriculture wage labour	1134	589	0.36	0.48	0.01
Primary activity: Allied agriculture	1134	589	0.13	0.34	0.00
Primary activity: Waged employment	1134	589	0.22	0.42	-0.02
Primary activity: Self employed	1134	589	0.04	0.20	0.01
Primary activity: Other	1134	589	0.02	0.12	-0.00
Religion: Hindu	1134	589	0.71	0.46	-0.04
Religion: Islam	1134	589	0.15	0.36	0.04*
Religion: Other	1134	589	0.14	0.35	0.00
Caste: Other backward caste (OBC)	1132	588	0.29	0.45	-0.05*
Caste: Scheduled caste (SC) or Scheduled tribe (ST)	1132	588	0.46	0.50	0.00
Caste: Denotified tribe (DT) or Nomadic tribe (NT)	1132	588	0.07	0.26	0.02
Caste: Forward caste	1132	588	0.18	0.39	0.03
Household owns toilet	1134	589	0.24	0.43	0.03
Household owns a functioning toilet	1134	589	0.21	0.41	0.03
Attrition	1208	621	0.05	0.22	0.02
Panel B: Household head characteristics					
Male	1134	589	0.92	0.27	0.00
Age (years)	1134	589	42.6	11.3	-0.09
Education (years)	1071	560	6.13	4.58	0.15
Able to read & write	1134	589	0.69	0.46	0.01

Note: Column 1 reports the total number of observations per variable. Columns 2-4 report the number of observations, mean and standard deviation specific to the control group for each variable. Column 5 displays the difference in mean values between the SL treatment group and the control group. Stars signify the level of statistical significance of this difference. Standard errors are clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$. *Extended household* is a dummy variable =1 if the household roster includes any other relative than a couple and their dependent children. The treatment indicator (SL) =1 if a household is located within a GP that was selected to receive the sanitation loan product.

Table 3

Descriptive statistics and treatment-control balance (Individual surveys)

	All	Control group			SL-Control
	(1)	(2)	(3)	(4)	(5)
	N	N	Mean	SD	Difference
Panel A: Women's characteristics					
Age (years)	1133	589	30.6	9.35	0.01
Education (years)	1079	567	5.65	4.04	0.08
Year's of marriage	1105	576	12.9	9.76	-0.09
Is married to household head	1134	589	0.68	0.47	0.02
Lives with her mother-in-law	1134	589	0.39	0.49	-0.01
Member of loan group	1134	589	0.22	0.41	-0.00
Contibuted to HH income last week	1132	588	0.34	0.47	-0.02
Bargaining power score	931	496	6.83	4.53	-0.03
Can go to local market alone	1108	577	0.51	0.50	-0.02
Can visit neighbour alone	1124	583	0.84	0.37	-0.03
Can visit friend outside village alone	1117	580	0.50	0.50	0.01
Panel B: Men's characteristics					
Age (years)	1074	553	35.9	10.1	-0.00
Education (years)	1041	539	7.53	4.11	0.02
Is household head	1074	553	0.73	0.44	0.01
Contibuted to HH income last week	1074	553	0.86	0.35	0.04*

Note: Column 1 reports the total number of observations per variable. Columns 2-4 report the number of observations, mean and standard deviation specific to the control group for each variable. Column 5 displays the difference in mean values between the SL treatment group and the control group. Stars signify the level of statistical significance of this difference. The treatment indicator (SL) =1 if a household is located within a GP that was selected to receive the sanitation loan product. Standard errors are clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

3.3 Measures of cost and benefit perceptions

We collected novel data on perceptions of costs and benefits of sanitation from both a male and a female household member during the baseline survey. Each of these interviews was conducted by an interviewer of the same gender and took place in a private/secluded area. The female respondent was usually the mother of the youngest child in the household, or spouse of the household head. The male respondent was typically the spouse of the female respondent; or the head of the household.[7] We collected information on three dimensions of costs and benefits: (i) monetary cost expectations for three standardized

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[7]In a small number of cases, the female respondent was a widow or her spouse was not present in the household (e.g. due to temporary migration). In this case, another male adult household member was selected to respond to the survey.

toilet models; (ii) non-monetary costs (e.g. time burdens for cleaning toilets) and (iii) benefits (e.g. safety of female household members, or improved household status) of one of two standardized toilet models.

A challenge in collecting data on perceptions of costs and benefits of an investment is that respondents might have in mind different types of toilets with varying qualities. Thus, variation in reported perceptions would also include variation in (unobserved to the researcher) toilet quality, which would confound comparisons of these perceptions within the household (as we wish to do here) and across the sample as a whole. To overcome this challenge, we asked respondents to indicate their perceptions of costs and benefits for the same images of toilets (shown below) of varying quality and cost.

Specifically, we elicited respondents' expectations of the minimum and maximum cost (in INR) for three models of toilets (shown in Figure 1), that were described as follows:[8]

- Toilet 1 is the simplest type with an unlined dug pit and a basic (kutcha) structure.

- Toilet 2 has a lined single pit and a simple structure (with roof) that protects from the rain and provides privacy. Of the three types, toilet 2 is the most similar to the standard of toilet recommended (and built) by the government.[9]

- Toilet 3 is a dual-pit toilet with a septic tank and a pucca (strong) super-structure, it is fitted with a lock for privacy and has a pipe for ventilation.

We are able to map toilet models 2 and 3 to toilets actually constructed by households, allowing us to calculate a GP-level price for these two toilet models. Specifically, we take the costs reported by households with a specific toilet model and deflate them to 2010 INR terms. Next, we calculate a median cost for that model at the GP-level so as to average out any quality-related contributions to the reported cost. For GPs where there were insufficient numbers of households with these toilet models, we calculate the median at a more geographically aggregated level (usually, at the block (or sub-district) level).[10]

We elicited perceptions of non-monetary costs and benefits of the toilet using a vignette. To avoid survey fatigue, respondents were randomly shown a picture of either toilet model 1 or model 3 and informed that a fictitious household in their village had

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[8]In addition to the construction cost, we also elicited respondents' expectations of the minimum and maximum time in years they expected each toilet model could be used before it would require repair, or emptying of the pit(s). From this data, we calculate each respondent's average duration expectation as the mid-point of the minimum and maximum duration. We find that duration expectations are highly correlated with monetary cost perceptions. Thus, in what follows, we focus our analysis on monetary cost perceptions but report the results for expected duration in Appendix G.1.

[9]61% of masons responded that the most common type of toilet built by households was a "flush/pour flush to pit latrine" (*source: mason survey*).

[10]This approach is in line with Attanasio et al. (2013) who use a similar strategy to obtain median unitvalues for food items in order to value home-produced food consumption in Mexico.

Figure 1
Toilet types
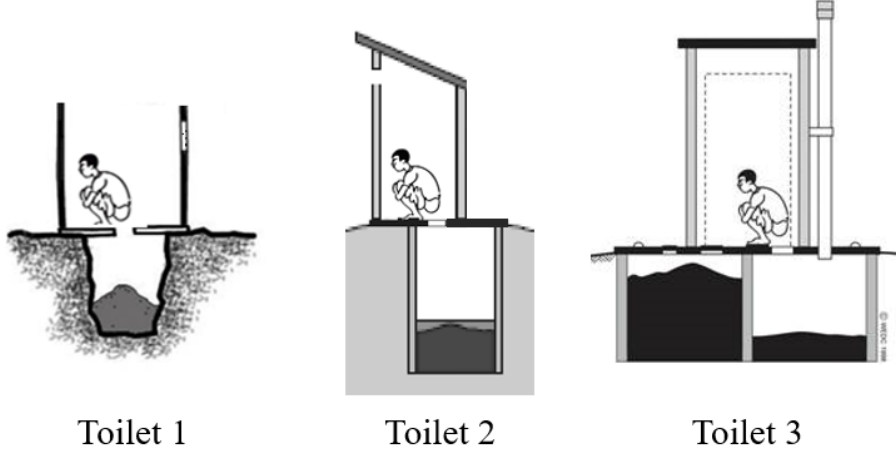
constructed a toilet of this type. They were then asked to indicate the extent to which they agreed (on a Likert scale with 5 points) with a series of statements – reproduced in full in Appendix B – relating to costs and benefits identified in the literature as being important in affecting adoption decisions. They capture perceptions of benefits such as improved health (and as a consequence reduced health expenditures), improved safety for women and children, increases in labor supply due to better health, improved status, time saving (since one doesn't need to walk far to find a suitable place to defecate), and overall improved happiness and well-being.

They also captured opinions on non-monetary costs – identified by academic and policy literature – such as toilets are unhealthy because they stink, having a toilet reduces opportunities for social interactions, increases time to fetch water, or could even lead to worse health. The responses were re-coded so that a higher value indicated more agreement with the statement. Thereafter, we combine responses into two indices for non-monetary costs and benefits using polychoric Principal Component Analysis (PCA). Responses from the male and female respondents were pooled when conducting the polychoric PCA to ensure that the same loadings are attached to each of the variables underlying the indices. This allows us to make comparisons across genders (and within household) and to interpret differences in the indices as differences in perceptions.[11]

In what follows, we focus our analysis on the perceptions pertaining to toilet model 3 - the twin pit toilet with a septic tank and a pucca (i.e. strong) super-structure. This toilet model is the one that households in our context most aspire to (Coffey and Spears, 2017). However, we use the data for the other two toilets for validation purposes. These validation exercises – reported in Appendix D – show that the male and female respondents correctly perceive that the basic toilet (Toilet 1) is cheaper than the intermediate

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[11]Factor loading tables are available in the Appendix C.

model (Toilet 2), which in turn is identified as being cheaper than the twin pit septic tank model (Toilet 3). Moreover, respondents also perceive lower benefits and higher non-monetary costs for toilet 1 relative to toilet 3.

The data reveal some novel insights into gender differences in perceptions of costs and benefits of household toilets; and on intra-household gender differences in these perceptions. We describe these in turn.

3.3.1 Gender Differences

Benefit Perceptions   Panel A of Figure 2 displays the distributions of perceived benefits scores for male and female respondents in our sample. A higher score indicates higher perceived benefits. The Figure shows that most male and female respondents perceive high benefits associated with this toilet; though women perceive higher benefits than men. The two distributions are statistically significantly different from one another as shown by a Kolmogorov-Smirnov test - we reject the null hypothesis (equality of distributions) with a test statistic of 0.18 and a p-value of 0.00. On average, as also shown in Table 4, and consistent with evidence showing that women have higher private returns to private toilets (e.g. Saleem et al. (2019)) women perceive higher benefits from the toilet compared to men.

Monetary Costs   Panel B of Figure 2 plots the distributions of the average expected monetary cost for toilet 3, calculated as the mid-point between the minimum and maximum reported by male and female respondents in our sample. Overall, the Figure indicates wide variation in expected monetary costs for this toilet, with men generally reporting a higher cost compared to women, except at the right tail where more women report very high cost expectations. The two distributions are statistically different from one another, as evidenced by the rejection of the null hypothesis of equality of distributions by the Kolmogorov-Smirnov test, with a test statistic = 0.22 and a p-value = 0.00.

While the two distributions are different from one another, the average expected monetary cost reported by women and men is very similar at just over INR 33,000 (in 2010 INR) (Table 4). This is significantly higher than the maximum sanitation loan provided by the MFI and the actual median costs paid by households with a similar toilet model in our sample (INR 20,000 in 2010 INR), indicated by the dashed vertical line in Figure 2. Interestingly, a majority of the male and female respondents in our sample have significantly *higher* average cost expectations than the actual costs.[12] On average, the over-estimation is just over INR 13,000 (USD 195) for both male and female

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[12]We define accuracy as the distance between the respondent's average estimate and the "true" value. True cost values are calculated using the GP median reported price paid for existing toilets in the baseline household survey.

Figure 2
Sanitation perceptions distributions

Panel A. Benefits

Panel B. Monetary costs

Panel C. Non-monetary costs
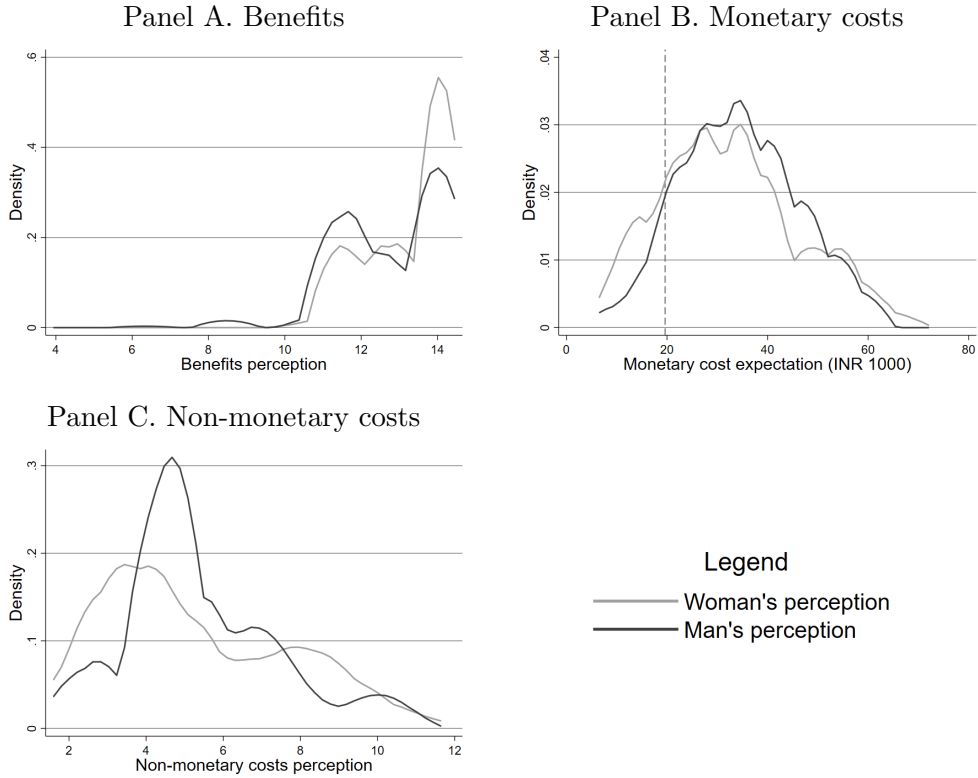
Note: The Figure displays the non-parametric distributions (estimated using an Epanechnikov kernel function) of the individual perception responses, corresponding to Benefits (Panel A), Monetary costs (Panel B), and Non-monetary costs (Panel C). Distributions are displayed separately for men and women (as per the legend). Results from the Kolmogorov-Smirnov test reject the null (that male and female distributions are equal) with p-value < 0.01 for all three panels. Distributions displayed in Panel B are adjusted to remove the top and bottom 1% of responses to improve visibility. The dashed line indicates the mean "true" cost (in INR 1000, index 100=2010) paid for this toilet type (toilet 3). Additional details about the variables are presented in Appendix refappendix:D.

respondents (see Table 4).[13]

The range between the maximum and minimum cost reported by each respondent also provides a measure of the respondent's cost uncertainty. We document significant uncertainty for both women and men. On average, women and men report a range of around INR 6,500, which is around 20% of the average expected cost. However, the range is very similar by gender with no statistically significant differences detected (Table 4).[14]

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[13]When we split the sample by baseline toilet ownership, we find that 71% of men and 66% of women from households with a toilet at baseline over-estimate the cost of this type of toilet by more than INR 5,000, compared to households without a toilet at baseline where 75% of men and 68% of women over-estimate by more than INR 5,000. Interestingly, even the *minimum* cost perception reported by a large proportion of respondents (68% of men and 62% of women) significantly over-estimates the actual cost of this toilet.

[14]We consider the differential impacts of the treatment on sanitation loan uptake and investment by intra-household differences in cost uncertainty. Results presented in Appendix G.3 show that while these differences did not affect loan uptake, it is only among households in which the husband had less uncertain cost perceptions that the intervention increased toilet uptake.

Table 4
Sanitation perceptions and accuracy by gender

	Mean and SD		Difference	
	(1) Women	(2) Men	(3) Women-Men	(4) N
Benefits perception	13.2 (1.27)	12.7 (1.38)	0.47***	545
Non-monetary costs perception	5.51 (2.40)	5.33 (1.92)	0.18	545
Monetary cost perception (INR 1000)	33.7 (23.5)	33.3 (12.2)	0.37	1131
Accuracy of monetary cost perception (INR 1000)	13.8 (23.7)	13.4 (13.0)	0.39	1131
Range of monetary cost perception (INR 1000)	6.49 (5.42)	6.63 (4.12)	-0.14	1131

Note: Columns 1-2 show the mean and standard deviation (in parentheses) of male and female sanitation perceptions, cost accuracy and range. *Accuracy* is calculated as an individual's average expected monetary cost minus the GP average "true" cost. Column 3 displays the difference as calculated by the wife's average response minus her spouse's, stars signify statistical significance of this difference. Sample size is reduced due to missing values which are imputed, as per Appendix E, in our main analysis. Standard deviation in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Non-monetary costs The distributions of perceived non-monetary cost scores are shown in Panel C of Figure 2. A higher value implies higher perceived non-monetary costs. The Figure indicates stark differences in the distributions of perceived non-monetary costs for women and men. In particular, the distribution for females is bi-modal, with a large group of women perceiving low costs of having a twin-pit toilet, and a significant minority perceiving high costs. By contrast, the distribution for men is unimodal, with the modal response indicating low, though not zero, costs of having the twin pit toilet. Interestingly, while on average, the perceived non-monetary costs for women and men are similar to one another (Table 4), the distributions themselves are statistically significantly different from one another, Kolmogorov-Smirnov test statistic = 0.10 and p-value = 0.00..

3.4 Intra-household Differences in Perceptions

Overall, the data indicate significant variation and some differences in perceived costs and benefits by gender. However, it is *intra*-household differences in perceptions of costs and benefits that will influence household decisions to take sanitation microcredit and make sanitation investments. Having multiple observations of these perceptions within the same household allows us to document these. We find significant variation in intra-household gender differences in these perceptions, displayed in Figure 3. Panel A, focuses on benefit perceptions, showing that while there is a significant proportion of households

where women have higher benefit perceptions than men; there is a large proportion of households in which benefit perceptions of the male and female respondent are either similar (and so have a difference close to zero), or where the men has *higher* benefit perceptions than the woman. This pattern suggests that there is significant variation in the extent to which household members internalize (higher) private returns of toilet ownership accruing to other household members.

By contrast, the distribution of intra-household monetary cost differences is not skewed towards one gender. Panel B shows that it is centred around 0 (suggesting similar cost expectations for both the male and female respondent), with similar proportions of households where either the man holds a higher cost perception than the woman or vice-versa. Slightly more skewness (although not as much as for benefit perceptions) is seen for intra-household differences in perceived non-monetary costs (Panel C), with significant proportions of households where women perceive higher non-monetary costs than men and vice versa. This is in line with the fact that women face the bulk of the cost of day-to-day cleaning of the toilet.

Importantly, the distributions of intra-household differences show that the variation in perceptions of costs and benefits by gender documented in Figure and Table 4 is a result of variation both *across* and *within* households. Thus, they show that we cannot generalize that gender differences in perceptions within our sample as a whole will hold in a similar fashion within *all* households.

3.5   Measuring bargaining power

Our measure of bargaining power is based on a standard series of questions on household decision making in which female respondents were asked who in the household has the final say on: (i) whether or not to buy a large household item, such as a bicycle or TV or land, (ii) whether or not she (the wife) should work to earn money, (iii) how the money earned will be used, and (iv) what to do with extra money she (the wife) may receive, such as a prize or gift.[15] This elicitation method is commonly used in the literature (Cassidy et al., 2021; Jayachandran et al., 2021). Such a method is suitable for this context because, by selecting the questions that focus on financial and expenditure decisions we are able to create a bargaining power measure that is specialized and closely related to the outcomes of interest. This is motivated by recent studies (e.g. Peterman et al. (2021)) which show that women's autonomy within the household varies with the decision being made, highlighting the importance of focusing on decisions most closely related to those targeted by the intervention. Furthermore, we focus on decisions that men are known to either make as the primary decision-maker, or are involved in making

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[15]Further questions were asked about decision-making related to children. The full set of questions administered is shown in Appendix B.

Figure 3
Intra-household perceptions differences

Panel A. Benefits

Panel B. Monetary costs

Panel C. Non-monetary costs
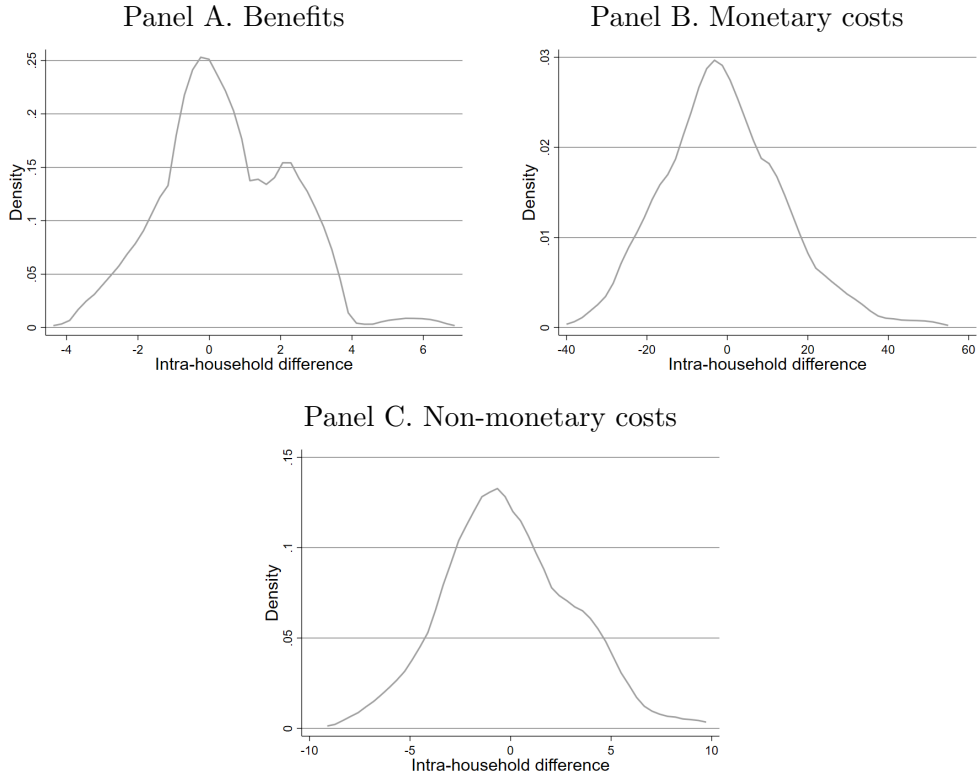
Note: The Figure displays the non-parametric distribution (estimated using an Epanechnikov kernel function) of the difference in intra-household perceptions for: Benefits (Panel A), Monetary costs (Panel B), and Non-monetary costs (Panel C). This differences is calculated as the wife's response minus her spouse's. Distributions displayed in Panel B are adjusted to remove the top and bottom 1% of responses to improve visibility.

(e.g. Routray et al. (2017)) show that men make most decisions related to making a new sanitation investment); and thus where women's involvement would likely capture her decision-making power.

We generate a bargaining power score by first re-coding the responses to each of the decisions to range from 0 (woman reports not to be involved in any of the decisions) to 6 (woman takes all decisions by herself only).[16] Intermediate values capture decision-making by multiple household members (e.g. her spouse, and/or in-laws), including potentially the woman herself.[17] Thereafter, we combine these decisions into a bargaining power score using polychoric PCA of these base variables, with resulting factor loadings

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[16]The precise response options were: 1 I decide, 2 my husband, 3 me and my husband together, 4 my mother in-law, 5 my father in-law, 6 my mother, 7 my father, 8 any other family member, 9 Other, 10 not applicable. Multiple answers were possible. When the response 'not applicable' was chosen, we set the the score to 0. This happens for example when the woman does not earn money herself, and hence cannot decide over it. We account for this choice in our analysis.

[17]The results are similar when using binary indicators for decision making that capture any involvement by the woman in the decision, while ignoring the number of decision-makers involved. Results are displayed in Appendix F4 and F5.

shown in Appendix Table C1.

Figure 4
Bargaining power distribution
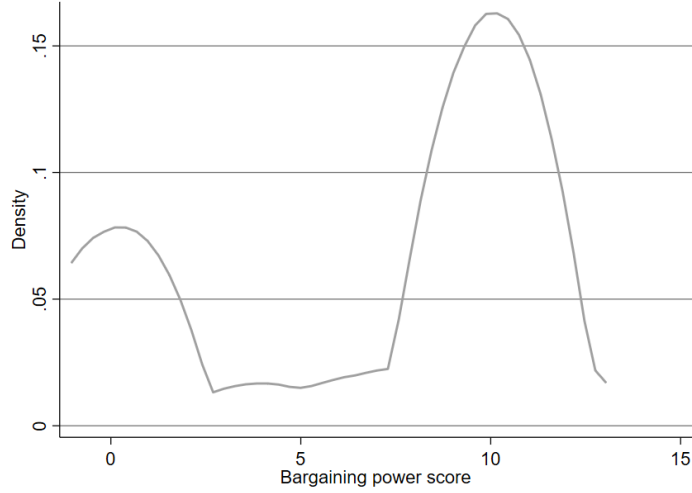
Note: Distribution is estimated non-parametrically using an
Epanechnikov kernel function. A higher bargaining power score reflects
both (i) a higher rate of involvement in decision making and (ii) fewer
decision makers (conditional on involvement).

The resulting distribution is bi-modal, as shown in Figure 4: a significant share of
women have very little bargaining power, and another - larger - share of women have
relatively high bargaining power. However, as we show in Table 5, women with relatively
high bargaining power usually make decisions with their spouse rather than by themselves
(except in female-headed households). In our analysis, we split the sample into three
categories: those with a relatively high female bargaining power score (High Bargaining
Power, or High BP hereon), those with medium scores (Mid Bargaining Power, or Mid
BP hereon) and those with low female bargaining power (Low Bargaining Power, or Low
BP). Women from households in the High BP group report being involved in all decisions
(Table 5), often alongside her partner or another household member (1.85 household
members are reported to participate on average), while women in the Mid BP group are
involved in most (but not all) decisions – with other household members. By contrast,
women in the Low BP group are not involved in making decisions on any of the four
domains considered. Decisions are primarily taken by their husbands or other household
members.

We assess the validity and relevance of this proxy of bargaining power by first ex-
ploring its correlation with a range of female characteristics linked with agency in the
literature, shown in Appendix F1. Using a similar list of covariates considered in Peter-
man et al. (2021) and Calvi (2020), we find sensible correlations. For example, bargaining
power is positively correlated with a woman's age (although not significant at the 10%
level), whether she contributed to household income in the last 6 months, whether she has

her own bank account, and with the ability to visit the market and neighbours alone. Conversely, bargaining power scores are negatively correlated with living with the woman's mother-in-law, having children under the age of two in the household, and the number of male HH members. Second, we show that conclusions from our main analysis are robust to using an alternative measure of bargaining power that includes children-related decisions (Appendix F2 and F3).

Table 5
Bargaining power breakdown

	Prop. of involvement:				No. of decision makers	N
	Wife	Husband	Other males	Other members		
Low BP	0.01	0.77	0.27	0.16	1.21	290
Mid BP	0.73	0.88	0.14	0.17	1.92	218
High BP	1.00	0.83	0.00	0.01	1.84	512
Total	0.66	0.83	0.11	0.09	1.68	1020

Note: The table reports the proportion of involvement in the four household decisions used to calculate bargaining power and the average number of decision makers by the wife's bargaining power group. Sample size is reduced due to missing values which are imputed, as per Appendix E, in our main analysis.

4 Theoretical Framework

To assess how intra-household differences in perceptions and bargaining power influence sanitation loan demand and sanitation investments, we specify a theoretical framework. We model sanitation investments as an investment in a durable household public good. The household has the option of taking a loan to meet the cost of the sanitation investments. The household members have potentially heterogeneous preferences over the perceived benefits and costs of sanitation investments and the decision about whether to take a loan and make the investment choice is the outcome of intra-household bargaining. We model the bargaining outcome using the Nash Bargaining Solution with non-cooperative behaviour within the household serves as the threat point (Lundberg and Pollak, 1993; Kanbur and Haddad, 1994; Chen and Woolley, 2001). Additionally, we draw on models of intra-household bargaining that include decisions about borrowing and investments (Ligon, 2002; van Tassel, 2004; Ngo and Wahhaj, 2012).

4.1 Setup

We consider a two-person household with members m (male) and f (female) that makes consumption decisions over two periods. We denote by x_{it} private consumption by household member $i \in \{m, f\}$ in period t. In addition to private consumption, the household

members may derive utility from a household toilet – a durable household public good – and $d_t \in \{0,1\}$ indicates whether the household has made a sanitation investment by period t. The utility obtained by household member i in period t is given by

$$u(x_{it}) + d_t \theta_i$$

where $u(.)$ is a twice continuously differentiable function, $u'(.) > 0, u''(.) < 0$ and $\lim_{x \to 0} u'(.) = \infty$ and $\theta_i \geq 0$ is the expected utility (of perceived benefits net of perceived non-monetary costs) that the household member i derives from a sanitation investment. Utility in the second period is discounted by a factor $\beta \in \{0,1\}$ compared to the first period.

The household has income y_t in period t and a sanitation investment involves a fixed monetary cost c. In period 1, the household has access to a loan of size L at interest rate R_l; i.e. the loan would require repayment of LR_l in period 2. In addition, the household may opt to save part of its income in period 1, and there is a return R_s on savings.

Household Decision-Making: There are two modes of household decision-making: cooperative and non-cooperative. In the case of non-cooperative decision-making: f controls a fraction $\lambda \in [0,1]$ of household resources where λ is an exogenous parameter; m can unilaterally make a sanitation investment but f cannot; m can unilaterally save but f cannot; and neither m nor f can obtain a loan. In the case of cooperative decision-making: household resources are pooled; the household can obtain a loan; and the allocation of resources is determined by the Nash bargaining solution, with the threat point corresponding to non-cooperation within the household.

4.2   Equilibrium Analysis

To determine the sanitation investment decisions for a specific household, as defined by the parameters $(\theta_m, \theta_f, y_1, y_2, \lambda)$, we first analyse household behaviour in the absence of cooperation. For ease of notation, we define $\lambda_f = \lambda$ and $\lambda_m = 1 - \lambda$.

For the subsequent analysis, we assume that c is known at the time the household makes borrowing and investment decisions. In Section 4.5, we allow for uncertainty in c and spousal differences in beliefs about c. To facilitate the analysis, we make a number of other simplifying assumptions about preferences, income and interest rates. We consider in Section A.1 how relaxing these assumptions would affect the predictions of the model about loan uptake and sanitation investments.

Assumption 1 $u'(\mu y_1) > R_s \beta u'(\mu y_2)$ *for each* $\mu \in [0,1]$.

Assumption 1 implies that, for any division of household income, the household members would prefer not to save out of period 1 income to consume in period 2.

Non-Cooperative Behaviour: In a non-cooperative household, f cannot invest in the durable good and she cannot save. Therefore, her only recourse is to spend $\lambda_f y_t$ on private consumption in period t. On the other hand, m is akin to an individual with income $\lambda_m y_t$ in period t with no access to loans. Therefore, the consumption-saving-borrowing-investment choices available to m are as follows:

Table 6

Utility obtained by spouse m in the absence of cooperation

#	Choice	Utility
1	No loan, no investment	$u\left(\lambda_m y_1\right) + \beta u\left(\lambda_m y_2\right)$
2	No loan, durable good in period 1	$u\left(\lambda_m y_1 - c\right) + \beta u\left(\lambda_m y_2\right) + (1 + \beta)\,\theta_m$
3	No loan, durable good in period 2	$u\left(\lambda_m y_1\right) + \beta u\left(\lambda_m y_2 - c\right) + \beta\theta_m$

We can show that, for a given θ_m, if c is large enough relative to $\lambda_m y_1$ and $\lambda_m y_2$, then there will be no sanitation investment in the absence of cooperation. If m chose to invest even in the absence of cooperation, then these investments would always take place in equilibrium regardless of f's preferences regarding sanitation investments and the distribution of bargaining power within the household. Thus, the interesting cases arise only if the following condition holds:

Assumption 2 *The monetary cost of sanitation investment c is sufficiently large relative to $\lambda_m y_1$, $\lambda_m y_2$ and θ_m that m prefers not to make a sanitation investment in the absence of cooperation.*

Thus, under Assumption 2, the non-cooperative outcome is the following: there is no sanitation investment, household member i spends a share λ_i of total household income on private consumption each period and obtains a utility of $u\left(\lambda_i y_1\right) + \beta u\left(\lambda_i y_2\right)$.

Cooperative Behaviour: By assumption, when houseold members cooperate they have the option of taking a loan and making a sanitation investment. The available choices are described in the table below:

Table 7

Utility obtained by spouse i under cooperation

#	Choice	Utility of Spouse i
1	No loan, no investment	$u\left(\mu_i y_1\right) + \beta u\left(\mu_i y_2\right)$
2	No loan, durable good in period 1	$u\left(\mu_i\left(y_1 - c\right)\right) + \beta u\left(\mu_i y_2\right) + (1 + \beta)\,\theta_i$
3	No loan, durable good in period 2	$u\left(\mu_i y_1\right) + \beta u\left(\mu_i\left(y_2 - c\right)\right) + \beta\theta_i$
4	Loan, durable good in period 1	$u\left(\mu_i\left(y_1 + L - c\right)\right) + \beta u\left(\mu_i\left(y_2 - LR_l\right)\right) + (1 + \beta)\,\theta_i$
5	Loan, durable good in period 2	$u\left(\mu_i\left(y_1 + L\right)\right) + \beta u\left(\mu_i\left(y_2 - LR_l - c\right)\right) + \beta\theta_i$
6	Loan, no investment	$u\left(\mu_i\left(y_1 + L\right)\right) + u\left(\mu_i\left(y_2 - LR_l\right)\right)$

In Table 7, μ_f and μ_m are choice parameters corresponding to the shares of dis-

posable income allocated to each household member in a cooperative agreement.[18] By construction, we have $\mu_f, \mu_m \in [0,1]$ and $\mu_f = 1 - \mu_m = \mu$. If the couple chose to make sanitation investments even in the absence of a loan, then loans would be taken for consumption purposes only and, contrary to our empirical findings, perceptions of benefits and costs of toilet ownership would have no effect on loan uptake. Therefore, we make the following assumption for the subsequent analysis.

Assumption 3 *The monetary cost of sanitation investment c is sufficiently large relative to y_1, y_2 and θ_m, θ_f such that, for any $\mu \in [0,1]$, both spouses prefer not to make a sanitation investment in the absence of a loan.*

If future household income is sufficiently large compared to current income, then the spouses may prefer to defer sanitation investments even when they have access to a loan. While this is plausible, allowing for such behaviour does not affect the key predictions from the model. For ease of exposition we rule out this possibility in our analysis:

Assumption 4 *If a household opts to take a loan, disposable income in period 1 exceeds that in period 2: $y_1 + L > y_2 - LR_l$.*

If θ_i is sufficiently large relative to c, then spouse i would prefer to use a loan for a sanitation investment rather than use it for consumption. In our analysis, we focus on couples for whom this condition holds true. Empirically, it is likely that some households take the loan specifically for consumption purposes. But, once again, perceptions of benefits and costs of toilet ownership would not affect the loan uptake decisions for these households. As such, we can ignore them in deriving predictions regarding the effects of these perceptions on loan uptake and sanitation investments. Therefore, we make the following assumption:

Assumption 5 *For both spouses, the perceived net benefit of sanitation investment θ_i is sufficiently large relative to its cost such that, for any $\mu \in [0,1]$, they prefer to make a sanitation investment if a loan has been taken.*

Under Assumptions 3-5, Choice 1 in Table 2 constitutes Pareto Improvement over Choices 2 and 3, and Choice 4 constitutes a Pareto Improvement over Choices 5 and 6. Then, the only remaining choice is between Choice 1 and Choice 4.

Equilibrium: If the couple chooses (1), it must be that $\mu = \lambda$, i.e. they agree to divide disposable income according to the income shares they control, as this is the only

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[18]In principle, the disposable income shares prescribed by a Pareto efficient agreement may vary from one period to the next to improve consumption smoothing by individual household members (see Dercon and Krishnan 2000; Ligon 2002; Duflo and Udry 2004). We constrain the income shares in the agreement to be identical across time periods to facilitate the analysis but our comparative statics results do not hinge on this assumption. For CRRA utility, the Pareto efficient consumption shares are indeed constant (see, for example, Townsend 1994).

cooperative agreement that satisfies their non-cooperative threat point utilities. Then Choice 4 will be chosen over Choice 1 if and only if $\exists \mu \in (0,1)$ such that

$$u\left(\mu_m\left(y_1 + L - c\right)\right) + \beta u\left(\mu_m\left(y_2 - LR_l\right)\right) + (1 + \beta)\,\theta_m \geq u\left(\lambda_m y_1\right) + \beta u\left(\lambda_m y_2\right) \quad (1)$$

$$u\left(\mu_f\left(y_1 + L - c\right)\right) + \beta u\left(\mu_f\left(y_2 - LR_l\right)\right) + (1 + \beta)\,\theta_f \geq u\left(\lambda_f y_1\right) + \beta u\left(\lambda_f y_2\right) \quad (2)$$

We can describe the equilibrium outcome in the household as follows.

Proposition 1 *Under Assumptions 1-5, if conditions 1 and 2 hold for some $\mu \in (0,1)$, the household takes a loan and makes a sanitation investment (Pareto optimal cooperative outcome). If the conditions do not hold, in each period the spouses divide disposable income for private consumption according to the income shares controlled by each spouse (identical to the non-cooperative equilibrium).*

If the household takes the loan and invests in sanitation, the disposable income shares obtained by each spouse will be given by the value of μ that maximises the Nash Product (i.e. the Nash Bargaining Solution):

$$\mu^* = \arg\max_{\mu} \begin{array}{l} \left[\left\{u\left(\mu_m\left(y_1 + L - c\right)\right) - u\left(\lambda_m y_1\right)\right\} + \beta\left\{u\left(\mu_m\left(y_2 - LR_l\right)\right) - u\left(\lambda_m y_2\right)\right\} + (1 + \beta)\,\theta_m\right] \\ \times \left[\left\{u\left(\mu_f\left(y_1 + L - c\right)\right) - u\left(\lambda_f y_1\right)\right\} + \beta\left\{u\left(\mu_f\left(y_2 - LR_l\right)\right) - u\left(\lambda_f y_2\right)\right\} + (1 + \beta)\,\theta_f\right] \end{array}$$
$$(3)$$

If $\mu^* > \lambda$ ($\mu^* < \lambda$), then f receives a larger (smaller) share of disposable income in each period when the household borrows and invests in sanitation relative to their pre-loan income shares. In effect, there is an increase (reduction) in intra-household transfers from m to f. Using (3), we can also show that μ^* is decreasing in θ_m and increasing in θ_f, i.e. if the couple chooses to borrow and invest in sanitation, net transfers towards f will be higher (lower) when m (f) has comparatively higher net perceived benefits from the sanitation investment.

4.3 Comparative Statics

Next, we investigate how varying bargaining power within the household (λ), perceived net benefits of sanitation investments (θ_m and θ_f) and cost of sanitation investments affect borrowing and investment decisions. Let $\theta = \theta_m + \theta_f$.

We can show that, for a given θ, the larger is the difference between θ_m and θ_f, the more difficult it is to find a value of μ that satisfies (1)-(2) because while θ_m and θ_f enter utility in a linear fashion, μ affects utility in a non-linear fashion (specifically an inverted U-shaped relationship with the sum of utilities).

We an also show that it is easier to satisfy (1)-(2) when θ_m, θ_f are 'aligned' with λ_m, λ_f; i.e. the spouse with more bargaining power has stronger preference for the durable

good; because it means that μ has to take a less extreme value to compensate the spouse who has a weaker preference for the durable good.

Formally, let us define $\underline{\mu}_i$ as follows:

$$u\left(\underline{\mu}_i\left(y_1 + L - c\right)\right) + \beta u\left(\underline{\mu}_i\left(y_2 - LR_l\right)\right) + (1+\beta)\,\theta_i = u\left(\lambda_i y_1\right) + \beta u\left(\lambda_i y_2\right) \quad (4)$$

Then, by construction, there is a level of intra-household transfer such that both spouses are better-off with the loan and durable good investment if and only if

$$\underline{\mu}_m + \underline{\mu}_f \leq 1 \quad (5)$$

We can use Lemma 1 to characterise the conditions under which (5) is satisfied.

Lemma 1 *We denote by $\underline{\mu}_i$ the smallest share of household income that spouse i would be satisfied with when the household takes a loan and invests in the durable good. Then (i) $\frac{\partial \underline{\mu}_i}{\partial \theta_i} < 0$ (ii) $\frac{\partial \underline{\mu}_i}{\partial \lambda_i} > 0$ (iii) $\frac{\partial^2 \underline{\mu}_i}{\partial (\theta_i)^2} < 0$ (iv) $\frac{\partial^2 \underline{\mu}_i}{\partial \theta_i \partial \lambda_i} < 0$.*

In words, Lemma 1 states that $\underline{\mu}_i$ is decreasing in θ_i and increasing in λ_i. Moreover, $\underline{\mu}_i$ is decreasing in θ_i at a decreasing rate and $\underline{\mu}_i$ is more responsive to θ_i when λ_i is large.

Proposition 2 *Without loss of the generality, suppose that spouse f has less bargaining power, i.e. $\lambda_f < \lambda_m$. Let us denote by θ the aggregate benefit derived by the couple from the sanitation investment (i.e. $\theta = \theta_f + \theta_m$). Keeping θ constant, strengthening f's preference for the sanitation investment (i.e. increasing θ_f) lowers the likelihood that the couple will take the loan and invest it.*

More precisely, if there is some $\theta_f \in [0, \theta]$ for which the couple takes the loan, there exists a $\underline{\theta}_f \in [0, \theta]$ such that the couple takes the loan and invests it if and only if $\theta_f \leq \underline{\theta}_f$.

According to Proposition 2, when the spouse with weaker bargaining power has a stronger preference for the sanitation investment (holding constant the aggregate preference), the couple is less likely to make the investment. An immediate corollary of Proposition 2 is that when the spouse with stronger bargaining power has a stronger preference for the sanitation investment, the couple is more likely to make the investment.

Proposition 3 *Without loss of generality, suppose that spouse f has stronger preference for the durable good, i.e. $\theta_f > \theta_m$. Strengthening f's bargaining power increases the likelihood that the couple will take the loan and invest it.*

More precisely, if there is some $\lambda_f \in [0, 1]$ for which the couple takes the loan, then there exists a $\bar{\lambda}_f \in [0, 1]$ such that the couple takes the loan and makes the investment if and only if $\lambda_f \geq \bar{\lambda}_f$.

Figure 5
Surplus generated by Sanitation Investment
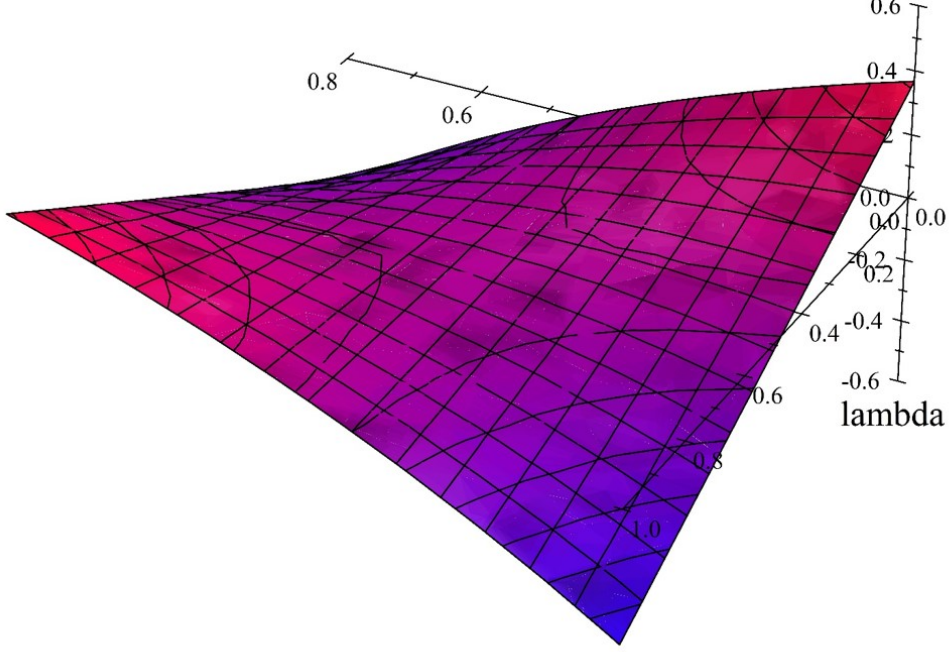
In Figure 5, we illustrate the comparative statics results described in Propositions 2 and 3. The vertical axis in the figure represents the surplus generated by loan uptake and sanitation investment by the household. The household borrows and makes the investment if and only if the surplus is positive. The two horizontal axes represents different values of λ and θ_f (and $\theta_m = \theta - \theta_f$). It is evident from the figure that the sanitation investment is more likely to take place if, for a given average level of net perceived benefits of sanitation investments, the household member with higher net perceived benefits preference also has higher bargaining power. The investment is least like to happen when one spouse has strong net perceived preference but bargaining power is concentrated in the other spouse.

4.4   Effect of Improving Access to Loans

Next, we consider how the comparative statics results above are affected by the availability of a more attractive loan option through, for example, a credit-related intervention. We can model better loan availability as a reduction in the interest rate.

From (4) it is straightforward to see that decreasing R_l will lead to a lowering of μ_i for $i = m, f$. This will increase the likelihood that the condition in (5) is satisfied and, thus, that the loan is taken up and invested in sanitation. Formally, we have the

following result.

Proposition 4 *Consider a couple described by the parameters $(\theta_m, \theta_f, \lambda)$. If there is some $R_l \in [0, \infty]$ such that the couple would take a loan and invest it when offered the loan contract (L, R_l), then there exists $\underline{R}_l(\theta_m, \theta_f, \lambda) \in [0, \infty]$ such that the couple would take the loan and invests it if and only if $R_l \leq \underline{R}_l(\theta_m, \theta_f, \lambda)$.*

Combining Proposition 4 with Propositions 2 and 3, we have the following results.

Proposition 5 *Without loss of the generality, suppose that spouse f has less bargaining power, i.e. $\lambda_f < \lambda_m$. Let us denote by θ the aggregate benefit derived by the couple from the sanitation investment (i.e. $\theta = \theta_f + \theta_m$). Let $\underline{\theta}_f(L, R_l) \in [0, \theta]$ be the threshold value of θ_f (keeping θ constant) below which the couple takes the loan and invests it when the loan contract on offer is (L, R_l). If $R_l' < R_l$, then $\underline{\theta}_f(L, R_l') > \underline{\theta}_f(L, R_l)$.*

Recall that Proposition 2 established the result that when one spouse has weaker bargaining power than the other, then strengthening her preference for the sanitation investment (while keeping constant the aggregate benefit derived by the couple from the investment) reduces the likelihood that the couple will take a loan and invest it; more precisely, the couple would not take the loan if her preference exceeds a certain threshold. Proposition 5 implies that this threshold is relaxed when the interest rate is lower.

Proposition 6 *Without loss of generality, suppose that spouse f has stronger preference for the sanitation investment, i.e. $\theta_f > \theta_m$. Let $\bar{\lambda}_f(L, R_l) \in [0, 1]$ be the threshold value of λ_f above which the couple takes the loan and invests it when the loan contract on offer is (L, R_l). If $R_l' < R_l$, then $\bar{\lambda}_f(L, R_l') < \bar{\lambda}_f(L, R_l)$.*

Recall that Proposition 3 established the result that when one spouse has a stronger preference for the sanitation investment than the other, then strengthening her bargaining power increases the likelihood that the couple will take a loan and invest it; more precisely, the couple would not take the loan if her bargaining power is below a certain threshold. Proposition 6 implies that this threshold is relaxed when the interest rate is lower.

Figure 6
How Varying the Interest Rate affects Sanitation Investment
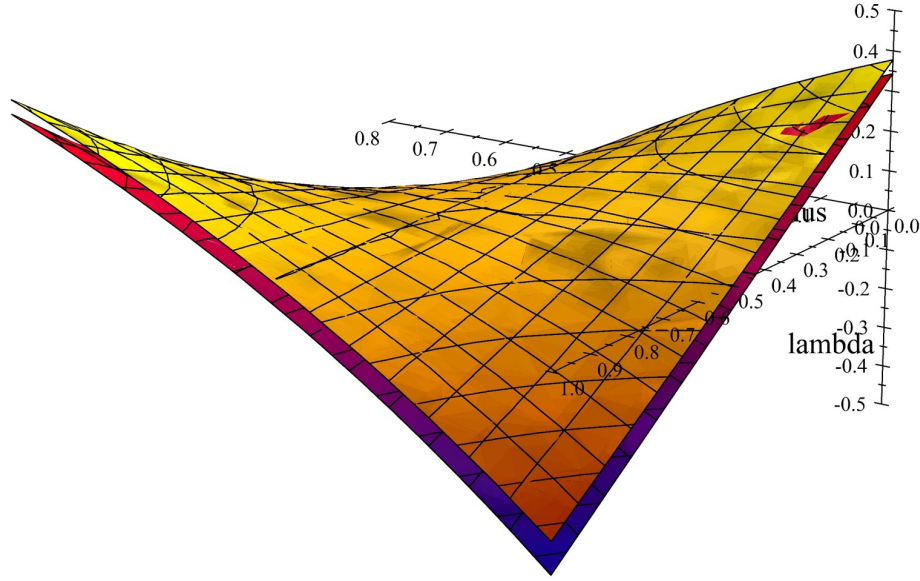
In Figure 6, we illustrate the comparative statics results described in Propositions 5 and 6. The lower graph and the higher graph in the figure describe, respectively, the surplus generated by loan uptake and sanitation investment at a high interest rate and a low interest rate. It is evident from the figure that lowering the interest rate, as expected, increases the surplus for all types of households. Consequently, it affects the households that are at the threshold of being indifferent between taking and not taking the loan (the region where the graph intersects with the horizontal plane of zero surplus). In particular, for given perceived net benefits, it lowers/raises the threshold value of bargaining power – of the spouse with higher/lower perceived benefits – above which the couple makes the investment. And for a given distribution of bargaining power, it raises/lowers the threshold value of perceived benefits – of the spouse with weaker/stronger bargaining power – below which the couple makes the investment.

Based on Proposition 5 and 6, we can make the following empirical predictions:

1. Suppose one spouse has weaker bargaining power. According to Proposition 5, access to a more attractive loan contract has a *larger* effect on loan uptake and sanitation investment for households in which the spouse with weaker bargaining power has a higher net perceived benefit of sanitation investment, compared to couples in which the two spouses have identical preferences or the other spouse has a higher net perceived benefit.

2. Propositions 5 and 6 imply that access to a more attractive loan contract has a *smaller* effect on loan uptake and sanitation investment in households in which

differences between the spouses in bargaining power and net perceived benefits are both large compared to couples in which these differences are small.

4.5 Extension: Spousal Differences in Perceived Cost of Sanitation Investments

So far, we have assumed in our analysis that the cost of sanitation investments is known at the time the household is making its decisions. However, the survey data shows that there is uncertainty about the cost of constructing a household toilet as well as differences in beliefs across household members. Therefore, in this section, we allow individual cost perceptions to differ from each other as well as uncertainty in perceived costs.

Let c_i be spouse i's perceived cost of the sanitation investment and suppose $f_i(.)$ is the probability density function for c_i. We definite c_i^e implicitly using the following equation:

$$E_i u\left(y_1 - L - c_i\right) = u\left(y_1 - L - c_i^e\right)$$

In words, c_i^e is the certainty equivalent of spouse i's perceived cost. Greater uncertainty – more precisely, a mean preserving spread of $f_i(.)$ – will translate into a higher certainty equivalent cost c_i^e. The latter will serve as a sufficient statistic for our subsequent analysis.

With this modification to our original model, $\underline{\mu}_i$ – the lowest income share for which spouse i would agree to a loan and sanitation investment is given by the following equation:

$$u\left(\underline{\mu}_i\left(y_1 + L - c_i^e\right)\right) + \beta u\left(\underline{\mu}_i\left(y_2 - LR_l\right)\right) + (1 + \beta)\,\theta_i = u\left(\lambda_i y_1\right) + \beta u\left(\lambda_i y_2\right) \quad (6)$$

Then we obtain the following results.

Lemma 2 *Suppose that there is uncertainty about the cost of sanitation investments and c_i^e is the certainty equivalent cost for spouse i. Then, the smallest share of household income $\underline{\mu}_i$ for which spouse i would agree to a loan and sanitation investment satisfies the following conditions: (i) $\frac{\partial \underline{\mu}_i}{\partial c_i^e} > 0$ (ii) $\frac{\partial \underline{\mu}_i}{\partial \lambda_i} > 0$ (iii) $\frac{\partial \underline{\mu}_i}{\partial c_i^e \partial \lambda_i} > 0$ (iv) $\frac{\partial^2 \underline{\mu}_i}{\partial\left(c_i^e\right)^2} > 0$.*

In words, Lemma 2 states that $\underline{\mu}_i$ is increasing in c_i^e and increasing in λ_i. Moreover, $\underline{\mu}_i$ is increasing in c_i^e at an increasing rate and $\underline{\mu}_i$ is more responsive to c_i^e when λ_i is large.

Proposition 7 *Without loss of generality, suppose spouse m has more bargaining power. Let c be the average of the couple's certainty equivalent perceived cost of sanitation investment (i.e. $c = \frac{1}{2}\left(c_f^e + c_m^e\right)$). There exists a threshold value $\underline{c}_m^e \geq c$ such that, for $c_m^e \in [c, \underline{c}_m^e]$, the couple will take the loan and invest in sanitation. For $c_m^e > \underline{c}_m^e$, the couple will not take the loan or invest in sanitation.*

Proposition 7 provides a partial characterisation of the couple's behaviour as a function of the certainty equivalent perceived cost of sanitation. If the spouse with more bargaining power also has the higher perceived cost then, according to Proposition 7, there is a threshold value such that the couple takes the loan and makes the sanitation investment if and only if perceived cost of that spouse falls below this threshold. If the spouse with more bargaining power has the *lower* perceived cost, the couple's behaviour is ambiguous (because of two effects going in opposite directions).

Corollary 1 (of Proposition 7) *The threshold value $\underline{c}_m^e$ defined in Proposition 7 is decreasing in the interest rate R_l.*

The corollary implies that, assuming that the spouse with more bargaining power also has the higher perceived cost, the range of values for this perceived cost over which the couple takes the loan and makes the investment is decreasing in the interest rate. From the corollary, we obtain a third empirical prediction as follows:

3. Suppose the spouse with stronger bargaining power tends to have a higher perceived cost of sanitation investment. Then, according to the corollary to Proposition 7, access to a more attractive loan contract has a larger effect on loan uptake and sanitation investments for households with a large differential in perceived costs compared to couples with similar perceived costs.

5   Empirical approach

To estimate whether the demand for the sanitation loan, and its conversion to new toilets depends on intra-household differences in benefit and cost perceptions, we estimate the following equation:

$$
\begin{aligned}
Y_{iv} = \alpha_0 &+ \alpha_1 SL_v * W_{iv}^{lower} + \alpha_2 SL_v * W_{iv}^{similar} + \alpha_3 SL_v * W_{iv}^{higher} \\
&+ \alpha_4 W_{iv}^{similar} + \alpha_5 W_{iv}^{higher} + \nu P_i + \lambda X_{iv} + \omega_v + \epsilon_{iv}
\end{aligned}
\tag{7}
$$

where Y_{iv} are our outcomes – sanitation loan take-up and toilet ownership at endline. SL_v takes the value 1 if the household lives in GP v that was randomly assigned to the SL (Sanitation Loan) treatment group, and 0 otherwise. W_{iv}^{lower}, $W_{iv}^{similar}$ and W_{iv}^{higher} are binary variables which indicate, respectively, whether in household i the wife has a lower, similar, or higher cost or benefit perception than the husband. Perceptions are defined to be similar if they are within a range close to 0.[19] We also control for the household's average cost or benefit perception (P_i), a vector of household-level controls,

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[19]In doing so, we allow for small differences that may be non-zero due to measurement error. We carry out robustness checks varying the size of this range and show that results are robust to this, see Appendix F.5.

X_{iv} and randomization strata fixed effects, ω_v. The coefficients of interest are α_1, α_2 and α_3 which identify the treatment effects within each of the sub-groups relative to the same sub-groups in control GPs. Standard errors are clustered at the GP level.

We also estimate how the intervention impacts vary with female decision-making power using the following equation:

$$Y_{iv} = \beta_0 + \beta_1 SL_v * Low_{iv} + \beta_2 SL_v * Mid_{iv} + \beta_3 SL_v * High_{iv}$$
$$+ \beta_4 Mid_{iv} + \beta_5 High_{iv} + \lambda X_{iv} + \omega_v + \epsilon_{iv} \tag{8}$$

where Low_{iv}, Mid_{iv} and $High_{iv}$ indicate whether the wife in household i in GP v has relatively low, mid or high decision-making power, and the remaining variables are as defined before.[20]

Finally, we assess the influence of the interaction between perceptions and bargaining power by estimating the following equation:

$$Y_{iv} = \gamma_0 + \gamma_1 SL_v * Low_{iv} * W_{iv}^{lower} + \gamma_2 SL_v * Low_{iv} * W_{iv}^{sim/high}$$
$$+ \gamma_3 SL_v * Mid_{iv} * W_{iv}^{lower} + \gamma_4 SL_v * Mid_{iv} * W_{iv}^{sim/high}$$
$$+ \gamma_5 SL_v * High_{iv} * W_{iv}^{lower} + \gamma_6 SL_v * High_{iv} * W_{iv}^{sim/high}$$
$$+ \mathbf{K}\rho + \nu P_i + \mu X_{iv} + \omega_v + \varepsilon_{iv} \tag{9}$$

where SL_v, X_{iv} and ω_v, Low_{iv}, Mid_{iv}, $High$ and W_{iv}^{lower} are as outlined above and $\mathbf{K}$ is a vector of additional interaction terms such that,

$$\mathbf{K} = \begin{bmatrix} Low_{iv} * W_{iv}^{sim/high} \\ Mid_{iv} * W_{iv}^{lower} \\ Mid_{iv} * W_{iv}^{sim/high} \\ High_{iv} * W_{iv}^{lower} \\ High_{iv} * W_{iv}^{sim/high} \end{bmatrix}$$

To improve readability of tables, we combine the similar and higher levels of intra-household differences in perceptions and expectations whereby $W_{iv}^{sim/high}$ indicates a household that belongs to the level where the wife has a similar or higher perception. In Appendix G, we show the results with the three different levels of intra-household differences in perceptions, finding consistent results.

6   Results

Our first set of results, presented in Section 6.1, sheds light on the role of intra-household differences in benefit and cost perceptions on sanitation loan uptake and investment

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[20]Our analysis controls for baseline household consumption in order to account for a potentially confounding correlation between bargaining power and wealth in this context. The results are robust to the exclusion of this control variable.

decisions. Section 6.2 turns to the role of female bargaining power.

6.1 The role of perceptions in borrowing and investment decisions

Table 8 reports differential impacts on sanitation loan take-up and investment decisions by intra-household gender differences in benefit and cost perceptions of sanitation investment. Columns (1)–(3) focus on sanitation loan uptake and Columns (4)–(6) on toilet ownership. The first three rows show our key parameters of interest, α_1, α_2, and α_3, estimated based on Equation (1). The bottom panel of the Table reports p-values for tests of equality of pairs of the coefficients α_1, α_2, and α_3.

We find that, conditional on average household benefit perceptions, households where the wife had a similar or higher benefit perception of the toilet than the husband at baseline are around 20 percentage points more likely to take a sanitation loan compared to households where the woman has lower benefit perception than the man (Column 1). These differences are statistically significant at the 1% level. On the other hand, intra-household differences in cost perceptions – whether non-monetary or monetary (Columns 2 and 3) – have no differential impacts of the intervention on loan uptake.

Given that women generally have weaker bargaining power than the spouse or household head in our study context, the heterogeneous effects on loan uptake from intra-household differences in benefit perception are in line with the first prediction from the theoretical model. The model predicted similar heterogeneity stemming from intra-household differences in cost perceptions that is not reflected in the estimates (although the point estimates are roughly in line with the predictions). This suggests that there is insufficient variation in relative cost perceptions across sample households to detect differences in loan uptake behaviour along these dimensions.

For ownership of toilets, we find that intra-household differences in benefit perceptions have no differential impacts on toilet construction (Column 4). While the estimated coefficient on toilet ownership is statistically significantly different from zero when the wife has higher benefit perceptions than the husband, and the size of the coefficient is larger than when benefit perceptions are the same or lower, the differences are not statistically significant. A similar pattern holds for non-monetary cost perceptions (Column 5). Given that intra-household differences in benefit perceptions do affect loan uptake, at least some of the sample households took these loans for sanitation investments but the estimated effects of toilet ownership suggest that, for some reason, they were unable to execute their plans.[21]

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[21]Augsburg et al. (2021) provide two explanations why households may not have been able to convert the sanitation loan to sanitation investments. First, a lack of other funding sources (e.g. savings) to supplement the loan (which did not cover the full cost of toilet models households wanted) undermined some households' abilities to see through the sanitation investment. Second, since the loan was only

By contrast, the degree to which the husband and wife differ in terms of their monetary cost (i.e. price) perceptions has a significant impact on the conversion of the loan to a new toilet. The coefficients reported in Column (6) indicate that increases in toilet ownership are concentrated among households where the wife has a lower price expectation than the husband. Moreover, this coefficient is statistically significantly different (at the 1% level) from the coefficient for the sub-group where the wife has a higher price expectation than the husband.

This last finding is somewhat puzzling, since toilet construction could be undermined if the wife underestimated the cost of the toilet. However, as we saw in Section 3, on average, both wives and husbands *over*-estimated the costs of the toilet. Thus, households where women had a lower cost perception might have perceptions that are closer to the actual costs than those held by her spouse. In other words, she may have more accurate cost perceptions. We thus assess how intervention impacts vary with the relative accuracy of the wife and husband's expected cost perceptions.

Table 9 displays the results, showing that while the relative accuracy of the wife's cost perception does not differentially affect sanitation loan uptake, it is only among households where the wife's cost perception is relatively more accurate than her husband's that the intervention results in an increase in toilet uptake. This suggests that households where the wife had a relatively lower cost perception were able to successfully convert the loan to a new toilet because her perception was relatively more accurate.

The heterogeneous effects on toilet ownership by accuracy of monetary cost perceptions are also consistent with the third prediction from the model: that if the spouse with more bargaining more has higher perceived cost, then improved loan access has a larger effect on households with a larger differential in perceived costs.

Thus, the overarching conclusion from these estimates is that intra-household differences in both benefit and cost perceptions matter for borrowing and investment decisions, but at different stages of the process. Differences in benefit perceptions have an important and statistically significant influence on sanitation loan up-take decisions, while differences in monetary cost perceptions are influential in households' ability to see through the conversion of the loan to a sanitation investment.

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labelled for sanitation and carried a lower interest rate than other loans offered by the MFI, it is likely that some households who were not sufficiently sensitive to loan labels took the loan for a non-sanitation purpose. Empirically identifying how these loans were used using the endline data is challenging since loans could have been diverted to multiple uses. It is not only difficult to measure all alternative uses, but also to identify impacts on any one of them with sufficient precision.

Table 8

Loan uptake, toilet ownership and intra-household perceptions

	Loan uptake			Toilet ownership		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs	(4) Benefits	(5) Non-monetary costs	(6) Monetary costs
Wife's perception lower x SL	0.07 (0.04)	0.24*** (0.06)	0.21*** (0.05)	0.07 (0.07)	0.07 (0.08)	0.17*** (0.05)
Wife's perception similar x SL	0.23*** (0.05)	0.17*** (0.06)	0.14*** (0.05)	0.04 (0.07)	0.06 (0.10)	0.07 (0.07)
Wife's perception higher x SL	0.27*** (0.06)	0.19*** (0.05)	0.15*** (0.03)	0.13* (0.08)	0.12** (0.06)	-0.01 (0.05)
HH average perception x SL	-0.03 (0.03)	-0.01 (0.02)	-0.07* (0.03)	-0.00 (0.04)	-0.03 (0.04)	0.02 (0.03)
HH average perception	0.00 (0.01)	-0.00 (0.01)	0.01 (0.01)	-0.01 (0.03)	0.02 (0.03)	0.01 (0.01)
Wife's perception similar	-0.04 (0.03)	0.01 (0.04)	0.03 (0.02)	-0.03 (0.07)	0.01 (0.08)	0.04 (0.06)
Wife's perception higher	-0.03 (0.03)	0.00 (0.02)	0.03* (0.02)	-0.06 (0.07)	-0.07 (0.07)	0.08* (0.04)
Strata FE	Yes	Yes	Yes	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes	Yes	Yes	Yes
Control DV mean (lower)	0.04	0.02	0.01	0.40	0.45	0.39
Control DV mean (similar)	0.00	0.04	0.03	0.37	0.41	0.44
Control DV mean (higher)	0.02	0.01	0.02	0.44	0.35	0.48
No. of HHs	556	556	1,134	556	556	1,134
p-value: lower=similar	0.01	0.29	0.18	0.73	0.94	0.21
p-value: lower=higher	0.00	0.50	0.23	0.55	0.62	0.01
p-value: similar=higher	0.56	0.75	0.78	0.39	0.58	0.29

Note: This table shows the results of how the impact of treatment varies by differences in intra-household benefit, non-monetary and monetary cost perceptions. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline and a dummy =1 if the household owns a toilet at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 9
Treatment and accuracy

	(1) Loan uptake	(2) Toilet ownership
Wife more accurate x SL	0.19***	0.16***
	(0.05)	(0.05)
Wife and husband similarly (in)accurate x SL	0.18***	0.04
	(0.05)	(0.05)
Wife less accurate x SL	0.16***	0.02
	(0.04)	(0.06)
Household average x SL	-0.07**	0.01
	(0.03)	(0.03)
Household average	0.01	0.01
	(0.01)	(0.01)
Wife and husband similarly (in)accurate	0.01	0.05
	(0.02)	(0.05)
Wife less accurate	0.03*	0.09**
	(0.02)	(0.04)
Strata FE	Yes	Yes
Household covariates	Yes	Yes
Control DV mean (more)	0.02	0.39
Control DV mean (similar)	0.02	0.43
Control DV mean (less)	0.01	0.48
No. of HHs	1,134	1,134
p-value: more=similar	0.81	0.08
p-value: more=less	0.64	0.04
p-value: similar=less	0.82	0.83

Notes: Accuracy is calculated as an individual's average expected monetary cost minus the GP average. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of household consumption. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

6.2 The role of bargaining power in borrowing and investment decisions

We next turn to analyze the role of female bargaining power in these borrowing and investment decisions. Table 10 shows that female bargaining power does not, in itself, differentially affect intervention impacts on sanitation loan uptake or sanitation investments. Across both outcomes - loan uptake (Column 1), and toilet ownership (Column 2), we find no evidence of a statistically significant difference between the treatment effect coefficients by different levels of female bargaining power, indicating that women with low bargaining power are just as likely to take a sanitation loan (and convert it into a

toilet) as households where women have higher bargaining power.[22]

Table 10

Investment decisions and bargaining power

	(1) Loan uptake	(2) Toilet ownership
Low BP x SL	0.14***	0.07
	(0.03)	(0.06)
Mid BP x SL	0.21***	0.12**
	(0.06)	(0.06)
High BP x SL	0.19***	0.06
	(0.04)	(0.05)
Mid BP	-0.05**	-0.08
	(0.02)	(0.05)
High BP	-0.03	-0.05
	(0.02)	(0.05)
Strata FE	Yes	Yes
Household covariates	Yes	Yes
Control DV mean (low BP)	0.01	0.43
Control DV mean (mid BP)	0.04	0.41
Control DV mean (high BP)	0.01	0.44
No. of HHs	1,134	1,134
p-value: low=mid	0.16	0.49
p-value: low=high	0.18	0.99
p-value: mid=high	0.75	0.44

Note: This table shows the results of how the impact of treatment varies by the woman's bargaining power (measured relative to the average for all women). Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline and a dummy =1 if the household owns a toilet at baseline. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

However, the model predicts that bargaining power and intra-household differences will both matter, and thus interact, in influencing loan uptake and investment decisions. In particular, Figure 2 implies that that improved loan access will have a larger impact on loan uptake and sanitation investments in the case of households that are moderately unequal in terms of both bargaining power and net perceived benefits compared to households that are very unequal along these dimensions. We analyze this through the

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[22]Providing female clients with access to sanitation labelled micro-credit could potentially influence sanitation investments through altering female bargaining power. We believe this is unlikely to be an important driver of our findings since we study households with women who were already clients of the partner MFI for, on average, 34 months at baseline; and had access to micro-credit. As we show in Appendix Table H1, at baseline, they had higher decision-making power than women from households in the study communities without a client of the partner MFI. Existing studies provide mixed evidence on the impacts of micro-credit access on women's empowerment: Angelucci et al. (2015) find small effects in Mexico while other studies such as Banerjee et al. (2015) find no effects in India. Thus, it is unlikely that providing access to an additional loan product will further increase women's bargaining power.

triple-interaction specification. Results are shown in Table 11. To ease readability of the table, we lump together households where the wife had similar or higher perceptions than the husband and contrast these to the case where the wife had lower perceptions.

We can see that loan uptake differs significantly by benefit perceptions in the Mid BP and High BP groups of households (Column 1). When the woman has lower benefit perceptions than the man and is in the Mid BP sub-group, the intervention does not result in any loan take-up on average. By contrast, having similar or higher benefit perceptions results in a loan uptake of 32 percentage points in the Mid BP sub-group. The difference is statistically significant at the 1% level. A similar pattern is seen for the High BP group (significant at the 7% level).

Lower perceptions of non-monetary costs of the toilet also spur higher loan uptake among the households in the Mid BP group (loan uptake of 43% compared to 16%, significant at 3% level), but not among the other bargaining power groups. Differences in monetary cost perceptions do not affect loan uptake differentially across all bargaining power groups.

For toilet ownership, we find that differential impacts of monetary cost perceptions are concentrated primarily in the Mid BP group with a large impact on toilet ownership for households where the woman has a lower cost expectation than the man. A similar pattern also holds for non-monetary cost expectations in this Mid BP group, though this difference is significant at the 17% level only. By contrast, bargaining power does not differentially impact the intervention effects on toilet ownership by perceptions of benefits.

The result that differences in perceptions matter for loan uptake and sanitation investments primarily in the Mid BP group is broadly consistent with the theoretical model. In particular, the model implies that if one spouse has strong bargaining power and also perceives high benefits from toilet ownership (relative to the other), then the household will invest in sanitation whether or not improved loan access is available. Similarly, if the spouse with strong bargaining power perceives minimal benefits from toilet ownership, then the household will not invest in sanitation whether or not improved loan access is available. Thus, as per the second prediction from the model, loan take-up and investment decisions are most likely to be influenced in the Mid BP group, among households where net perceived benefits are moderately unequal.

Interestingly, the differential impacts of intra-household differences in perceptions of monetary cost on toilet uptake in the Mid BP group is driven by households where the wife's cost perception is more accurate than her husband's (Table 12).

Overall, these results show that the intra-household differences in perceptions influence borrowing and investment decisions only in the mid BP and high BP group of households. Within these households, women are highly likely to be involved in decision-making (73% and 100% of decisions considered as shown in Section 3). By contrast,

Table 11

Loan uptake, toilet ownership, intra-household perceptions and bargaining power

	Loan uptake			Toilet ownership		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs	(4) Benefits	(5) Non-monetary costs	(6) Monetary costs
Low BP x Wife's perception lower x SL	0.08 (0.07)	0.14* (0.08)	0.21*** (0.05)	-0.02 (0.13)	-0.00 (0.13)	0.12 (0.10)
Low BP x Wife's perception higher x SL	0.21*** (0.06)	0.19*** (0.05)	0.10** (0.04)	-0.01 (0.10)	0.02 (0.10)	0.03 (0.07)
Mid BP x Wife's perception lower x SL	0.00 (0.09)	0.43*** (0.12)	0.24*** (0.09)	0.07 (0.14)	0.29* (0.16)	0.30*** (0.08)
Mid BP x Wife's perception higher x SL	0.32*** (0.08)	0.16** (0.07)	0.16*** (0.05)	0.13 (0.10)	0.05 (0.10)	-0.06 (0.08)
High BP x Wife's perception lower x SL	0.08 (0.07)	0.21*** (0.08)	0.20*** (0.05)	0.13 (0.12)	0.04 (0.10)	0.10 (0.06)
High BP x Wife's perception higher x SL	0.24*** (0.05)	0.18*** (0.06)	0.18*** (0.05)	0.12 (0.08)	0.18** (0.08)	0.04 (0.06)
Strata FE	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Control DV mean (lowBP*lower)	0.04	0.05	0.00	0.50	0.54	0.39
Control DV mean (lowBP*higher)	0.02	0.00	0.02	0.43	0.37	0.46
Control DV mean (midBP*lower)	0.10	0.00	0.04	0.38	0.35	0.28
Control DV mean (midBP*higher)	0.02	0.06	0.03	0.39	0.41	0.56
Control DV mean (highBP*lower)	0.02	0.00	0.01	0.36	0.43	0.45
Control DV mean (highBP*higher)	0.00	0.01	0.01	0.41	0.35	0.42
No. of HHs	556	556	1,134	556	556	1,134
lowBP*lower=lowBP*higher	0.21	0.59	0.23	0.57	0.90	0.52
midBP*lower=midBP*higher	0.00	0.03	0.38	0.74	0.17	0.00
highBP*lower=highBP*higher	0.07	0.78	0.82	0.94	0.24	0.46
joint equality (lower)	0.57	0.11	0.82	0.88	0.32	0.10
joint equality (higher)	0.42	0.97	0.32	0.34	0.24	0.49

Note: This table shows the results of how the impact of treatment varies by differences in intra-household benefit, non-monetary and monetary cost perceptions. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline and a dummy =1 if the household owns a toilet at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 12
Accuracy triple interaction

	(1) Loan uptake	(2) Toilet ownership
Low BP x Wife more accurate x SL	0.16** (0.06)	0.16 (0.11)
Low BP x Wife less accurate x SL	0.13*** (0.05)	0.03 (0.07)
Mid BP x Wife more accurate x SL	0.25*** (0.09)	0.29*** (0.10)
Mid BP x Wife less accurate x SL	0.17*** (0.05)	-0.03 (0.07)
High BP x Wife more accurate x SL	0.16*** (0.04)	0.08 (0.07)
High BP x Wife less accurate x SL	0.21*** (0.05)	0.06 (0.06)
Strata FE	Yes	Yes
Covariates	Yes	Yes
Control DV mean (lowBP*more)	0.00	0.38
Control DV mean (lowBP*less)	0.02	0.46
Control DV mean (midBP*more)	0.05	0.29
Control DV mean (midBP*less)	0.01	0.54
Control DV mean (highBP*more)	0.01	0.47
Control DV mean (highBP*less)	0.01	0.42
No. of HHs	1,134	1,134
lowBP*more=lowBP*less	0.70	0.29
midBP*more=midBP*less	0.34	0.00
highBP*more=highBP*less	0.39	0.80
joint equality (more)	0.50	0.20
joint equality (less)	0.36	0.60

Notes: Accuracy is calculated as an individual's average expected monetary cost minus the GP average. Less accurate and similarly accurate are combined into one category. Outcome variables are binary whereby Loan uptake $=1$ if a household takes a sanitation loan and Toilet ownership $=1$ if a household owns a toilet at endline. Covariates include a dummy $=1$ if the household has a child under the age of 2 at baseline, a dummy $=1$ if the household owns a toilet at baseline and the log of household consumption. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

only 1% of women in the Low BP group is involved in household decision-making.[23] Thus, our findings show that intra-household differences in perceptions influence choices only when the woman has a minimum level of agency.

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[23]Furthermore, Appendix describes how loan uptake decisions are made by bargaining power groups. It demonstrates that husbands are involved in the majority of loan decisions across all bargaining power groups. In the Low BP group (Panel A) the husband primarily makes the decision alone whereas in the High BP group (Panel C) the decision is mostly made jointly.

6.3 Robustness Checks

We conduct several checks to assess the robustness of our findings. First, we assess the robustness of results to alternative definitions of bargaining power. We find that the results are qualitatively similar when we include decisions related to children in the bargaining power score calculation (Tables F2 and F3 in the Appendix).

Our measures of intra-household bargaining power and intra-household differences in perceptions do not contain any experimentally-generated variation. A concern thus is that they may be correlated with other confounding factors that may also influence the response of households to the intervention. The estimates presented thus far controlled for baseline household consumption, to capture confounds due to differing household resources. As a robustness check, we also verify the sensitivity of the estimates to the inclusion of control variables to capture confounding factors such as (i) household characteristics: religion, caste, average yearly consumption, dwelling ownership status, composition (number of members, number of women, presence of children under 2/5), (ii) household head information: age, gender and education level, and (iii) individual responses: social norms regarding open defecation (e.g. if the husband/wife agrees that it is acceptable to defecate in the open). Reassuringly, we obtain similar results (see Appendix F.4).

7 Conclusion

This paper exploits novel data on perceptions of costs and benefits of a standardized toilet, collected from both men and women (typically spouses) from the same household within a randomised controlled trial of a sanitation loan intervention to (i) document the extent to which perceptions of costs and benefits vary by gender and within household, and (ii) assess how intra-household differences in perceptions, and bargaining power affect take-up of the sanitation loan and sanitation investments.

The analysis yields a number of novel insights. We document that while women, on average, perceive higher benefits of the standardized toilet, there is significant variation in intra-household differences in benefit perceptions. In a significant share of households (32%), men perceive a higher benefit of the toilet – which is a model desired by households in this context – than women. We also document similar variation in intra-household perceptions of monetary and non-monetary costs. Interestingly, we find that over 70% of women and men over-estimate the monetary cost of the toilet, and that this over-estimation is large in magnitude.

We incorporate differences in net perceived benefits into an intra-household decision-making model in order to theoretically analyze the roles of the differences in perceptions and intra-household bargaining power, and the new sanitation loan on investment deci-

sions. Comparative statics from the model show that the introduction of the sanitation loan will increase investments most among households where the partner with the lower bargaining power has higher relative net perceived benefit. The more favorable sanitation loan increases the bargaining surplus, allowing the partner with the higher net perceived benefit to compensate the other partner to make the investment. By contrast, households where the partner with higher bargaining power also has a higher net perceived benefit would have made the sanitation investment without requiring this compensation.

We exploit the random allocation of the intervention to Gram Panchayats to test the resulting theoretical predictions. We find that these intra-household differences in perceptions influence the take-up of sanitation loans and sanitation investments, but at different steps of the investment process. Intra-household differences in perceptions of benefits influence the take-up of sanitation loans, with households where the woman perceives a lower benefit to sanitation than the men being almost four times less likely to take the loan. However, when it comes to sanitation investments, it is the intra-household differences in perceptions of costs and in particular, monetary costs which influence whether a loan is successfully converted to a new toilet. Households where the woman had a lower monetary cost perception were more likely to invest in a toilet relative to those where she had a similar or higher perception as her husband. Since most men and women over-estimated the cost of the toilet, a lower cost perception implied a more accurate cost perception, thereby facilitating investments.

Moreover, we show that intra-household differences in perceptions only influence borrowing and investment behaviour in households where the woman has some involvement – even if with other household members – in making financial and investment decisions. In households where she is not involved in decision-making, the intra-household differences in perceptions do not influence intervention impacts on loan uptake or sanitation investments. Thus, it is only when the woman is likely to be involved in the decision that her perceptions and expectations can enter discussions, and potentially also influence those of her spouse or other household members.

Our findings provide novel insights into households' decision-making processes in making lumpy, complex and costly investments in low-income settings. Targeting sanitation micro-credit to women can be effective in spurring sanitation investments, especially in households where women had relatively moderate bargaining power and higher net perceived benefits than her spouse. However, the findings also suggest that effective policies should seek to engage specifically with men, while also seeking to encourage the involvement of women in decision-making processes. They also highlight the importance of disseminating information on not just benefits of an investment, but also on costs. Information campaigns undertaken by the first phase of India's Swacch Bharat Mission policy mainly highlighted the benefits of toilets. However, our results suggest that there are significant mis-perceptions in monetary costs, and that these have an especially impor-

tant influence in ensuring that financial resources earmarked for sanitation investments result in these.

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Appendix

A Theoretical Appendix

A.1 Discussion on Model Assumptions

In this section, we discuss how relaxing the assumptions in Section 4.2 would affect our theoretical predictions. If Assumption 1 does not hold, then the household may opt to save in period 1 for consumption in period 2. By assumption, in the case of non-cooperative behaviour, only m can save (unilaterally). Therefore, if Assumption 1 does not hold, m may save out of period 1 income to consume in period 2. But we still obtain the result that, if c is large enough relative to to $\lambda_m y_1$ and $\lambda_m y_2$, there will be no sanitation investment. In the case of cooperative behaviour, the optimal choice of saving will be determined by the Nash bargaining solution (with more weight on the intertemporal preferences of the spouse with stronger bargaining power). But the possibility of positive savings in period 1 would not affect how varying the parameters L, R_l and θ_f, θ_m affect the preference ordering of the different options available to the household. Therefore, we revert to our previous reasoning and the comparative statics results would continue to hold.

If Assumption 3 does not hold for some households, then these households would make the sanitation investment whether or not a loan is available. Therefore, improved loan access would not affect their investment behaviour. Improved loan access may lead to increased borrowing for consumption purposes but perceptions of the benefits and costs of sanitation investments would not affect borrowing behaviour. Therefore, for households who make the sanitation investment regardless of whether or not the loan is available (because of perceptions of large benefits or low costs), the model would predict that improved loan access does not have a differential effect on behaviour as a function of benefit and cost perceptions of each spouse.

If Assumption 4 does not hold then, for some households, the choice will be between Choice 1 and Choice 5. Then Choice 4 will be chosen over Choice 1 if and only if $\exists \mu \in (0,1)$ such that

$$u\left(\mu_m\left(y_1 + L\right)\right) + \beta u\left(\mu_m\left(y_2 - LR_l - c\right)\right) + \beta \theta_m \geq u\left(\lambda_m y_1\right) + \beta u\left(\lambda_m y_2\right) \quad (10)$$

$$u\left(\mu_f\left(y_1 + L\right)\right) + \beta u\left(\mu_f\left(y_2 - LR_l - c\right)\right) + \beta \theta_f \geq u\left(\lambda_f y_1\right) + \beta u\left(\lambda_f y_2\right) \quad (11)$$

It is straightforward to verify that the results in Lemma 1 still hold when we replace (1) and (2) with the conditions in (10) and (11). Similarly, the reasoning in Propositions 2-6 still apply for these conditions.

Suppose Assumption 5 does not hold. Then some households would choose to take the loan and not invest in sanitation. For these households, improved loan access may

lead to increased borrowing for consumption purposes but perceptions of the benefits and costs of sanitation investments would not affect borrowing behaviour. Therefore, for households that prefer to use the loan for consumption purposes (because of perceptions of small benefits or high costs), the model would predict that improved loan access does not have a differential effect on behaviour as a function of benefit and cost perceptions of each spouse.

A.2 Proofs of Lemmas and Propositions

Proof. of Lemma 1: (i) Differentiating throughout (4) w.r.t. θ_i, we obtain

$$u'\left(\underline{\mu}_i\left(y_1 + L - c\right)\right)\left(y_1 + L - c\right)\frac{\partial \underline{\mu}_i}{\partial \theta_i} + \beta u'\left(\underline{\mu}_i\left(y_2 - LR_l\right)\right)\left(y_2 - LR_l\right)\frac{\partial \underline{\mu}_i}{\partial \theta_i} + (1 + \beta) = 0 \tag{12}$$

Since $u'(.) > 0$ and $(y_1 + L - c), (y_2 - LR_l) > 0$, we must have $\frac{\partial \underline{\mu}_i}{\partial \theta_i} < 0$.

(ii) Differentiating throughout (4) w.r.t. λ_i, we obtain

$$u'\left(\underline{\mu}_i\left(y_1 + L - c\right)\right)\left(y_1 + L - c\right)\frac{\partial \underline{\mu}_i}{\partial \lambda_i} + \beta u'\left(\underline{\mu}_i\left(y_2 - LR_l\right)\right)\left(y_2 - LR_l\right)\frac{\partial \underline{\mu}_i}{\partial \lambda_i} = u'\left(\lambda_i y_1\right)y_1 + \beta u'\left(\lambda_i y_2\right)y_2 \tag{13}$$

Since the RHS of (13) is positive, we must have $\frac{\partial \underline{\mu}_i}{\partial \lambda_i} > 0$.

(iii) Differentiating throughout (12) w.r.t. θ_i, we obtain

$$u''\left(\underline{\mu}_i\left(y_1 + L - c\right)\right)\left(y_1 + L - c\right)^2 \frac{\partial \underline{\mu}_i}{\partial \theta_i} + \beta u'\left(\underline{\mu}_i\left(y_1 + L - c\right)\right)\left(y_1 + L - c\right)\frac{\partial^2 \underline{\mu}_i}{\partial \left(\theta_i\right)^2}$$

$$+ u''\left(\underline{\mu}_i\left(y_2 - LR_l\right)\right)\left(y_2 - LR_l\right)^2 \frac{\partial \underline{\mu}_i}{\partial \theta_i} + \beta u'\left(\underline{\mu}_i\left(y_2 - LR_l\right)\right)\left(y_2 - LR_l\right)\frac{\partial^2 \underline{\mu}_i}{\partial \left(\theta_i\right)^2}$$

$$= 0 \tag{14}$$

Since $u''(.) < 0$ and $\frac{\partial \underline{\mu}_i}{\partial \theta_i} < 0$, we must have $\frac{\partial^2 \underline{\mu}_i}{\partial(\theta_i)^2} < 0$ so that (14) holds.

(iv) Differentiating throughout (12) w.r.t. λ, we obtain

$$u''\left(\underline{\mu}_i\left(y_1 + L - c\right)\right)\left(y_1 + L - c\right)^2 \frac{\partial \underline{\mu}_i}{\partial \theta_i} + u'\left(\underline{\mu}_i\left(y_1 + L - c\right)\right)\left(y_1 + L - c\right)\frac{\partial^2 \underline{\mu}_i}{\partial \theta_i \partial \lambda_i}$$

$$+ \beta u''\left(\underline{\mu}_i\left(y_2 - LR_l\right)\right)\left(y_2 - LR_l\right)^2 \frac{\partial \underline{\mu}_i}{\partial \theta_i} + \beta u'\left(\underline{\mu}_i\left(y_2 - LR_l\right)\right)\left(y_2 - LR_l\right)\frac{\partial^2 \underline{\mu}_i}{\partial \theta_i \partial \lambda_i}$$

$$= 0 \tag{15}$$

Since $u''(.) < 0$ and $\frac{\partial \underline{\mu}_i}{\partial \theta_i} < 0$, we must have $\frac{\partial^2 \underline{\mu}_i}{\partial \theta_i \partial \lambda_i} < 0$ so that (15) holds. ∎

Proof. of Proposition 2: Using Lemma 1(i), Increasing θ_f (and consequently decreasing θ_m) reduces $\underline{\mu}_f$ and increases $\underline{\mu}_m$. As $\lambda_f < \lambda_m$, we have, using Lemma 1(iv), $\frac{\partial \underline{\mu}_f}{\partial \theta_f} > \frac{\partial \underline{\mu}_m}{\partial \theta_m}$ (i.e. $\underline{\mu}_f$ is less responsive to changes in θ_f, than $\underline{\mu}_m$ is to changes in θ_m). Therefore,

$$\frac{\partial \underline{\mu}_f}{\partial \theta_f} - \frac{\partial \underline{\mu}_m}{\partial \theta_m} > 0.$$

$$\implies \frac{d}{d\theta_f} \left(\underline{\mu}_f + \underline{\mu}_m \right) > 0 \tag{16}$$

Recall that there is a level of intra-household transfer such that both spouses are better-off with the loan and durable good investment if and only if (5) holds. It follows that if there is some $\theta_f \in [0, \theta]$ such that (5) holds, then (16) implies there exists $\underline{\theta}_f \in [0, \theta]$ such that the couple will take the loan and invest in the durable good if and only if $\theta_f \leq \underline{\theta}_f$. ∎

Proof. of Proposition 3: Using Lemma 1(ii), Increasing λ_f (and consequently decreasing λ_m) increases $\underline{\mu}_f$ and reduces $\underline{\mu}_m$. As $\theta_f > \theta_m$ by assumption, we have, using Lemma 1(iv), $\frac{\partial \underline{\mu}_f}{\partial \lambda_f} < \frac{\partial \underline{\mu}_m}{\partial \lambda_m}$ (i.e. $\underline{\mu}_f$ is less responsive to changes in λ_f, than $\underline{\mu}_m$ is to changes in λ_m). Therefore, $\frac{\partial \underline{\mu}_f}{\partial \lambda_f} - \frac{\partial \underline{\mu}_m}{\partial \lambda_m} < 0$.

$$\implies \frac{d}{d\lambda_f} \left(\underline{\mu}_f + \underline{\mu}_m \right) < 0 \tag{17}$$

Recall that there is a level of intra-household transfer such that both spouses are better-off with the loan and durable good investment if and only if (5) holds. It follows that if there is some $\lambda_f \in [0, 1]$ such that (5) holds, then (17) implies that there exists $\bar{\lambda}_f \in [0, 1]$ such that the couple will take the loan and invest in the durable good if and only if $\lambda_f \geq \bar{\lambda}_f$. ∎

Proof. of Proposition 4: Differentiating throughout (4) w.r.t. R_l, we obtain

$$\beta u' \left(\underline{\mu}_i \left(y_2 - LR_l \right) \right) \left\{ \frac{\partial \underline{\mu}_i}{\partial R_i} \left(y_2 - LR_l \right) - L\underline{\mu}_i \right\} = 0$$

$$\implies \frac{\partial \underline{\mu}_i}{\partial R_i} = \frac{L\underline{\mu}_i}{y_2 - LR_l} > 0$$

$$\implies \frac{d}{dR_i} \left(\underline{\mu}_f + \underline{\mu}_m \right) > 0 \tag{18}$$

Recall that there is a level of intra-household transfer such that both spouses are better-off with the loan and durable good investment if and only if (5) holds. It follows that if there is some $R_l \in [0, \infty]$ such that (5) holds, then (18) implies that there exists $\underline{R}_l \left(\theta_m, \theta_f, \lambda \right) \in [0, \infty]$ such that the couple will take the loan and invest in the durable good if and only if $R_l \leq \underline{R}_l$. ∎

Proof. of Proposition 5: Without loss of generality, suppose f has weaker bargaining power, i.e. $\lambda = \lambda_f < \lambda_m = 1 - \lambda$. As per Proposition 2, let us denote by $\underline{\theta}_f \left(L, R_l \right)$ the threshold value of her preference for the durable good (holding constant θ) below which the couple takes the loan and invests in the durable good, when offered the loan contract (L, R_l). Let $\underline{\theta}_m \left(L, R_l \right) = \theta - \underline{\theta}_f \left(L, R_l \right)$.

By construction, $R_l = \underline{R}_l\left(\underline{\theta}_m\left(L,R_l\right),\underline{\theta}_f\left(L,R_l\right),\lambda\right)$ where $\underline{R}_l\left(.\right)$ is as defined in Proposition 4. Then, by Proposition 4, the couple with durable good preferences $\underline{\theta}_f\left(L,R_l\right)$ and $\underline{\theta}_m\left(L,R_l\right)$ also takes the loan and invests in the durable good if offered the loan contract $\left(L,R_l'\right)$ where $R_l' < R_l$; i.e. the condition in (5) is satisfied with strict inequality for the couple $\left(\underline{\theta}_f\left(L,R_l\right),\underline{\theta}_m\left(L,R_l\right),\lambda\right)$ and loan contract $\left(L,R_l'\right)$. Then, by continuity, there exists some $\theta_f > \underline{\theta}_f\left(L,R_l\right)$ and $\theta_m = \theta - \theta_f$ such that the couple represented by $\left(\theta_f,\theta_m,\lambda\right)$ also satisfies (5) for loan contract $\left(L,R_l'\right)$. It follows that $\underline{\theta}_f\left(L,R_l'\right) > \underline{\theta}_f\left(L,R_l\right)$. ∎

Proof. of Proposition 6: Without loss of generality, suppose that spouse f has stronger preference for the durable good, i.e. $\theta_f > \theta_m$. As per Proposition 3, let us denote by $\bar{\lambda}_f\left(L,R_l\right)$ the threshold value of her bargaining power above which the couple takes the loan and invests in the durable good, when offered the loan contract $\left(L,R_l\right)$.

By construction, $R_l = \underline{R}_l\left(\theta_m,\theta_f,\bar{\lambda}_f\left(L,R_l\right)\right)$ where $\underline{R}_l\left(.\right)$ is as defined in Proposition 4. Then, by Proposition 4, the couple in which bargaining power is distributed according to $\bar{\lambda}_f\left(L,R_l\right)$ also takes the loan and invests in the durable good if offered the loan contract $\left(L,R_l'\right)$ where $R_l' < R_l$; i.e. the condition in (5) is satisfied with strict inequality for the couple $\left(\theta_f,\theta_m,\bar{\lambda}_f\left(L,R_l\right)\right)$ and loan contract $\left(L,R_l'\right)$. Then, by continuity, there exists some $\lambda_f < \bar{\lambda}_f\left(L,R_l\right)$ such that the couple represented by $\left(\theta_f,\theta_m,\lambda\right)$ also satisfies (5) for loan contract $\left(L,R_l'\right)$. It follows that $\bar{\lambda}_f\left(L,R_l'\right) < \bar{\lambda}_f\left(L,R_l\right)$. ∎

Proof. of Lemma 2: (i) Differentiating throughout (6) w.r.t. c_i^e, we obtain

$$u'\left(\underline{\mu}_i\left(y_1+L-c\right)\right)\left\{\frac{\partial\underline{\mu}_i}{\partial c}\left(y_1+L-c\right)-\underline{\mu}_i\right\} = 0 \tag{19}$$

Since $u'\left(.\right) > 0$, we must have $\frac{\partial\underline{\mu}_i}{\partial c}\left(y_1+L-c\right)-\underline{\mu}_i = 0$. Therefore,

$$\frac{\partial\underline{\mu}_i}{\partial c} = \underline{\mu}_i\left(y_1+L-c\right)^{-1} > 0 \tag{20}$$

(ii) We obtain the result by following the steps and reasoning in the proof of Lemma 1(ii).

(iii) Since $\underline{\mu}_i$ is increasing in λ_i (Lemma 2(ii)), it follows from (20) that $\frac{\partial\underline{\mu}_i}{\partial c}$ is increasing in λ_i.

(iv) Since $\underline{\mu}_i$ is increasing in c_i^e (Lemma 2(i)) and $\left(y_1+L-c\right)$ is decreasing in c, it follows from (20) that $\frac{\partial\underline{\mu}_i}{\partial c}$ is increasing in c_i^e. ∎

Proof. of Proposition 7: Suppose $\lambda_m > \lambda_f$ and $c_m^e \geq c \geq c_f^e$. Using Lemma 2(i), increasing c_m^e (and consequently decreasing c_f^e) increases $\underline{\mu}_m$ and decreases $\underline{\mu}_f$. As $\lambda_m > \lambda_f$ and $c_m^e \geq c \geq c_f^e$, we have, using Lemma 1(iii) and Lemma 1(iv), $\frac{\partial\underline{\mu}_m}{\partial c_m^e} > \frac{\partial\underline{\mu}_f}{\partial c_f^e}$ (i.e. $\underline{\mu}_m$ is

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more responsive to changes in c_m^e, than $\underline{\mu}_f$ is to changes in c_f^e). Therefore, $\frac{\partial \underline{\mu}_m}{\partial c_m^e} - \frac{\partial \underline{\mu}_f}{\partial c_f^e} > 0$.

$$\implies \frac{d}{dc_m^e}\left(\underline{\mu}_f + \underline{\mu}_m\right) > 0 \tag{21}$$

Therefore, if (5) holds for some $\tilde{c}_m^e \geq c$, it also holds for $c_m^e \in [c, \tilde{c}_m^e)$. Recall that there is a level of intra-household transfer such that both spouses are better-off with the loan and durable good investment if and only if (5) holds. Therefore, there exists a threshold $\underline{c}_m^e \geq c$ such that, for $c_m^e \in [c, \underline{c}_m^e)$, the condition in (5) holds and the couple takes the loan and invests in sanitation. Furthermore, for $c_m^e > \underline{c}_m^e$, the couple does not take the loan or invest in sanitation. ∎

B Relevant survey questions

Table B1
Household decision making

Who in your family usually has the final say on the following decisions:
Multiple answers possible.

1. Whether or not you should work to earn money	a. I decide
2. Whether or not to buy a large household item, such as a bicycle or TV or land	b. My husband
	c. Me and my husband
3. Whether or not to buy an item such as a cooking stove or refrigerator	d. My mother-in-law
4. How the money you earn will be used	e. My father-in-law
5. What to do with extra money you may receive (e.g. a gift, price)	f. My mother
	g. My father
6. About schooling or children aged under 18	h. Any other family member
7. Whether to take a child to the doctor when he/she is sick	
8. What to feed the child and whether to give them special snacks	
9. Whether and how to discipline a child	
10. Whether to have another child	

How much do you think it would cost you to build a toilet as shown in the next three picture? And, how long do you think your household would be able to use this toilet without any hassle (e.g. having to repair it or having the pit(s) fill up?
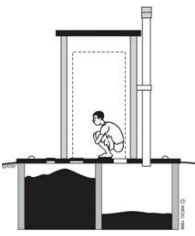
Toilet description	Picture	Expected monetary cost	Expected duration
A simple toilet, with simple hole dug out to be a pit (no lining) and a simple structure that ensures that one can't be seen by others when using it. This structure could be made of plastic sheets, palm leaves, other locally available materials.		• Minimum cost (Rs): • Maximum cost (Rs):	• Minimum years: • Maximum years:
A toilet with a lined single pit and structure that ensures privacy and protects from the elements (such as rain).		• Minimum cost (Rs): • Maximum cost (Rs):	• Minimum years: • Maximum years:
A toilet with a septic tank, a pucca super-structure (i.e. walls, roof, door) that ensures privacy, can be locked and has a vent-pipe for aeration.		• Minimum cost (Rs): • Maximum cost (Rs):	• Minimum years: • Maximum years:

Table B3
Benefit and cost perceptions

Imagine a family in your community that had no toilet previously, constructed recently a toilet, similar to the one shown in this picture (respondent shown toilet 1 or 3) Do you think the following statements hold for this family?		
Perceived benefits	1. Because of the toilet, the family will be happier.	O Strongly agree
	2. Because of the toilet, the family will be healthier.	O Agree
	3. The household members of the family will be able to work more because of this toilet.	O No opinion
	4. The family will be less embarrassed when family and friends come around to visit them.	O Disagree
	5. The family will be less embarrassed when guest from the outside visit them.	O Strongly disagree
	6. This toilet will increase the family's status in the society.	
	7. Women in the family will now be safer with this toilet.	
	8. The family will save time because they now have this toilet.	
Perceived costs	9. Toilets are unhealthy because they stink.	O Strongly agree
	10. Family members will get less exercise due to the toilet.	O Agree
	11. Family members will miss out on spending time with others because of this toilet.	O No opinion
	12. Family members might get sick more easily when using this toilet.	O Disagree
	13. The family will have to spend more time fetching water because of the toilet.	O Strongly disagree

C PCA factor loading tables

Table C1: Bargaining power - Factor loading tables (PCA)

	Bargaining power score
Whether you should work for money	.500
Whether to buy a large household item	.498
How the money you earn will be used	.512
What to do with extra money you may receive	.490

Table C2: Benefits perceptions - Factor loading tables (PCA)

	Benefits perception score
Because of the toilet my family will...	
Be happier	.361
Be healthier	.366
Be able to do more work	.359
Be less embarrassed when family visit	.368
Be less embarrassed when guests visit	.365
Gain a higher status	.322
Be safer	.348
Save time	.336

Table C3: Non-monetary cost perceptions - Factor loading tables (PCA)

	Non-monetary costs perception score
Toilets are unhealthy because they stink	.438
Because of the toilet my family will...	
Get less exercise	.493
Miss out on spending time with others	.503
Might get sick more easily	.468
Have to spend more time fetching water	.305

D   Validation graphs

The following graphs are used to validate that individual perceptions are in-line with the expected hierarchy by toilet type. Recall from section 3.3 that the different toilet types can be categorised into:

- Toilet 1: a basic unlined pit latrine without a sturdy superstructure

- Toilet 2: a standard lined pit latrine with basic superstructure (including roof)

- Toilet 3: refers to a more sophisticated toilet with twin-pit septic tanks and a sturdy (pucca) superstructure with roof and lock

Figure D1 displays the distribution of average perceived monetary cost for each of the three toilet types. As expected, the Figure shows that both male and female individuals correctly perceive toilet 1 to be cheaper than toilet 2 and toilet 2 to be cheaper than toilet 3. Figure D2 repeats this exercise for benefit perception scores and reports that both genders perceive higher benefits from toilet 3 compared to toilet 1, this difference is particularly clear for female perceptions. Finally, Figure D3 displays the distributions in non-monetary cost by toilet type. While, for women, the perceive non-monetary cost of toilet 1 is higher than for toilet 3, this difference is not so clear for the male sample.

Figure D1
Monetary cost perception data validation
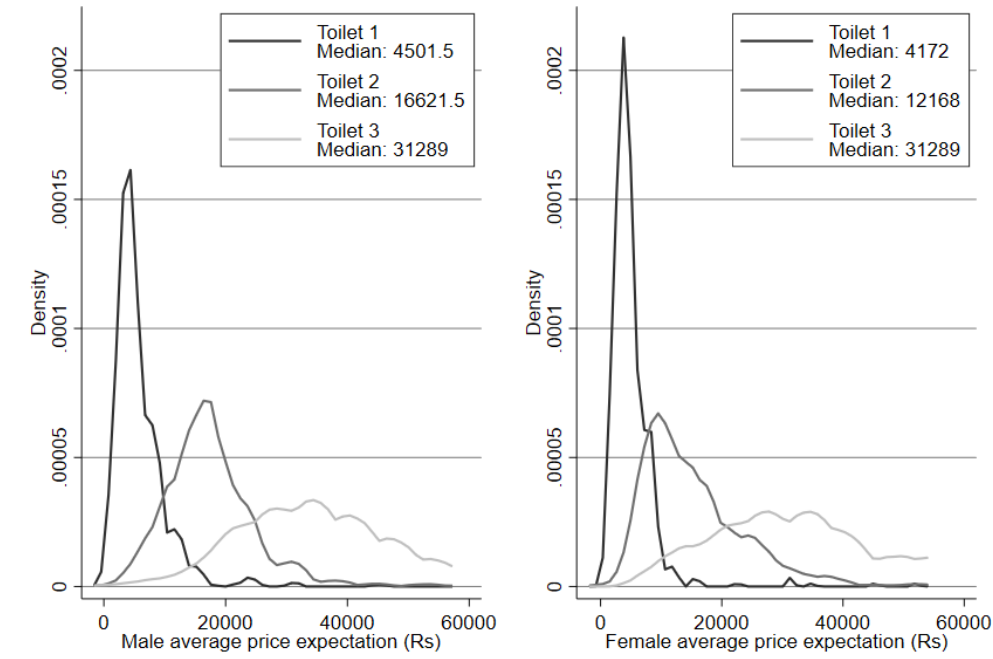
Kolmogorov-Smirnov test: we reject the null hypothesis (equality of distributions) for all, p-value < 0.01

Figure D2
Benefit perception score validation

Kolmogorov-Smirnov test: we reject the null hypothesis (equality of distributions) for all, p-value < 0.01
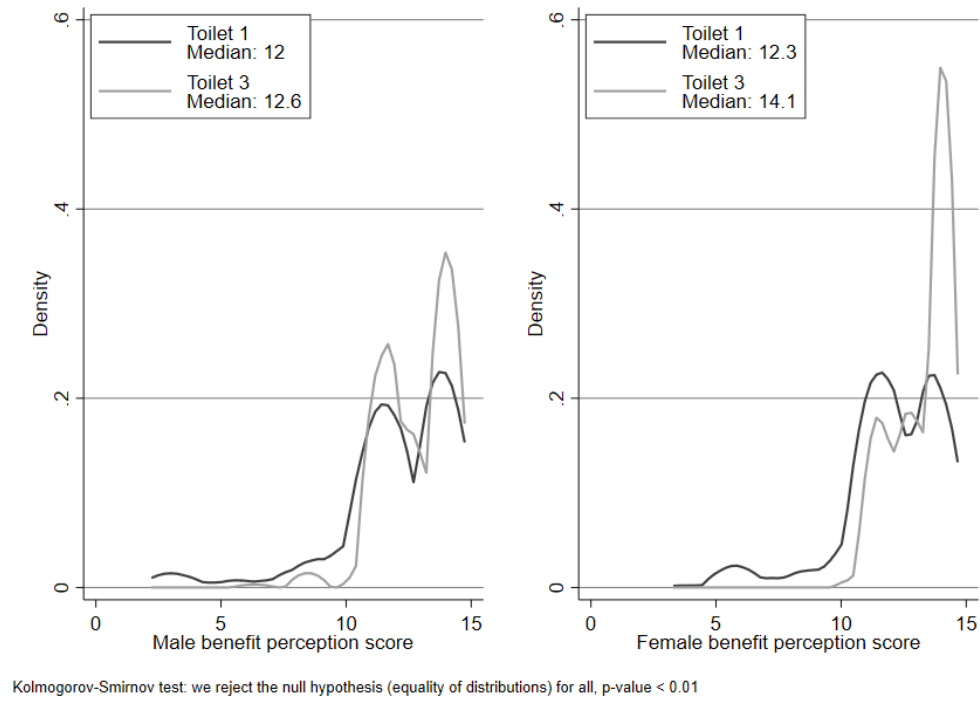
Figure D3
Non-monetary cost perception score validation

Kolmogorov-Smirnov test: we reject the null hypothesis (equality of distributions) for all, p-value < 0.01
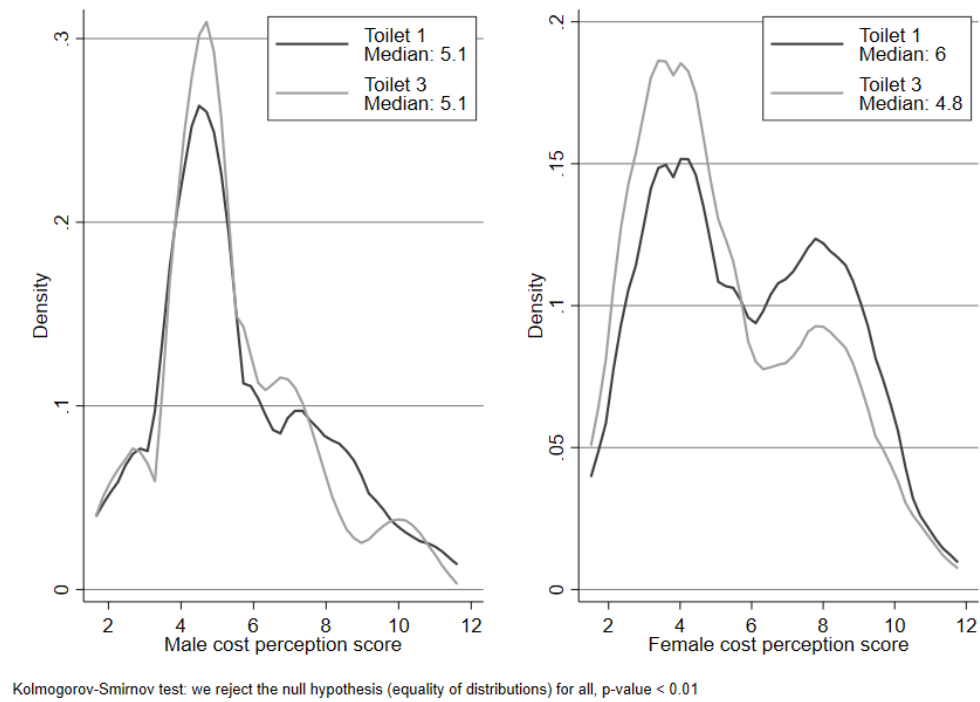
E Imputations

Imputation is used when missing values occur in our individual perceptions and bargaining power score generation. For the imputation of benefit and cost perceptions, we replace missing values with the sample mean. To control for imputation we include an dummy indicator variable in the relevant analysis.

Missing decision making responses are replaced with zero if the response is "Not applicable". The following table provides details on the number of imputed observations for each key variable.

Key variable	Achieved	Imputed
Husband's benefit perception	519	556
Wife's benefit perception	545	556
Husband's non-monetary cost perception	519	556
Wife's non-monetary cost perception	545	556
Husband's monetary cost perception	1074	1135
Wife's monetary cost perception	1132	1135
Wife's bargaining power	932	1135

F Robustness checks

First, we want to assess the robustness of bargaining power variable. Table F1 displays the correlation between the constructed bargaining power score and other baseline characteristics commonly associated with female bargaining power (more details in Section 3.3. The bargaining power score displays correlations in the expected direction for each variable, for example, the results suggest a positive correlation between bargaining power score and whether the woman has a bank account, whether she contributes to household income and being allowed to go to the market alone, and a negative correlation with living with her mother-in-law and the number of male household members. To ensure the bargaining power results are not driven by selection of specific decisions we repeat the analysis with an alternative definition of bargaining power. This alternative score is generated in the same fashion as previously but with the addition of decisions relating to the rearing of children. Results, in Tables F2 and F3, display qualitatively similar relationships to those in our main regression. To further test this robustness, we re-calculate the bargaining power scores using binary base variables, such that =1 if the woman is involved in the decision. This simpler method does not account for number of decision makers. Results, displayed in Tables F4 and F5, provide similar insights to our main results.

Second, we assess the robustness of our findings to the inclusion of household controls. The concern being that perception and bargaining power variables could be correlated

with confounding factors that also influence loan uptake and/or toilet ownership. Results, obtained in Tables F7, F6 and F8, are robust to the inclusion of such controls.

Third, we consider how results differ when the intra-household perception categories are altered. The original boundaries were constructed such that "Wife's perception similar" had mean 0 and included roughly 33% of the sample. The new categories are generated such that the similar category includes all intra-household differences within the range of half a standard deviation above or below 0. Results are displayed in Tables F9, F10 and F11. The conclusions drawn remain largely similar.

F.1 Determinants of bargaining power

Table F1

Determinants of bargaining power

	(1) Unimputed BP	(2) Imputed BP
Age (w)	0.10	0.11
	(0.11)	(0.10)
Years of education (w)	0.10	0.07
	(0.11)	(0.10)
Woman has bank account	0.88**	0.72**
	(0.36)	(0.31)
Contributed to HH income in last 6 months (w)	0.49*	0.61**
	(0.30)	(0.28)
Woman is member of loan group	0.39	0.32
	(0.34)	(0.28)
Can go to local market alone	1.80***	1.71***
	(0.56)	(0.46)
Can visit neighbour alone	1.76**	1.39**
	(0.69)	(0.58)
Can visit friend outside village alone	-0.12	-0.16
	(0.46)	(0.38)
Age (m)	0.08	0.09
	(0.12)	(0.10)
Years of education (m)	-0.01	0.03
	(0.11)	(0.10)
No. male HH members	-0.34***	-0.28***
	(0.11)	(0.09)
No. female HH members	-0.06	-0.10
	(0.10)	(0.08)
Live with husband's mother	-0.63*	-0.66**
	(0.36)	(0.32)
Child(ren) less than 2 at BL	-1.21***	-0.89***
	(0.36)	(0.30)
Constant	2.12	1.94
	(2.36)	(1.85)
Mean of BP	6.82	6.20
SD of BP	4.54	4.48
Adjusted R^2	0.27	0.32
No. of HHs	931	1,134

Note: This table shows the correlation between the constructed bargaining power variable and correlates associated with female empowerment. Outcome variable is the bargaining power PCA score generated from household decision making information. Standard errors are reported in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

F.2 Alternative bargaining power measures: Including child-related decisions

Table F2

Investment decisions and bargaining power (alternative BP)

	(1) Loan uptake	(2) Toilet ownership
Low BP x SL	0.15*** (0.03)	0.06 (0.06)
Mid BP x SL	0.22*** (0.06)	0.14** (0.07)
High BP x SL	0.19*** (0.04)	0.06 (0.05)
Mid BP	-0.02 (0.02)	-0.07 (0.06)
High BP	-0.02 (0.02)	-0.04 (0.05)
Strata FE	Yes	Yes
Household covariates	Yes	Yes
Control DV mean (low BP)	0.01	0.44
Control DV mean (mid BP)	0.04	0.41
Control DV mean (high BP)	0.01	0.43
No. of HHs	1,134	1,134
p-value: low=mid	0.25	0.43
p-value: low=high	0.34	0.98
p-value: mid=high	0.64	0.37

Note: This table shows the results of how the impact of treatment varies by the woman's bargaining power (measured relative to the average for all women). This alternative bargaining power measure takes into account all previously included decisions with the addition of decisions relating to child rearing. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of household consumption. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table F3

Loan uptake, toilet ownership, intra-household perceptions and bargaining power (alternative BP)

	Loan uptake			Toilet ownership		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs	(4) Benefits	(5) Non-monetary costs	(6) Monetary costs
Low BP x Wife's perception lower x SL	0.05 (0.06)	0.19** (0.08)	0.22*** (0.05)	-0.03 (0.12)	0.03 (0.13)	0.17** (0.08)
Low BP x Wife's perception higher x SL	0.22*** (0.06)	0.16*** (0.05)	0.10** (0.04)	0.02 (0.10)	0.03 (0.09)	-0.02 (0.07)
Mid BP x Wife's perception lower x SL	0.03 (0.09)	0.38*** (0.13)	0.22** (0.09)	0.06 (0.14)	0.29* (0.17)	0.29*** (0.09)
Mid BP x Wife's perception higher x SL	0.34*** (0.08)	0.21*** (0.08)	0.19*** (0.06)	0.10 (0.11)	0.03 (0.11)	0.02 (0.08)
High BP x Wife's perception lower x SL	0.09 (0.08)	0.21*** (0.08)	0.20*** (0.05)	0.14 (0.13)	0.03 (0.10)	0.10 (0.06)
High BP x Wife's perception higher x SL	0.23*** (0.05)	0.17** (0.07)	0.17*** (0.05)	0.12 (0.08)	0.19** (0.08)	0.04 (0.07)
Strata FE	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Control DV mean (lowBP*lower)	0.04	0.04	0.00	0.54	0.51	0.35
Control DV mean (lowBP*higher)	0.02	0.00	0.02	0.42	0.40	0.50
Control DV mean (midBP*lower)	0.10	0.00	0.05	0.33	0.37	0.33
Control DV mean (midBP*higher)	0.02	0.06	0.03	0.41	0.40	0.49
Control DV mean (highBP*lower)	0.02	0.00	0.01	0.36	0.43	0.44
Control DV mean (highBP*higher)	0.00	0.01	0.01	0.40	0.34	0.42
No. of HHs	556	556	1,134	556	556	1,134
lowBP*lower=lowBP*higher	0.06	0.71	0.04	0.77	0.98	0.05
midBP*lower=midBP*higher	0.00	0.17	0.71	0.78	0.16	0.03
highBP*lower=highBP*higher	0.10	0.70	0.69	0.89	0.18	0.48

Note: This table shows differential impact of treatment by intra-household perceptions and bargaining power. Using the broader definition of bargaining power that includes child-related decisions. Outcome variables are binary such that loan uptake =1 if a household takes a sanitation loan and toilet ownership =1 is a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of yearly household consumption per capita at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

F.3 Alternative bargaining power measures: Binary base variables

Table F4

Investment decisions and bargaining power (binary base BP)

	(1) Loan uptake	(2) Toilet ownership
Low BP x SL	0.13*** (0.03)	0.08 (0.06)
Mid BP x SL	0.22*** (0.06)	0.16** (0.07)
High BP x SL	0.19*** (0.04)	0.04 (0.05)
Mid BP	-0.06** (0.03)	-0.12** (0.06)
High BP	-0.03 (0.02)	-0.04 (0.05)
Strata FE	Yes	Yes
Household covariates	Yes	Yes
Control DV mean (low BP)	0.01	0.43
Control DV mean (mid BP)	0.04	0.37
Control DV mean (high BP)	0.01	0.45
No. of HHs	1,134	1,134
p-value: low=mid	0.13	0.34
p-value: low=high	0.12	0.60
p-value: mid=high	0.61	0.14

Note: This table shows the results of how the impact of treatment varies by the woman's bargaining power (measured relative to the average for all women). This alternative bargaining power score is generated from binary base variables (=1 if wife is involved in that decision). Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of household consumption. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table F5
Loan uptake, toilet ownership, intra-household perceptions and bargaining power (binary base BP)

	Loan uptake			Toilet ownership		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs	(4) Benefits	(5) Non-monetary costs	(6) Monetary costs
Low BP x Wife's perception lower x SL	0.08 (0.07)	0.13 (0.08)	0.20*** (0.05)	0.02 (0.13)	-0.02 (0.14)	0.11 (0.10)
Low BP x Wife's perception higher x SL	0.18*** (0.06)	0.17*** (0.05)	0.09** (0.04)	-0.01 (0.10)	0.04 (0.10)	0.06 (0.07)
Mid BP x Wife's perception lower x SL	0.01 (0.10)	0.42*** (0.12)	0.26*** (0.10)	0.13 (0.15)	0.34** (0.15)	0.39*** (0.08)
Mid BP x Wife's perception higher x SL	0.32*** (0.08)	0.17* (0.09)	0.17*** (0.06)	0.22** (0.11)	0.16 (0.11)	-0.04 (0.09)
High BP x Wife's perception lower x SL	0.07 (0.07)	0.22*** (0.07)	0.19*** (0.05)	0.07 (0.11)	0.03 (0.10)	0.08 (0.06)
High BP x Wife's perception higher x SL	0.24*** (0.05)	0.18*** (0.06)	0.18*** (0.04)	0.07 (0.07)	0.10 (0.08)	0.02 (0.06)
Strata FE	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
DV mean (lowBP*lower)	0.05	0.06	0.00	0.45	0.54	0.41
DV mean (lowBP*higher)	0.02	0.00	0.02	0.44	0.37	0.45
DV mean (midBP*lower)	0.10	0.00	0.04	0.43	0.32	0.25
DV mean (midBP*higher)	0.02	0.07	0.04	0.32	0.37	0.51
DV mean (highBP*lower)	0.02	0.00	0.01	0.37	0.45	0.45
DV mean (highBP*higher)	0.00	0.01	0.01	0.44	0.38	0.45
No. of HHs	556	556	1,134	556	556	1,134
lowBP*lower=lowBP*higher	0.25	0.61	0.07	0.84	0.75	0.66
midBP*lower=midBP*higher	0.00	0.05	0.34	0.60	0.26	0.00
highBP*lower=highBP*higher	0.03	0.62	0.90	0.98	0.56	0.48

Note: This table shows differential impact of treatment by intra-household perceptions and bargaining power where bargaining power score is generated from binary base variables (=1 if wife is involved in that decision). Outcome variables are binary such that loan uptake =1 if a household takes a sanitation loan and toilet ownership =1 is a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of yearly household consumption per capita at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

F.4 Household controls

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Table F6

Investment decisions and bargaining power with additional household covariates

</div>

	(1) Loan uptake	(2) Toilet ownership
Low BP x SL	0.13***	0.04
	(0.03)	(0.06)
Mid BP x SL	0.21***	0.10*
	(0.06)	(0.06)
High BP x SL	0.19***	0.06
	(0.04)	(0.05)
Mid BP	-0.05**	-0.08
	(0.02)	(0.05)
High BP	-0.04	-0.07
	(0.02)	(0.05)
Strata FE	Yes	Yes
Household covariates	Yes	Yes
Control DV mean (low BP)	0.01	0.43
Control DV mean (mid BP)	0.04	0.41
Control DV mean (high BP)	0.01	0.44
No. of HHs	1,134	1,134
p-value: low=mid	0.12	0.43
p-value: low=high	0.11	0.78
p-value: mid=high	0.78	0.54

Note: This table shows the results of how the impact of treatment varies by the woman's bargaining power (measured relative to the average for all women). Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include caste dummies, open defecation social norm dummies (e.g. a dummy =1 if the man/wife agrees that it is acceptable to defecate in the open), and household controls (log household consumption per capita, religion dummies, dummy =1 if a household member owns the dwelling, number of household members, gender of the household head, the age and education level of the household head, a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table F7

Loan uptake, toilet ownership and intra-household perceptions with additional household covariates

	Loan uptake			Toilet ownership		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs	(4) Benefits	(5) Non-monetary costs	(6) Monetary costs
Wife's perception lower x SL	0.06 (0.04)	0.22*** (0.06)	0.21*** (0.05)	0.07 (0.07)	0.05 (0.08)	0.15*** (0.05)
Wife's perception similar x SL	0.21*** (0.05)	0.17*** (0.05)	0.13** (0.05)	0.02 (0.07)	0.07 (0.10)	0.06 (0.07)
Wife's perception higher x SL	0.26*** (0.06)	0.18*** (0.05)	0.15*** (0.03)	0.12 (0.08)	0.12* (0.06)	-0.02 (0.05)
HH average perception x SL	-0.04 (0.03)	-0.02 (0.03)	-0.07** (0.03)	-0.02 (0.04)	-0.04 (0.04)	0.03 (0.03)
HH average perception	0.01 (0.01)	-0.00 (0.01)	0.01 (0.01)	0.00 (0.03)	0.02 (0.03)	0.00 (0.01)
Wife's perception similar	-0.04 (0.03)	-0.00 (0.04)	0.03 (0.03)	-0.03 (0.07)	-0.01 (0.08)	0.04 (0.05)
Wife's perception higher	-0.03 (0.04)	-0.01 (0.03)	0.03* (0.02)	-0.05 (0.07)	-0.07 (0.07)	0.08* (0.05)
Strata FE	Yes	Yes	Yes	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes	Yes	Yes	Yes
Control DV mean (lower)	0.04	0.02	0.01	0.40	0.45	0.39
Control DV mean (similar)	0.00	0.04	0.03	0.37	0.41	0.44
Control DV mean (higher)	0.02	0.01	0.02	0.44	0.35	0.48
No. of HHs	556	556	1,134	556	556	1,134
p-value: lower=similar	0.01	0.46	0.16	0.62	0.91	0.19
p-value: lower=higher	0.01	0.62	0.21	0.58	0.52	0.01
p-value: similar=higher	0.50	0.84	0.73	0.34	0.63	0.30

Note: This table shows the results of how the impact of treatment varies by differences in intra-household benefit, non-monetary and monetary cost perceptions. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include caste dummies, open defecation social norm dummies (e.g. a dummy =1 if the man/wife agrees that it is acceptable to defecate in the open), and household controls (log household consumption per capita, religion dummies, dummy =1 if a household member owns the dwelling, number of household members, gender of the household head, the age and education level of the household head, a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table F8

Loan uptake, toilet ownership, intra-household perceptions and bargaining power with additional household covariates

	Loan uptake			Toilet ownership		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs	(4) Benefits	(5) Non-monetary costs	(6) Monetary costs
Low BP x Wife's perception lower x SL	0.05 (0.07)	0.10 (0.08)	0.20*** (0.05)	-0.06 (0.12)	-0.06 (0.12)	0.09 (0.10)
Low BP x Wife's perception higher x SL	0.19*** (0.06)	0.19*** (0.05)	0.09** (0.04)	-0.04 (0.10)	0.01 (0.10)	0.00 (0.07)
Mid BP x Wife's perception lower x SL	0.00 (0.09)	0.41*** (0.12)	0.23*** (0.09)	0.07 (0.14)	0.28* (0.15)	0.27*** (0.08)
Mid BP x Wife's perception higher x SL	0.30*** (0.08)	0.16** (0.07)	0.16*** (0.05)	0.12 (0.11)	0.05 (0.09)	-0.07 (0.08)
High BP x Wife's perception lower x SL	0.09 (0.07)	0.21*** (0.08)	0.20*** (0.05)	0.16 (0.12)	0.04 (0.10)	0.11* (0.06)
High BP x Wife's perception higher x SL	0.23*** (0.05)	0.19*** (0.06)	0.18*** (0.05)	0.12 (0.08)	0.19** (0.09)	0.03 (0.07)
Strata FE	Yes	Yes	Yes	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes	Yes	Yes	Yes
Control DV mean (lowBP*lower)	0.04	0.05	0.00	0.50	0.54	0.39
Control DV mean (lowBP*higher)	0.02	0.00	0.02	0.43	0.37	0.46
Control DV mean (midBP*lower)	0.10	0.00	0.04	0.38	0.35	0.28
Control DV mean (midBP*higher)	0.02	0.06	0.03	0.39	0.41	0.56
Control DV mean (highBP*lower)	0.02	0.00	0.01	0.36	0.43	0.45
Control DV mean (highBP*higher)	0.00	0.01	0.01	0.41	0.35	0.42
No. of HHs	556	556	1,134	556	556	1,134
lowBP*lower=lowBP*higher	0.13	0.33	0.07	0.89	0.69	0.42
midBP*lower=midBP*higher	0.00	0.04	0.44	0.74	0.18	0.00
highBP*lower=highBP*higher	0.09	0.84	0.75	0.78	0.22	0.39
joint equality (lower)	0.78	0.07	0.92	0.49	0.21	0.19
joint equality (higher)	0.47	0.94	0.13	0.42	0.25	0.61

Note: This table shows the results of how the impact of treatment varies by differences in intra-household benefit, non-monetary and monetary cost perceptions. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include caste dummies, open defecation social norm dummies (e.g. a dummy =1 if the man/wife agrees that it is acceptable to defecate in the open), and household controls (log household consumption per capita, religion dummies, dummy =1 if a household member owns the dwelling, number of household members, gender of the household head, the age and education level of the household head, a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

F.5 Alternative intra-household perception boundaries

Table F9

Loan uptake, toilet ownership and intra-household perceptions

	Loan uptake			Toilet ownership		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs	(4) Benefits	(5) Non-monetary costs	(6) Monetary costs
Wife's perception lower x SL	0.09*	0.22***	0.27***	0.06	0.10	0.19***
	(0.05)	(0.06)	(0.06)	(0.07)	(0.08)	(0.06)
Wife's perception similar x SL	0.19***	0.18***	0.16***	0.05	0.07	0.06
	(0.05)	(0.05)	(0.04)	(0.07)	(0.08)	(0.04)
Wife's perception higher x SL	0.28***	0.20***	0.11***	0.14	0.09	0.03
	(0.07)	(0.05)	(0.04)	(0.08)	(0.06)	(0.07)
HH average perception x SL	-0.03	-0.02	-0.06*	-0.00	-0.03	0.01
	(0.03)	(0.02)	(0.03)	(0.04)	(0.04)	(0.03)
HH average perception	0.00	-0.00	0.01	-0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.01)
Wife's perception similar	-0.02	0.00	0.02	-0.08	0.03	0.02
	(0.03)	(0.03)	(0.01)	(0.07)	(0.07)	(0.04)
Wife's perception higher	-0.02	-0.01	0.05**	-0.09	-0.03	0.08
	(0.03)	(0.02)	(0.02)	(0.07)	(0.07)	(0.06)
Strata FE	Yes	Yes	Yes	Yes	Yes	Yes
Household covariates	Yes	Yes	Yes	Yes	Yes	Yes
Control DV mean (lower)	0.04	0.01	0.01	0.42	0.41	0.42
Control DV mean (similar)	0.01	0.05	0.01	0.35	0.45	0.42
Control DV mean (higher)	0.02	0.00	0.03	0.46	0.35	0.47
No. of HHs	556	556	1,134	556	556	1,134
p-value: lower=similar	0.08	0.50	0.09	0.92	0.72	0.06
p-value: lower=higher	0.01	0.74	0.04	0.44	0.94	0.07
p-value: similar=higher	0.34	0.70	0.25	0.39	0.77	0.67

Note: This table shows the results of how the impact of treatment varies by differences in intra-household benefit, non-monetary and monetary cost perceptions with adjusted adjusted perception boundaries. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of yearly household consumption per capita at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table F10

Loan uptake, intra-household perceptions and bargaining power

	Loan uptake		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs
Low BP x Wife's perception lower x SL	0.08 (0.07)	0.16* (0.09)	0.22** (0.09)
Low BP x Wife's perception higher x SL	0.20*** (0.06)	0.17*** (0.05)	0.12*** (0.04)
Mid BP x Wife's perception lower x SL	-0.03 (0.10)	0.36*** (0.12)	0.34*** (0.12)
Mid BP x Wife's perception higher x SL	0.31*** (0.08)	0.20** (0.08)	0.16*** (0.05)
High BP x Wife's perception lower x SL	0.14* (0.08)	0.19** (0.09)	0.24*** (0.07)
High BP x Wife's perception higher x SL	0.21*** (0.05)	0.20*** (0.06)	0.17*** (0.04)
Strata FE	Yes	Yes	Yes
Covariates	Yes	Yes	Yes
Control DV mean (lowBP*lower)	0.05	0.03	0.00
Control DV mean (lowBP*higher)	0.02	0.02	0.01
Control DV mean (midBP*lower)	0.13	0.00	0.02
Control DV mean (midBP*higher)	0.02	0.06	0.04
Control DV mean (highBP*lower)	0.00	0.00	0.01
Control DV mean (highBP*higher)	0.01	0.01	0.01
No. of HHs	556	556	1,134
lowBP*lower=lowBP*higher	0.17	0.89	0.31
midBP*lower=midBP*higher	0.00	0.19	0.11
highBP*lower=highBP*higher	0.41	0.98	0.34
joint equality (lower)	0.44	0.39	0.67
joint equality (higher)	0.48	0.91	0.47

Note: This table shows the results of how the impact of treatment varies by differences in intra-household benefit, non-monetary and monetary cost perceptions with adjusted perception boundaries. Loan uptake =1 if a household takes a sanitation loan. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of yearly household consumption per capita at baseline. Household average is standardised with mean 0 and standard deviation 1. Some explanatory variable have been removed to improve legibility, the full table can be viewed in Appendix G. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table F11

Toilet ownership, intra-household perceptions and bargaining power

	Toilet ownership		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs
Low BP x Wife's perception lower x SL	-0.10 (0.14)	0.01 (0.15)	0.13 (0.14)
Low BP x Wife's perception higher x SL	0.02 (0.10)	-0.00 (0.09)	0.05 (0.07)
Mid BP x Wife's perception lower x SL	0.12 (0.14)	0.28* (0.16)	0.39*** (0.11)
Mid BP x Wife's perception higher x SL	0.11 (0.11)	0.06 (0.10)	0.03 (0.06)
High BP x Wife's perception lower x SL	0.14 (0.12)	0.08 (0.10)	0.09 (0.07)
High BP x Wife's perception higher x SL	0.12 (0.07)	0.13 (0.08)	0.06 (0.06)
Strata FE	Yes	Yes	Yes
Covariates	Yes	Yes	Yes
Control DV mean (lowBP*lower)	0.55	0.50	0.50
Control DV mean (lowBP*higher)	0.42	0.42	0.42
Control DV mean (midBP*lower)	0.38	0.35	0.28
Control DV mean (midBP*higher)	0.39	0.40	0.46
Control DV mean (highBP*lower)	0.38	0.39	0.47
Control DV mean (highBP*higher)	0.40	0.40	0.43
No. of HHs	556	556	1,134
lowBP*lower=lowBP*higher	0.54	0.96	0.59
midBP*lower=midBP*higher	0.92	0.19	0.00
highBP*lower=highBP*higher	0.86	0.65	0.78
joint equality (lower)	0.40	0.40	0.05
joint equality (higher)	0.68	0.47	0.94

Note: This table shows the results of how the impact of treatment varies by differences in intra-household benefit, non-monetary and monetary cost perceptions with adjusted perception boundaries. Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of yearly household consumption per capita at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

G Additional tables

Table G1 displays the results by intra-household differences in toilet duration expectations. Column (1) focuses on sanitation loan uptake and column (2) on toilet ownership. Both columns shows that there are no differential impacts by intra-household differences in duration expectations on loan uptake or toilet ownership.

Table G2 displays the results for the triple interaction specification with intra-household expected duration and bargaining power. Column (1) displays no statistically significant differences by intra-household duration expectations nor by bargaining power on loan uptake. In column (2) we find, for Low and Mid bargaining power categories, that toilet ownership is between 22 and 24 percentage points (pp) higher in households where the wife's duration expectation is lower than her husbands. This difference is statistically significant at the 5% level. This relationship is reversed for households with high bargaining power - toilet ownership is 16 pp higher in households where the wife's duration expectation is higher than her husbands (significant at the 10% level).

G.1 The role of intra-household duration perceptions

Table G1

Loan uptake, toilet ownership and intra-household duration expectations

	(1) Loan uptake	(2) Toilet ownership
Wife's duration lower x SL	0.17***	0.12**
	(0.05)	(0.06)
Wife's duration similar x SL	0.15***	0.10*
	(0.04)	(0.06)
Wife's duration higher x SL	0.22***	0.01
	(0.04)	(0.06)
HH average duration x SL	-0.05	0.04
	(0.03)	(0.03)
HH average duration	0.02**	-0.00
	(0.01)	(0.02)
Wife's duration similar	-0.02	-0.03
	(0.02)	(0.06)
Wife's duration higher	-0.06**	-0.01
	(0.03)	(0.05)
Strata FE	Yes	Yes
Household covariates	Yes	Yes
Control DV mean (lower)	0.04	0.42
Control DV mean (similar)	0.01	0.38
Control DV mean (higher)	0.00	0.48
No. of HHs	1,134	1,134
p-value: lower=similar	0.77	0.85
p-value: lower=higher	0.34	0.15
p-value: similar=higher	0.12	0.22

Note: This table shows the results of how the impact of treatment varies by differences in intra-household duration expectation. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of yearly household consumption per capita at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Loan uptake, toilet ownership, intra-household duration expectations
and bargaining power

	(1) Loan uptake	(2) Toilet ownership
Low BP x Wife's duration lower x SL	0.16*** (0.06)	0.20* (0.11)
Low BP x Wife's duration higher x SL	0.13*** (0.05)	-0.01 (0.07)
Mid BP x Wife's duration lower x SL	0.19** (0.09)	0.29*** (0.11)
Mid BP x Wife's duration higher x SL	0.22*** (0.05)	0.01 (0.06)
High BP x Wife's duration lower x SL	0.15** (0.07)	-0.06 (0.08)
High BP x Wife's duration higher x SL	0.20*** (0.04)	0.12** (0.06)
Low BP x Wife's duration higher	-0.00 (0.03)	-0.04 (0.09)
Mid BP x Wife's duration lower	-0.01 (0.03)	-0.22** (0.11)
High BP x Wife's duration lower	0.01 (0.04)	0.00 (0.09)
Mid BP x Wife's duration higher	-0.07** (0.03)	-0.04 (0.08)
High BP x Wife's duration higher	-0.04 (0.03)	-0.13 (0.09)
HH average duration x SL	-0.05 (0.03)	0.03 (0.03)
HH average duration	0.02* (0.01)	0.01 (0.02)
Strata FE	Yes	Yes
Covariates	Yes	Yes
Control DV mean (lowBP*lower)	0.00	0.43
Control DV mean (lowBP*higher)	0.02	0.44
Control DV mean (midBP*lower)	0.08	0.28
Control DV mean (midBP*higher)	0.01	0.48
Control DV mean (highBP*lower)	0.04	0.51
Control DV mean (highBP*higher)	0.00	0.41

	(1) Loan uptake	(2) Toilet ownership
No. of HHs	1,134	1,134
lowBP*lower=lowBP*higher	0.68	0.10
midBP*lower=midBP*higher	0.68	0.02
highBP*lower=highBP*higher	0.50	0.05
lowBP*lower=midBP*lower	0.81	0.58
lowBP*lower=highBP*lower	0.90	0.05
midBP*lower=highBP*lower	0.71	0.01
lowBP*higher=midBP*higher	0.12	0.83
lowBP*higher=highBP*higher	0.14	0.07
midBP*higher=highBP*higher	0.78	0.16

Note: This table shows the results of how the impact of treatment varies by the woman's bargaining power and differences in intra-household duration expectations. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. To improve legibility we have combined similar and higher intra-household difference categories into a single "higher" category. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of yearly household consumption per capita at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

G.2 Full interaction tables

Tables G3 and G4 below repeat the triple interaction results in Section 6 with the three intra-household perception categories (lower, similar and higher) for loan uptake and toilet ownership outcomes, respectively. Again we can see that loan uptake differs significantly by benefit perception and non-monetary cost perceptions in the mid bargaining power group and toilet ownership differs by monetary cost perceptions in the mid bargaining power group.

Table G3

Loan uptake, intra-household perceptions and bargaining power

	Loan uptake		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs
Low BP x Wife's perception lower x SL	0.09 (0.07)	0.14* (0.08)	0.21*** (0.05)
Low BP x Wife's perception similar x SL	0.24*** (0.09)	0.24** (0.09)	0.05 (0.06)
Low BP x Wife's perception higher x SL	0.18** (0.09)	0.18*** (0.06)	0.12** (0.05)
Mid BP x Wife's perception lower x SL	0.00 (0.09)	0.43*** (0.12)	0.24*** (0.09)
Mid BP x Wife's perception similar x SL	0.32*** (0.10)	0.19** (0.09)	0.13 (0.08)
Mid BP x Wife's perception higher x SL	0.31*** (0.11)	0.14 (0.10)	0.18*** (0.06)
High BP x Wife's perception lower x SL	0.08 (0.07)	0.21*** (0.08)	0.20*** (0.05)
High BP x Wife's perception similar x SL	0.16*** (0.06)	0.10 (0.08)	0.21** (0.09)
High BP x Wife's perception higher x SL	0.29*** (0.08)	0.25*** (0.08)	0.17*** (0.04)
High BP x Wife's perception higher x SL	0.00 (.)		
Low BP x Wife's perception similar	-0.03 (0.04)	-0.02 (0.06)	0.03 (0.03)
Low BP x Wife's perception higher	-0.01 (0.07)	-0.03 (0.05)	0.06** (0.03)
Mid BP x Wife's perception lower	-0.03 (0.07)	-0.14* (0.07)	-0.02 (0.03)
Mid BP x Wife's perception similar	-0.13* (0.07)	-0.12 (0.08)	-0.02 (0.03)
High BP x Wife's perception lower	-0.03 (0.06)	-0.04 (0.05)	-0.01 (0.02)
High BP x Wife's perception similar	-0.03 (0.05)	0.01 (0.06)	0.03 (0.05)

Mid BP x Wife's perception higher	-0.11*	-0.08	0.01
	(0.06)	(0.07)	(0.03)
High BP x Wife's perception higher	-0.03	-0.06	0.01
	(0.05)	(0.06)	(0.03)
HH average perception x SL	-0.03	-0.03	-0.06**
	(0.03)	(0.03)	(0.03)
HH average perception	0.00	0.01	0.01
	(0.01)	(0.01)	(0.01)
High BP x Wife's perception higher x SL		0.00	
		(.)	
High BP x Wife's perception higher x SL			0.00
			(.)
Strata FE	Yes	Yes	Yes
Covariates	Yes	Yes	Yes
Control DV mean (lowBP*lower)	0.04	0.05	0.00
Control DV mean (lowBP*similar)	0.00	0.00	0.02
Control DV mean (lowBP*higher)	0.03	0.00	0.02
Control DV mean (midBP*lower)	0.10	0.00	0.04
Control DV mean (midBP*similar)	0.00	0.08	0.00
Control DV mean (midBP*higher)	0.03	0.04	0.05
Control DV mean (highBP*lower)	0.02	0.00	0.01
Control DV mean (highBP*similar)	0.00	0.03	0.04
Control DV mean (highBP*higher)	0.00	0.00	0.00
No. of HHs	556	556	1,134
lowBP*lower=lowBP*similar	0.12	0.37	0.05
lowBP*lower=lowBP*higher	0.37	0.65	0.22
lowBP*similar=lowBP*higher	0.64	0.53	0.39
midBP*lower=midBP*similar	0.01	0.10	0.34
midBP*lower=midBP*higher	0.01	0.03	0.49
midBP*similar=midBP*higher	0.95	0.64	0.65
highBP*lower=highBP*similar	0.23	0.31	0.89
highBP*lower=highBP*higher	0.07	0.72	0.66
highBP*similar=highBP*higher	0.18	0.15	0.63
lowBP*lower=midBP*lower	0.42	0.04	0.71
lowBP*lower=highBP*lower	0.98	0.47	0.87
midBP*lower=highBP*lower	0.53	0.12	0.59
lowBP*similar=midBP*similar	0.52	0.71	0.38
lowBP*similar=highBP*similar	0.37	0.29	0.12
midBP*similar=highBP*similar	0.15	0.47	0.52
lowBP*higher=midBP*higher	0.34	0.73	0.39
lowBP*higher=highBP*higher	0.28	0.37	0.44

midBP*higher=highBP*higher	0.89	0.35	0.91

Note: This table shows the results of how the impact of treatment varies by differences in intra-household perceptions and bargaining power. Outcome variable, loan uptake, is binary such that =1 if a household takes a sanitation loan. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of yearly household consumption per capita at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table G4

Toilet ownership, intra-household perceptions and bargaining power

	Toilet ownership		
	(1) Benefits	(2) Non-monetary costs	(3) Monetary costs
Low BP x Wife's perception lower x SL	-0.01 (0.13)	-0.01 (0.13)	0.12 (0.10)
Low BP x Wife's perception similar x SL	-0.05 (0.14)	-0.07 (0.20)	0.18 (0.12)
Low BP x Wife's perception higher x SL	0.03 (0.14)	0.07 (0.10)	-0.04 (0.07)
Mid BP x Wife's perception lower x SL	0.07 (0.14)	0.29* (0.16)	0.30*** (0.08)
Mid BP x Wife's perception similar x SL	-0.02 (0.13)	0.09 (0.15)	-0.05 (0.13)
Mid BP x Wife's perception higher x SL	0.24* (0.14)	0.02 (0.11)	-0.06 (0.09)
High BP x Wife's perception lower x SL	0.13 (0.12)	0.03 (0.10)	0.10 (0.06)
High BP x Wife's perception similar x SL	0.11 (0.10)	0.09 (0.12)	0.06 (0.11)
High BP x Wife's perception higher x SL	0.11 (0.12)	0.25** (0.11)	0.03 (0.08)
Low BP x Wife's perception similar	-0.00 (0.14)	0.04 (0.17)	0.00 (0.09)
Low BP x Wife's perception higher	-0.13 (0.13)	-0.14 (0.11)	0.06 (0.07)
Mid BP x Wife's perception lower	-0.13 (0.11)	-0.26** (0.12)	-0.17*** (0.06)
Mid BP x Wife's perception similar	-0.04 (0.13)	-0.08 (0.14)	0.12 (0.10)

continued

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High BP x Wife's perception lower	-0.10	-0.07	-0.02
	(0.10)	(0.10)	(0.07)
High BP x Wife's perception similar	-0.20*	-0.11	-0.10
	(0.10)	(0.12)	(0.09)
Mid BP x Wife's perception higher	-0.25**	-0.12	0.06
	(0.12)	(0.12)	(0.11)
High BP x Wife's perception higher	-0.07	-0.20*	-0.01
	(0.11)	(0.12)	(0.08)
HH average perception x SL	-0.00	-0.05	0.02
	(0.04)	(0.04)	(0.03)
HH average perception	-0.01	0.02	0.01
	(0.03)	(0.03)	(0.01)
Strata FE	Yes	Yes	Yes
Covariates	Yes	Yes	Yes
Control DV mean (lowBP*lower)	0.50	0.54	0.39
Control DV mean (lowBP*similar)	0.42	0.43	0.44
Control DV mean (lowBP*higher)	0.44	0.34	0.48
Control DV mean (midBP*lower)	0.38	0.35	0.28
Control DV mean (midBP*similar)	0.45	0.44	0.60
Control DV mean (midBP*higher)	0.34	0.38	0.54
Control DV mean (highBP*lower)	0.36	0.43	0.45
Control DV mean (highBP*similar)	0.30	0.37	0.36
Control DV mean (highBP*higher)	0.51	0.33	0.46
No. of HHs	556	556	1,134
lowBP*lower=lowBP*similar	0.86	0.77	0.70
lowBP*lower=lowBP*higher	0.84	0.65	0.15
lowBP*similar=lowBP*higher	0.69	0.50	0.12
midBP*lower=midBP*similar	0.60	0.33	0.02
midBP*lower=midBP*higher	0.38	0.15	0.00
midBP*similar=midBP*higher	0.14	0.69	0.94
highBP*lower=highBP*similar	0.89	0.68	0.71
highBP*lower=highBP*higher	0.86	0.12	0.43
highBP*similar=highBP*higher	0.98	0.28	0.80
lowBP*lower=midBP*lower	0.64	0.14	0.16
lowBP*lower=highBP*lower	0.44	0.79	0.86
midBP*lower=highBP*lower	0.75	0.16	0.04
lowBP*similar=midBP*similar	0.89	0.49	0.16
lowBP*similar=highBP*similar	0.33	0.42	0.44
midBP*similar=highBP*similar	0.34	0.99	0.54
lowBP*higher=midBP*higher	0.30	0.76	0.88
lowBP*higher=highBP*higher	0.64	0.20	0.47

continued

midBP*higher=highBP*higher	0.47	0.14	0.43

Note: This table shows the results of how the impact of treatment varies by differences in intra-household perceptions and bargaining power. Outcome variable, toilet ownership, is binary such that =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of yearly household consumption per capita at baseline. Household average is standardised with mean 0 and standard deviation 1. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

G.3 Uncertainty

Table G5
Investment decisions and uncertainty

	(1) Loan uptake	(2) Toilet ownership
Wife's uncertainty lower x SL	0.16***	0.01
	(0.04)	(0.06)
Wife's uncertainty similar x SL	0.17***	0.08
	(0.04)	(0.06)
Wife's uncertainty higher x SL	0.21***	0.14***
	(0.05)	(0.05)
HH average uncertainty x SL	0.01	-0.04
	(0.02)	(0.03)
HH average uncertainty	-0.00	0.01
	(0.01)	(0.02)
Wife's uncertainty similar	-0.01	-0.04
	(0.02)	(0.06)
Wife's uncertainty higher	0.01	-0.09
	(0.02)	(0.05)
Strata FE	Yes	Yes
Household covariates	Yes	Yes
Control DV mean (lower)	0.01	0.48
Control DV mean (similar)	0.01	0.43
Control DV mean (higher)	0.03	0.38
No. of HHs	1,134	1,134
p-value: lower=similar	0.84	0.37
p-value: lower=higher	0.30	0.07
p-value: similar=higher	0.39	0.43

Notes: Uncertainty measured as the range/mean of individual minimum and maximum monetary cost expectations. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of household consumption. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table G6
Uncertainty triple interaction

	(1) Loan uptake	(2) Toilet ownership
Low BP x Wife's uncertainty lower x SL	0.12** (0.05)	0.02 (0.10)
Low BP x Wife's uncertainty higher x SL	0.15*** (0.04)	0.09 (0.07)
Mid BP x Wife's uncertainty lower x SL	0.14** (0.06)	-0.11 (0.11)
Mid BP x Wife's uncertainty higher x SL	0.24*** (0.07)	0.22*** (0.06)
High BP x Wife's uncertainty lower x SL	0.20*** (0.05)	0.07 (0.09)
High BP x Wife's uncertainty higher x SL	0.19*** (0.05)	0.06 (0.06)
Strata FE	Yes	Yes
Covariates	Yes	Yes
Control DV mean (lowBP*lower)	0.00	0.46
Control DV mean (lowBP*higher)	0.02	0.42
Control DV mean (midBP*lower)	0.05	0.56
Control DV mean (midBP*higher)	0.03	0.35
Control DV mean (highBP*lower)	0.00	0.45
Control DV mean (highBP*higher)	0.02	0.43
No. of HHs	1,134	1,134
lowBP*lower=lowBP*higher	0.56	0.57
midBP*lower=midBP*higher	0.26	0.00
highBP*lower=highBP*higher	0.91	0.91
joint equality (lower)	0.34	0.42
joint equality (higher)	0.39	0.16

Notes: Uncertainty measured as the range/mean of individual minimum and maximum monetary cost expectations. Outcome variables are binary whereby Loan uptake =1 if a household takes a sanitation loan and Toilet ownership =1 if a household owns a toilet at endline. Covariates include a dummy =1 if the household has a child under the age of 2 at baseline, a dummy =1 if the household owns a toilet at baseline and the log of household consumption. Standard errors in parentheses, clustered at the Gram Panchayat. $*p < 0.10, **p < 0.05, ***p < 0.01$.

# H   Additional descriptives

H.1   Clients and non-clients

Table H1

Client - nonclient bargaining power difference

	All	Clients			Nonclients-Clients
	N	N	Mean	SD	Difference
Bargaining power score (financial)	1846	931	6.81	4.54	-0.71***
Bargaining power score (all)	1362	670	10.5	5.93	-0.77**

Note: This table shows the difference in average bargaining power between clients and non-clients. Standard errors are clustered at the Gram Panchayat. Stars signify the level of statistical significance of the difference between clients and non-clients. $*p < 0.10, **p < 0.05, ***p < 0.01$.

H.2   Loan uptake decisions

Figure H1

Loan uptake decisions
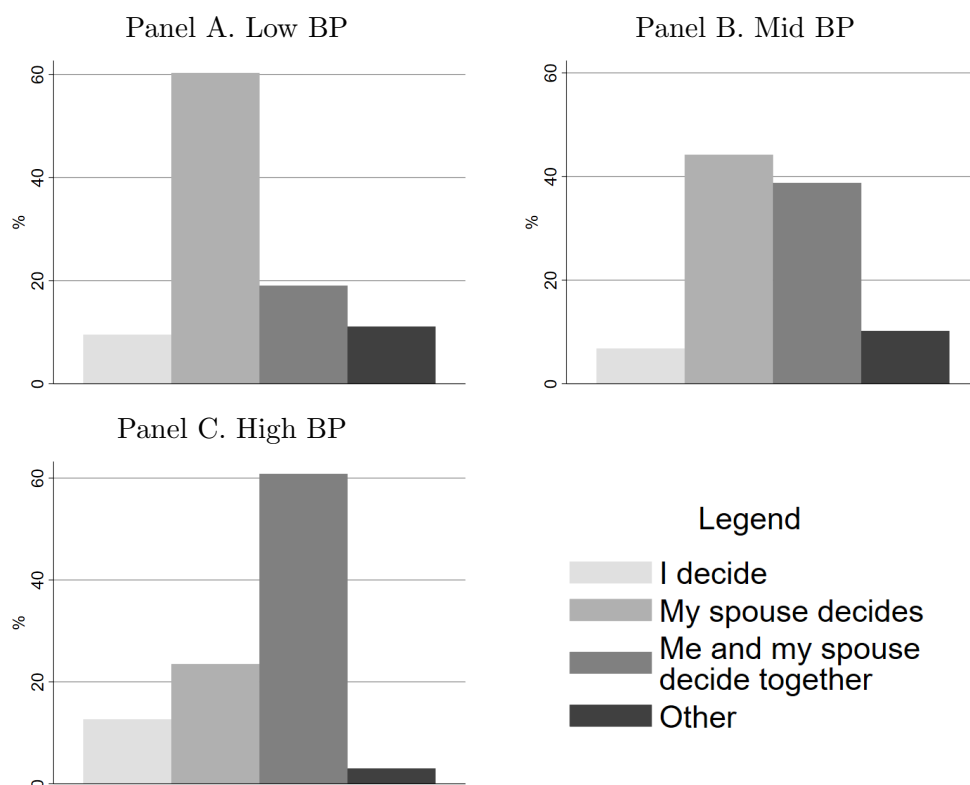
Note: The Figure displays responses to the survey question: "Who in your household would take the decision of whether or not to take a loan from the savings and lending group?". For each of the three bargaining power groups Low BP (Panel A), Mid BP (Panel B), and High BP (Panel C).