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At scale implementation and the perils of fragmentation

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Abstract

Governments frequently rely on multiple actors to deliver technology-adoption policies at scale, often presuming that layering low-cost interventions, such as information, onto existing programs is at least weakly beneficial. We show that this need not hold. Using a cluster-randomized trial of private-sector sanitation microloans and an NGO-led information campaign in rural India, combined with quasi-random variation in government policy implementation, we find that information can reduce adoption when delivery is fragmented across actors. The mechanism operates through household expectations about complementarities that fail to materialize. Our findings offer a new explanation for why interventions may lose effectiveness at scale.

Keywords: NGOs, government, private-sector, coordination, sanitation
JEL Classification: L31, L38, O16

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1 Introduction

Widespread adoption of effective technologies is essential to tackle key global challenges, including access to water and sanitation, and climate mitigation and adaptation. However, adoption at scale is impeded by three diffusion-impeding features: (i) large fixed costs that outweigh marginal benefits for liquidity-constrained households (Devoto et al., 2012, Guiteras et al., 2015a, Cameron et al., 2019b); (ii) incomplete information and behavioral frictions that slow learning and habit formation (Conley and Udry, 2010, Foster and Rosenzweig, 2010, Allcott and Rogers, 2014); and (iii) externalities that weaken willingness to pay (Kremer et al., 2011, Bakhtiar et al., 2023). As long as any one of these frictions binds, take-up may stall, leading to a low-adoption equilibrium. In principle, adoption at scale therefore requires policies that relax multiple constraints simultaneously.

In response, governments rely on multi-actor delivery models–often involving private sector and NGOs–to address distinct frictions.[1] As coordination costs rise with scale (Mani, 2021), however, these arrangements are vulnerable to *organizational fragmentation*: components that are theoretically complementary delivered by decentralized actors with limited coordination. As a result, multi-actor interventions may experience a 'voltage drop' (Al-Ubaydli et al., 2023)-—not only because individual components lose effectiveness at scale, but because fragmented delivery can attenuate or even reverse intended complementarities, even when each component remains effective in isolation. Despite widespread reliance on such multi-actor arrangements, empirical evidence on how organizational fragmentation shapes the effectiveness of multi-actor interventions remains limited (Besley and Ghatak, 2001, 2017).

In this paper, we provide causal evidence that organizational fragmentation can trig-

[1]Such multi-actor involvements may occur through explicit arrangements (e.g., public-private partnerships or contracting out), within rules of frameworks set by the Government, or more commonly, through informal or no specific arrangements (Fabre and Straub, 2023). Moreover, non-state actors such as NGOs may have agreements from governments to operate in specific jurisdictions, but without any specific arrangement to coordinate activities with Government provision.

ger practical frictions in implementation leading to outcomes short of policy objectives and offering a new explanation for why interventions may lose effectiveness at scale. Focusing on household sanitation adoption in rural India, we exploit randomized and quasi-random variation in sanitation interventions delivered by a private lender, an NGO, and the government. We show that adding an NGO-led information campaign can *reduce* adoption of a welfare-improving technology when delivery is fragmented across actors—even though each intervention is effective in isolation. In our setting, organizational fragmentation arises primarily because information campaigns emphasize complementarities with government subsidies whose delivery is unreliable, rather than because multiple actors provide redundant or conflicting information.

The mechanism operates through household expectations about the joint availability of interventions. When information campaigns emphasize complementarities—for example, between credit and government subsidies—but implementation by one actor is weak and coordination across actors is limited, these complementarities fail to materialize. Households may then delay or forgo investment decisions while waiting for complementary support that ultimately does not arrive. In our setting, NGO-led awareness creation highlights the availability of government subsidies for toilet construction, but subsidy implementation is weak. As a result, adoption is not only muted but, in some cases, lower than under simpler intervention bundles.

We study these interactions in the context of household sanitation adoption in rural India, where last-mile uptake remains a central policy objective. We combine a village-level randomized experiment in sanitation credit and information with quasi-random variation in local implementation of a nationwide government program providing information and subsidies. Our study takes place in Latur and Nanded districts in Maharashtra, India's second largest state. In this setting, household toilets cost roughly 50 percent of median annual income, and three organizations concurrently implemented sanitation interventions starting in early 2015: the government, a large microfinance in-

stitution (MFI hereafter), and an NGO. The government program was the *Swachh Bharat Mission* (*Gramin*) (Clean India Mission–Rural; SBM-G hereafter), launched in late 2014 when only one-third of the Indian population had access to a toilet (Census 2011). SBM-G was a flagship initiative, aiming to eliminate open defecation by 2 October 2019, the 150th birth anniversary of Mahatma Gandhi, through two core components—awareness creation and targeted post-construction subsidies. Backed by substantial public funding, implementation of these components was decentralized to Gram Panchayats (villages, GPs hereafter). Given the scale of the challenge, the government encouraged participation from private- and third-sector organizations but did not mandate any specific model for coordination.

The MFI offered sanitation loans to its existing female clients for the construction, repair, or upgrade of household toilets. These loans complemented SBM-G subsidies by providing bridge financing—since subsidies were disbursed only after (partial) construction— or by topping up subsidy amounts, and by relaxing credit constraints for households ineligible for subsidies (Augsburg et al., 2023a). The NGO, working closely with the MFI, implemented an information campaign promoting sanitation adoption. The campaign emphasized messages similar to those disseminated under SBM-G and was therefore largely substitutable for government awareness activities. Importantly, both the NGO and government information campaigns explicitly framed microcredit, public subsidy, and a combination of these as key sources of sanitation financing.

To identify the effects of organizational fragmentation on the effectiveness of component interventions, we combine the random variation from cluster randomized controlled trial (cRCT) with quasi-random variation in local implementation of the SBM-G policy.[2] The cRCT randomized 120 Gram Panchayats (GPs)[3] to one of three arms: MFI

[2]While random assignment of SBM-G across locations would be feasible in principle, such a design would address a different question (i.e. SBM-G versus no SBM-G). Instead, we study variation in the intensity with which a universal policy was implemented, which is the relevant margin for understanding organizational fragmentation in large-scale delivery, and a margin that would not be desirable to randomize.

[3]The GP is the lowest administrative unit in India.

sanitation loan only, MFI sanitation loan plus NGO awareness creation, and a control group. The trial began in early 2015, coinciding with the rollout of SBM-G, with endline data collected in 2017 from 4,222 MFI client households. We complement the survey data with administrative records from the MFI and surveys of local officials responsible for SBM-G implementation.

We exploit heterogeneity in the local intensity of SBM-G implementation arising from the program's decentralized design. While SBM-G was a national policy, implementation was delegated to GPs, generating variation that was not predictable to households at the onset of the MFI and NGO interventions. Using data from local SBM officials, we construct a binary measure of high versus low SBM implementation intensity based on officials' expectations of achieving open defecation–free (ODF) status. We address concerns of potential confounding from correlations of the proxy with pre-existing differences in detail, showing that the limited correlations we observe would, if anything, bias against finding evidence of organizational fragmentation. Importantly, these correlations reflect realized differences in SBM-G implementation during the 2015–2017 study period—such as actual support received, subsidy disbursement delays, and the availability of masons—rather than purely aspirational expectations reported by officials.

A key distinction throughout the paper is between individual responses —such as demand for financing—and the social welfare-relevant adoption, defined as the construction of a functioning household toilet. While intermediate responses may reflect the relaxation of individual constraints, they do not necessarily translate into adoption when complementary inputs are imperfectly delivered. Our analysis therefore focuses on whether multi-actor interventions induce durable investments, and on how this mapping depends on coordination across implementing actors. We document several key findings.

First, sanitation loan take-up 30 months after introduction is similar across the two RCT treatment arms and across levels of SBM-G implementation intensity. Around 20

percent of MFI clients in both treatment arms took up a sanitation loan, with no statistically significant differences across groups, highlighting the importance of credit and liquidity constraints.

Second, toilet construction is highest in settings where all three components—credit, information, and subsidies—are effectively delivered, namely where the MFI loan is available and SBM-G implementation intensity is high. In these contexts, complementarities across components are realized.

Third, adding the NGO awareness campaign in GPs with high SBM-G implementation intensity does not differentially affect toilet construction. Where government implementation is strong, government and NGO information are substitutable, rendering the additional information campaign largely innocuous.

Finally, when awareness creation is delivered by the NGO in areas with low SBM-G implementation intensity—where subsidies are weak or unavailable—we observe no increase in toilet construction despite a significant increase in sanitation loan take-up. In this case, the NGO information campaign induces households to take loans in anticipation of subsidies that fail to materialize, resulting in lower toilet construction than under credit provision alone. We provide evidence to this effect, showing that the NGO information campaign spurred sanitation loan take-up in the months immediately after its activities were delivered, particularly in the low SBM-G implementation intensity GPs. However, toilet uptake does not follow, and sanitation loan take-up consequently stalls. We also show that major delays in receiving subsidies played a key role in the non-conversion of loans to toilets. This pattern arises precisely when technical complementarities collide with fragmented implementation, illustrating how multi-actor delivery can overturn the conventional presumption that "more is better".

Our findings speak to three strands of research. First, we contribute to the "science of scaling" literature, which studies how the impacts of interventions evolve as they are expanded and delivered at scale. Existing work highlights several reasons

why impacts may attenuate at scale, including diminishing marginal returns, general-equilibrium spillovers, and declines in implementation fidelity, with weak state capacity further shaping these dynamics (Bold et al., 2018, Muralidharan and Niehaus, 2017, Vivalt, 2020, List et al., 2022, Pritchett et al., 2013). A related body of evidence shows that layering additional tasks or components onto delivery systems can reduce effectiveness by overburdening frontline providers (Banerjee et al., 2015, Briceño et al., 2017, Olken et al., 2014), and in some cases negate otherwise successful interventions (Yousafzai et al., 2014). Recent work further shows that implementation delays can generate "delay disappointment," whereby anticipated benefits that fail to materialize on time reduce well-being, even when programs are eventually delivered (Giné et al., 2024).

We identify a distinct and underexplored mechanism: organizational fragmentation across complementary actors. When interventions addressing different frictions are delivered by decentralized providers with limited coordination, complementarities may fail to materialize in practice, attenuating—or even reversing—effects and contributing to the "voltage drop" observed in many scaling contexts (Al-Ubaydli et al., 2023), even when individual components remain effective in isolation.

Second, we contribute to the organizational-economics literature on agency problems in public service delivery, where objectives extend beyond standard financial incentives and incorporate elements of pro-sociality. In such settings, mission-oriented actors may nonetheless have imperfectly aligned preferences. While theory emphasizes how complementarities can generate multiple equilibria and coordination problems (Kremer, 1993, Acemoglu and Kremer, 1998), empirical evidence—particularly in low-capacity settings where contracting and accountability are weak—remains limited (Bardhan and Mookherjee, 2006, Mookherjee, 2006, Child et al., 2024). By combining a village-level randomized experiment with quasi-random variation in government implementation, we provide causal evidence on how fragmented delivery can convert theoretical complementarities into practical frictions.

Third, we add to the literature on household adoption of lumpy sanitation investments. Prior work finds that information-based interventions (including CLTS), subsidies, and sanitation credit each generate modest gains on average, with substantial heterogeneity and incomplete conversion of inputs into toilets (Guiteras et al., 2015a, Cameron et al., 2019a, Briceno et al., 2017, Abramovsky et al., 2019, Cameron et al., 2021, Lipscomb and Schechter, 2018, Augsburg et al., 2023a, BenYishay et al., 2017, Garn et al., 2017, Pickering et al., 2015). We show that these impacts depend critically on coordination with the public policy environment: where interventions are aligned, complementarities are realized; where delivery is fragmented, loan demand rises but toilet construction stalls.

Taken together, our findings highlight that adding interventions is not innocuous when delivery is fragmented across actors. Information can alter household beliefs about the availability of complementary inputs, and when these inputs fail to materialize in practice, otherwise well-designed interventions may underperform or backfire. This mechanism is likely to be relevant in many policy domains where governments rely on decentralized delivery and engage private and third-sector actors to address multiple constraints simultaneously. Our results therefore underscore the importance of coordination—not only in implementation, but also in how complementarities are communicated to beneficiaries—when policies are designed and scaled.

The remainder of the paper is organized as follows. Section 2 describes the institutional context, including details of the interventions. Section 3 presents the research design, data, and intervention implementation. Section 4 outlines the empirical strategy and discusses identification in detail. Section 5 presents the main results and discussed mechanisms. Section 6 concludes.

2 Context

At the time of our study, India accounted for a disproportionate share of the global sanitation deficit. In 2014, roughly half of Indian households lacked access to a toilet, and open defecation remained widespread, particularly in rural areas (Census 2011). Despite substantial progress since then, sanitation remains a major global challenge: as of 2024, an estimated 1.5 billion people—nearly one-fifth of the world's population—still lack access to safe sanitation (JMP, 2024), with substantial health and welfare consequences when large-scale improvements fail to materialize (Augsburg et al., 2025).

Our study is set in rural India, focusing on the districts of Nanded and Latur in the western state of Maharashtra. Although Maharashtra is among India's richest states, these districts consistently rank among its most deprived. Data from the 2012–2013 District Level Household Survey (DLHS-4) indicate that 21 percent (18.7 percent) of households in Latur and Nanded (rural India) held a Below Poverty Line (BPL) card, 56.6 percent (46.3 percent) owned land, and household heads had on average 4.16 (3.98) years of schooling. Sanitation coverage was particularly low: only 23.7 percent of households reported owning a toilet, compared with 38 percent in rural Maharashtra and 55.8 percent in rural India.

The last-mile adoption and usage of toilets by households faces several constraints in this context. A first critical constraint is that of affordability. The average cost of the non-sewered toilets that households prefer to install comes to around INR 25,000 (USD 375), just over 50% of annual median household income in our study context.[4] Aside from the high cost of toilets, households face significant financing constraints, with most existing toilets pre-intervention being financed through own savings. It is thus unsurprising that 83% of households in our context cited affordability and a lack of money as the key reason why they do not own a toilet. Thus, any successful intervention

[4]We use an exchange rate of 1 USD = 71.1840 INR throughout the paper when reporting US dollar amounts, based on xe.com, accessed 10 February 2019.

seeking to increase adoption of household toilets must include components that address affordability and financing constraints.

Second, households may have incorrect beliefs about toilets and lack knowledge on suitable toilet models, how to obtain them, availability of financing tools, etc. Indeed Augsburg et al. [2023b] document significant variation in men and women's perceptions of costs and benefits of a preferred toilet model in this context, including notable overestimation in the cost of a toilet. Furthermore, incorrect beliefs can also impede behavioral change, which is essential to eliminate the practice of open defecation even when toilets are available. Coffey et al. [2014] among others document that household members continue defecating in the open even when they have toilets. Thus, there is a need for awareness creation campaigns to correct misperceptions and knowledge gaps.

There was generally good access to the materials and services needed to construct toilets in our study context. Prior to the roll-out of the interventions, 92% of communities had at least one mason (who constructed 92% of existing toilets), and 87% reported having a carpenter. Plumbers were present in 51% of communities. Materials were more difficult to come by: cement block producers were available in 33% of communities, brick producers in 20% and sanitary hardware stores in 18%. In the other communities, households would have to travel distances of 7-17 km to obtain these services.

Against this backdrop, we partnered with a leading MFI and an NGO that sought to increase sanitation uptake and use through two interventions: (i) the introduction of a sanitation-specific microcredit product (MFI), and (ii) an awareness campaign promoting safe sanitation practices (NGO). The study was conducted between 2015 and 2017, coinciding with the implementation of the Government of India's flagship rural sanitation program, Swachh Bharat Mission–Gramin (SBM-G). The next section describes these interventions and their components in detail.

2.1 Interventions

2.1.1 Sanitation microcredit

A large MFI operating in five states of India (at the time) offered a sanitation loan for either the construction of a new household toilet or the upgrade/repair of an existing one. The MFI serves exclusively female clients, organized into joint-liability groups of 5–10 women living in the same GP. Clients could access a variety of collateral-free loan products—business, education, emergency—within borrowing caps set by the MFI and in line with Reserve Bank of India regulations.[5] The sanitation loan expanded this product range and could be taken alongside other loans, subject to the borrowing caps. From mid-2015, eligibility required the successful completion of at least one loan cycle.

Product details are summarized in Table 1. The maximum loan amount was INR 15,000 (USD 225), provided at an average annual interest rate of 20% on a declining balance, with a two-year maturity. Clients could opt for weekly or biweekly repayment, but in practice all chose weekly. Loan officers introduced the sanitation loans to clients during their regular weekly meeting, with a brief message outlining the benefits of a toilet along with details of the loan product. After the initial introduction, loan officers marketed the sanitation loan periodically. Loans were disbursed in cash, and the MFI offered no information or support on toilet models, materials, or labor.

Thus, the MFI sanitation loan primarily relaxed credit or liquidity constraints.

[5] At the time of the study, the Reserve Bank of India imposed the following requirements on rural microfinance customers from October 2015 (pre-October 2015): (1) annual household income of at most INR 100,000 (INR 60,000); (2) total indebtedness of at most INR 100,000 (INR 50,000) excluding education and medical expenses; (3) overall loan amount of at most INR 60,000 (INR 35,000) in the first cycle and INR 100,000 (INR 50,000) in subsequent cycles; (4) loan tenure should not be less than 24 months for any loan amount in excess of INR 30,000 (INR 15,000). In addition, at least 50% (75%) of the MFI's portfolio should be comprised of income-generating loans.

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

Notes: As appears in Augsburg et al. [2023a].

2.1.2 NGO information provision

A local NGO that had been working in rural community development since 2005 implemented an awareness campaign designed to boost knowledge about sanitation. The content emphasized the health, hygiene and women's safety benefits of sanitation, and the availability of government subsidies through community- and MFI client-level activities. Appendix Figure A1 provides pictures of these activities.

The community-level activities started with receiving approval from the GP *sarpanch* (leader). GP officials were then offered training covering (i) the NGO's planned activities, (ii) hygiene and sanitation messages using IEC materials, (iii) information on the SBM-G scheme, (iv) available sanitation technologies, and (v) awareness handouts for distribution (see Appendix Figure A2). This was followed by a 30–45 minute street play on sanitation and hygiene, performed by six professional Marathi actors, and the installation of a banner or wall painting. The plays were comic and interactive, drawing in local audiences, while the banners contrasted the village's situation with and without open defecation. Messages reinforced those of SBM-G (described below): how building and using toilets improves health, creates a cleaner environment, enhances women's safety, and improves marriage prospects. In addition, the information also highlighted the availability of sanitation microcredit loans, the SBM-G subsidy and how these could complement one another.

In parallel, the NGO held one-off training sessions with MFI loan officers, covering

the same topics as with GP officials, and organized awareness sessions for MFI clients during their lending group meetings and sanitation-focused events at periodic block meetings.

2.1.3 The SBM-*G* policy

The SBM-G policy was launched on October 2, 2014 (two months before the implementation of the MFI sanitation loans and NGO awareness campaign), when India had the 'dubious distinction of having the highest number of people defecating in the open' (Mehta, 2018). The program's goal was to eliminate this practice by October 2, 2019, the 150th birth anniversary of Mahatma Gandhi.

SBM-G relied on two main components: (i) information, education, and communication (IEC) activities to address knowledge gaps and increase demand for household toilets, and (ii) partial subsidies – referred to by the government as financial incentives– for vulnerable groups to ease affordability constraints.[6] Subsidies were the dominant budgetary item, accounting for 97 percent of expenditures in 2015-16 (Kapur and Deshpande, 2018), aiming to alleviate financial constraints for poor households.[7]

The IEC component aimed to increase demand for the construction and use of private household toilets. SBM-G guidelines mandated that 8% of the national budget be allocated to IEC, with suggested activities including training grassroots motivators in community approaches to sanitation (most prominently CLTS), "triggering" meetings followed by visits to open defecation sites, and a variety of media campaigns such as songs, drama, wall paintings, banners, group meetings, exhibitions, and mass media

[6] Guiteras et al. [2015b] show that subsidies are effective in increasing toilet uptake in rural Bangaldesh, drawing on evidence from an RCT conducted with an NGO and focusing on a specific toilet model. Similarly, Cameron et al. [2021] show that a partial subsidy significantly increases toilet ownership among poor households in the context of CLTS.

[7] SBM built on earlier government sanitation initiatives: the Central Rural Sanitation Program (CRSP, 1986), the Total Sanitation Campaign (TSC, 1999), and the Nirmal Bharat Abhiyan (NBA, 2012). These programs gradually expanded focus from household latrine construction (CRSP), to IEC activities and village-level rewards for open-defecation-free status (TSC), and later to community-led total sanitation approaches under the NBA.

outreach (GoI Ministry of Drinking Water and Sanitation, undated). Given the overlap in content and framing, the SBM-G IEC component and the NGO awareness campaign functioned as a close substitutes, as implemented in our setting.

The subsidy of INR 12,000 (USD 169) was intended to encourage private toilet construction by alleviating financial constraints. Eligibility was restricted to households recorded as lacking a toilet in the 2012-13 SBM baseline survey (conducted by communities and verified by district and state officials) and either classified as Below Poverty Line (BPL) or belonging to vulnerable Above Poverty Line (APL) groups such as Scheduled Castes/Scheduled Tribes, pensioners, landless households, small and marginal farmers, or female-headed households (SBM, 2017). Households could claim the subsidy only once, and those who had received support from earlier sanitation programs were ineligible. No financial assistance was provided for toilet repairs or upgrades.

The subsidy followed a "reimbursement after verification" model: households were expected to finance construction upfront and receive payment only after verification by sub-district or district officials. While this model mitigates moral hazard and imperfect commitment frictions, it does little to relax liquidity constraints: with toilet costs amounting to roughly half of median annual household income in our study area, many poor households were unable to cover the upfront outlay. Policymakers and practitioners highlighted this limitation (Rama Mohan, 2017), and SBM-G guidelines proposed the use of microcredit as a bridge-financing mechanism, highlighting how the sanitation loan could act as a natural complement to the SBM-G subsidies by easing liquidity constraints. Thus, the MFI loan and the SBM subsidies are likely to be complements.

Implementation of SBM was devolved, with primary responsibility given to individual states (as is standard for sanitation policy), with financial, technical, and other support from the Ministry of Drinking Water and Sanitation. Delivery was further decentralized to GPs, supported by higher administrative levels (block, district, and state).

Within this framework, states retained discretion over how subsidies were disbursed.

In Maharashtra, eligible households could obtain a partial payment once they demonstrated that construction had begun (e.g., by showing a dug pit). GPs also had considerable autonomy in how they implemented SBM-G and were encouraged to partner with private- and third-sector organizations. Ultimately, effective implementation — as reflected in toilet construction and reductions in open defecation — depended on local strategies and support from higher tiers of government. As a result, implementation approaches varied between and within states.

As a general strategy, GPs engaged a variety of local actors in sanitation awareness ranging from grassroots organizations, NGOs, self-help groups to school students (Mehta, 2018). The private sector was also recognised as an important stakeholder, with private firms encouraged to donate funds in terms of their corporate social responsibility (CSR). Banks were also encouraged to lend for sanitation purposes, especially once the Reserve Bank of India included sanitation as a priority sector for lending, which requires banks to devote a set share of its lending portfolio to these sectors.

Importantly, although the role of NGOs and private lenders was formally acknowledged and encouraged, SBM-G created no mechanism to coordinate their activities; any alignment depended on ad-hoc initiatives by local GP officials.

3 Research Design and Data

3.1 Research design

Our objective is to identify whether organizational fragmentation affects the effectiveness of multi-actor intervention bundles. In an ideal setting, all interventions (and thereby actors) — and their combinations — would be randomly assigned, allowing direct identification of interaction effects. In practice, this would require randomizing the *intensity* of government implementation across locations. Such randomization would require a degree of coordination across multiple actors that is both ethically problematic and

fundamentally at odds with the fragmented delivery environments of interest, rendering it infeasible and unlikely to yield externally valid estimates. Instead, our approach combines randomized variation in the private-sector and NGO interventions with quasi-random variation in the intensity of government implementation.

RCT Experiment The experiment was conducted in 120 GPs in Nanded and Latur districts where the partner MFI was already operating and planned to introduce sanitation loans.[8] The GPs were randomly assigned, within strata defined by MFI branch and GP size[9], to one of three experimental arms: (i) control (41 GPs), (ii) sanitation loan only (MFI; 40 GPs), and (iii) sanitation loan plus NGO-led awareness creation ($MFI\&NGO$; 39 GPs). All GPs, including those in the control arm, continued to receive the MFI's standard financial services. The RCT design generates exogenous variation to identify the causal effects of the MFI sanitation microcredit intervention relative to the control group, and the additional effect of the NGO awareness creation intervention on top of the MFI microcredit.

Variation in SBM-G Implementation Implementation of SBM-G was not randomized. However, because delivery was decentralized to the GP level, both the form and intensity of implementation varied substantially across GPs. Local governments adopted a range of approaches to supporting sanitation adoption. Some GPs engaged directly in sanitation awareness activities (11 percent), others lobbied higher-tier officials for resources (26 percent), facilitated bridge financing for households (22 percent), organized bulk procurement of materials and labor (2 percent), or left construction decisions to households while facilitating access to subsidies (55 percent).

Additional variation arose from differences in higher-tier government support, including the speed and reliability of subsidy disbursement, the provision of information,

[8] These 120 GPs were randomly selected from a list of 133 eligible GPs.

[9] GPs with fewer than 480 households were classified as small; the remainder as large. Randomization was conducted using Stata by researchers at the Institute for Fiscal Studies.

education, and communication (IEC) materials, verification of beneficiary eligibility, and access to technical assistance. As a result, households were exposed to different combinations of local initiatives and higher-level support, generating meaningful heterogeneity in the effective intensity of SBM-G implementation within a GP. We exploit this variation to study how government implementation interacts with the MFI and NGO interventions. Sections 3.3.3 and 4 discuss, respectively, our measure of SBM implementation intensity and the associated identification assumptions in detail.

3.2 Data

Our analysis draws on three key data sources: (1) a household survey of MFI client households; (2) Administrative records from the partner MFI; and (3) community-level data, including surveys of GP officials (at baseline and endline) and an endline survey of masons.

3.2.1 MFI client and household survey

Sample size and Sampling Our sampling frame consisted of all active MFI borrowers listed in the MFI's Management Information System (MIS) as of November 2014. At baseline (Dec 2014–Jan 2015), we targeted 15 clients per GP, stratified by the presence of children under two years of age. At endline (Aug–Sep 2017), the sample was expanded from 1,800 to 4,200 clients (about 35 per GP). It followed all client households surveyed at baseline, and further added client households from the same lending centers (*kendras*) as the clients sampled at baseline. In GPs with a single *kendra* (72 GPs), all clients were included. In GPs with multiple *kendras* (48 GPs), one *kendra* with at least one baseline client was randomly chosen, with additional *kendras* selected as needed to reach the targeted sample size. This yielded a final endline sample of 4,222 households, the main sample for our analysis.

The household survey, administered to the household head, collected information

on household composition, religion, caste, education, assets, income, and borrowing, as well as detailed data on sanitation behaviors and investments. For toilet ownership, the survey recorded toilet type, construction date, whether it was functioning, and costs. We use the construction date to construct a retrospective measure of ownership prior to the interventions. Interviewers verified reported toilet ownership by direct observation.[10] When observed, they also recorded toilet cleanliness, structural quality, and appearance. We use the surveyor observed measure of toilet ownership, combined with information on whether the toilet was functional to create our main outcome, functioning toilet ownership. This measure will allow us to capture investments in new toilets and in repairing/upgrading toilets to make or keep them functional.

Column 2 of Appendix Table B2 presents descriptive statistics for MFI client households in the control GPs. These households have, on average, five members. Two-thirds are Hindu, 21.2% Muslim and 11.8% Buddhist. Around 24% of households belong to general castes, while 41.6% and 34% belong to scheduled and backward castes respectively. The vast majority of household heads are male (90%), married (91%), 45 years of age on average, and have just under six years of education on average. Almost all households (96%) live in dwellings they own. Around two-thirds of these dwellings are of moderate quality (semi-pucca), while less than 20% of households live in high-quality (pucca) dwellings. Over half of the households (52%) earn their income through agricultural labor, cultivation, or related activities, 27% rely on wages from non-agricultural employment, and 16% from self-employment. Approximately 59% of the control sample possesses a Below Poverty Line (BPL) card, while 28% holds an Above Poverty Line (APL) card. According to reported construction dates, approximately 24% of households in the control group had a toilet at baseline.

[10]Refusal to show the toilet was rare (2.4%). In 5.0% of cases—balanced across treatment and control—respondents reported owning a toilet, but it was incomplete at the time of the visit.

3.2.2 Administrative records from the partner MFI

We also use administrative data from the MFI, which tracks all loans taken by clients in the study GPs from the MFI during the study period. For each loan, the data reports product type, interest rate, tenure, installment schedule, and repayment behavior. These data allow us to construct an accurate client-level measure of sanitation loan take-up –our intermediate outcome– free from recall bias, as well as the precise timing (month–year) of take-up. This provides a finer temporal measure of loan uptake than household survey reports.

3.2.3 Community-level data

Community level data were collected through surveys of GP officials at baseline and endline, and a mason survey at endline. The baseline survey, conducted with the GP leader (*sarpanch*) and other officials, captured GP characteristics such as population size, primary economic activities, accessibility, availability of shops/markets and other facilities, along with leadership characteristics. It also provides information on sanitation coverage, access to sanitation markets, and prior engagement with health and sanitation programs.

At endline, we surveyed GP-level officials responsible for sanitation and SBM-G implementation and collected detailed data on SBM-G implementation in their GPs. The resulting data includes details on local (GP) initiatives, the support received from block and district officials, support provided by the GP to households, and subsidy disbursement, including delays. We provide further details on these indicators in Section 3.3.3 when discussing SBM-G implementation. In addition, at endline we surveyed one randomly selected mason in each GP, gathering information on the local sanitation market and SBM-G implementation.

3.3 Intervention Implementation and Organizational Fragmentation

We next describe the implementation of the three interventions, discuss how we measure SBM implementation intensity and define how we capture organizational fragmentation in our setting. A timeline of activties is provided in Appendix Figure B1.

3.3.1 Sanitation microcredit

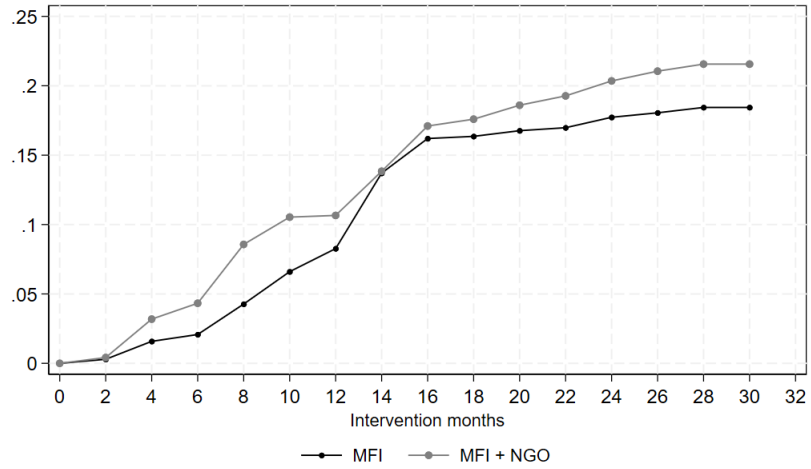
Sanitation loans were introduced in the first half of 2015 (staggered across branches), after the NGO client awareness sessions were delivered, and the first loans were disbursed from March 2015 onward. Figure 1 shows the cumulative sanitation loan uptake over time based on MFI administrative data. Uptake rose steadily, reaching about 20 (22) percent of clients in MFI-only ($MFI\&NGO$) treated GPs by endline. Early uptake was relatively modest because branches received training and began offering the product at different points between January and July 2015. A small number of sanitation loans (21) were also issued in control GPs, primarily due to client-initiated requests rather than implementation errors. These were swiftly noticed and stopped due to close monitoring of treatment fidelity.[11]

3.3.2 NGO information provision

NGO awareness creation activities were implemented one-off over a 1–2 month period in each MFI branch, starting in January 2015. Trained NGO staff delivered awareness sessions for MFI loan officers and clients (in $MFI\&NGO$ GPs only), followed by community-level sensitization activities. These activities were completed across all branches by July 2015 (Appendix Table B1 shows details on the timeline). Treatment fidelity was closely monitored: The NGO had sufficient budget to cover all 39 $MFI + NGO$ GPs and reported

[11]Researchers emphasized the importance of retaining the control group to MFI staff, and posters indicating treatment status of GPs (particularly control) were placed prominently in the branch offices. In addition, the MFI's management information system (MIS), was programmed to flag sanitation loan applications from control GPS.

Figure 1: Sanitation loan take-up during the intervention



Note: The graph plots the cumulative share of clients taking a sanitation loan (left panel) and constructing a functioning toilet (right panel) throughout the intervention. Data sources: MFI administrative data and endline household survey.

progress regularly to the research team.

Table 2 provides evidence that the activities took place and were memorable to client households and GP officials over two years later.[12] The table reports impacts on GP officials' recollections of sanitation activities, such as street plays, flyer distribution, and wall painting, over the three-year period to endline, as well as on MFI clients' recollections of such activities. Columns 1 - 3 of the table show that SBM officials in the $MFI + NGO$ treatment arm were significantly more likely to report that activities had taken place than officials in the control and MFI only arms. In particular, they were 25 and 26 percentage points more likely to report street plays, and 19 and 31 percentage points more likely to report wall paintings, compared to the control and MFI only groups, respectively.[13]

MFI clients in $MFI + NGO$ GPs were 7.33 percentage points more likely than those

[12]The table shows results from estimating equation $Y_{ivs} = \alpha_0 + \alpha_1 MFI_{vs} + \alpha_2 MFI\&NGO_{vs} + \beta X_{ivs} + \theta_s + \varepsilon_{ivs}$, where Y_{ivs} is outcome variable of household i in GP v in stratum s, MFI_{vs} is equal to 1 if the MFI sanitation loan was introduced in GP v, 0 otherwise; $MFI\&NGO_{vs}$ equals 1 if NGO awareness creation was introduced along with the MFI sanitation loan, 0 otherwise. We use '$MFI\&NGO$' in the equation and '$MFI + NGO$' in the tables and text for ease of readability. X_{ivs} includes controls selected to maximize precision (by explaining variation in endline toilet ownership among control households), and to account for sampling strategy; interviewer fixed effects are also included. θ_s are stratum fixed effects and standard errors are clustered at the GP level.

[13]Interviewers verified the presence of the wall paintings and wall banners during field work.

in the control group to recall any sanitation awareness activities. The coefficient for the *MFI* only arm is positive, but small and statistically insignificant. These effects are noteworthy given that sanitation awareness activities were also taking place in control GPs (likely under SBM-G), underscoring the additional reach of the NGO awareness program.

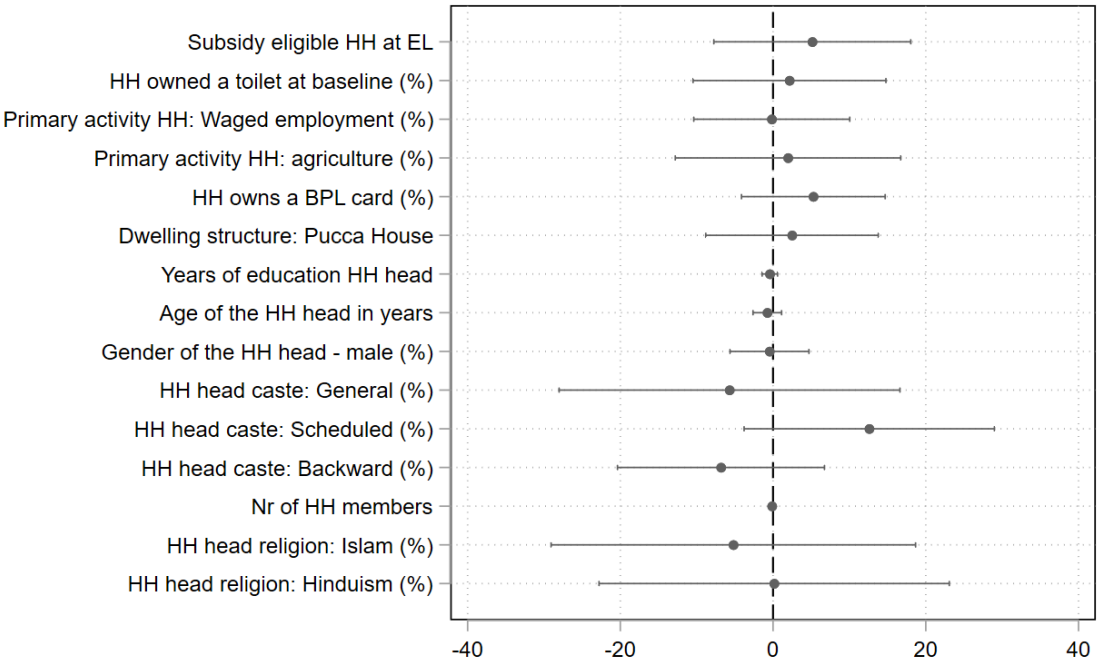
Table 2: Intervention impact on awareness of sanitation activities in the community

	(1) Street play	(2) Flyers	(3) Wall painting	(4) Any
MFI	0.0660	-0.0017	0.0509	0.0319
	(0.1036)	(0.0631)	(0.0962)	(0.0282)
MFI + NGO	0.2526**	0.0036	0.3631***	0.0733**
	(0.0967)	(0.0596)	(0.1007)	(0.0336)
Covariates	No	No	No	Yes
F-test	0.061	0.932	0.003	0.172
Control mean	0.512	0.073	0.366	0.296
Observations	120	120	120	4200

Notes: MFI equals microfinance (sanitation loan) arm. MFI + NGO equals microfinance (sanitation loan) and NGO awareness creation activities. Standard errors clustered at the village level are shown in parentheses. *, **, *** indicate significance at the 10, 5 and 1 percent level. Covariates: Toilet ownership at baseline, presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size, strata dummies and interviewer fixed effects. Columns 1-3 control for ratio of number of sampled clients to village size and strata fixed effects. Data source: client survey and SBM survey data. Columns 1-3 capture GP official's remembrance of street play activities, distribution of flyers and presence of wall paintings. The wall painting variable includes reports of wall banners and this is consistent with the presence of wall paintings reported by interviewer observation at endline. Column 4 captures whether MFI clients remember of any sanitation awareness activities taking place in the GP.

We also show in Figure 2 (and Appendix Table C1) that borrower characteristics are similar across the two treatment arms for a broad set of observable characteristics, indicating that the NGO awareness campaign did not alter the composition of households taking the sanitation loan.

Figure 2: Characteristics of sanitation loan takers



Notes: The graph plots the difference in clients' characteristics with confidence intervals between clients who took a sanitation loan in MFI and $MFI + NGO$. HH stands for household, EL for endline. Data sources: Listing and baseline HH survey, administrative data.

3.3.3 The SBM-*G* policy

We draw on the surveys with local SBM officials and local masons to document GP-level implementation of the SBM-G policy. The data shows that SBM-G was implemented in all study GPs, but with substantial heterogeneity.

We capture this variation in implementation intensity through one composite indicator, since direct measures of individual activities or support may be incomplete and households faced a combination of GP- and higher-tier actions that could act as substitutes or complements. We therefore use an expectation-based measure from the endline GP survey: officials were asked whether they expected their GP to achieve ODF status by 2019.[14] This response integrates their own planned activities with realized and antic-

[14]In Appendix Tables C2 and C3, we present results for our main specification using alternative proxies for effective SBM implementation, including whether GPs received support from higher-tiers and whether they provided households with support. Reassuringly, we obtain similar results and our main conclusions hold.

ipated higher-tier support, and thus provides a concise proxy for the overall SBM policy environment households faced.

Our data confirm that this expectation-based proxy is strongly correlated with other indicators of implementation intensity at both the GP and higher-tier levels. As shown in Figure 3 and Appendix Table D1, high-intensity GPs were substantially more likely to have received support from block officials (68% vs. 43%) and district officials (42% vs. 17%). They were also more likely to have offered households assistance in toilet construction (78% vs. 57%), and in applying for subsidies (46% vs. 26%), and were less likely to have faced long subsidy delays (more than six months). In addition, high-intensity GPs were more likely to report receiving support - financial and otherwise - from higher tiers over most or all of the period from the launch of SBM-G to our endline survey in late 2017. This, in turn, made them more likely to provide consistent support to households over the whole period.

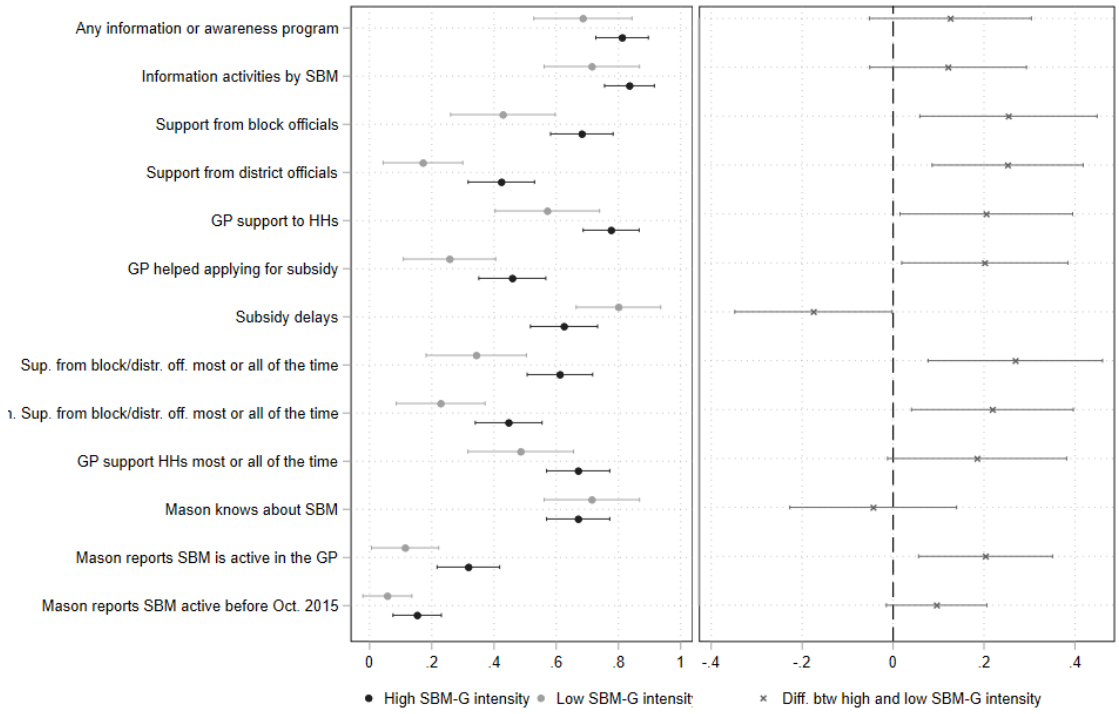
Mason survey data further validates this measure. While masons in both high- and low-intensity GPs were similarly aware of the SBM-G policy, those in high-intensity GPs were almost three times as likely to report that SBM-G was active in their GP (31.8% vs. 11.4%) and that activities had begun by October 2015.

Taken together, these patterns confirm that there was meaningful heterogeneity in the local implementation of SBM-G, and that our expectation-based measure captures genuine differences in SBM-G implementation intensity over the study period.

3.3.4 Organizational Fragmentation

The evidence presented shows that the MFI and NGO programs were implemented as intended. By contrast, local GP-level implementation of SBM-G was inconsistent, with high implementation intensity GPs starting SBM-G implementation earlier, offering more (and consistent) support to households, receiving consistently higher levels of higher-tier support and experiencing fewer delays in subsidy disbursement relative

Figure 3: Balance tests by SBM intensity



Notes: For each variable, the left panel plots means and 95% confidence intervals for GPs with high and low SBM implementation intensity; the right panel reports the difference between groups. HH stands for households, GP for Gram panchayat (village). Data sources: Endline SBM and mason surveys.

to low implementation intensity GPs. As we discuss in detail in the identification section, high- and low-intensity GPs are otherwise comparable along a wide range of pre-intervention characteristics.

This variation in SBM implementation intensity and fidelity generates organizational fragmentation in the intervention components – information, credit, subsidies – available to households when they make their sanitation financing and take-up decisions. In high SBM implementation intensity GPs, households received the information and subsidy components from the SBM-G program. When the MFI offers sanitation loans, the credit component is introduced, allowing households to cover upfront construction costs to get the subsidy. Adding the NGO awareness intervention does not introduce a new component. In low SBM implementation intensity GPs on the other hand, the subsidy component, in particular, was not well implemented, but also information activities were

(marginally) less likely to be implemented (Figure 3). Thus, when the credit component is introduced by the MFI loans, the absence of the complementary Government subsidies generates organizational fragmentation. Adding the NGO awareness campaign leads to further organizational fragmentation as it provides information on a component – subsidies – which later failed to materialize. Thus, SBM implementation intensity captures the extent of organizational fragmentation in our context.

4 Empirical Strategy and Identification

To test whether the interventions were more or less effective when implemented jointly—or in a more coordinated manner—with the government program we estimate the following equation:

$$\begin{aligned} Y_{ivs} = \alpha_0 + \gamma_1 MFI_{vs} * SBM^H_{vs} + \gamma_2 MFI\&NGO_{vs} * SBM^H_{vs} \\ + \gamma_3 MFI_{vs} * SBM^L_{vs} + \gamma_4 MFI\&NGO_{vs} * SBM^L_{vs} \\ + \beta_1 SBM^H_{vs} + \beta_2 X_{ivs} + \theta_s + \epsilon_{ivs} \end{aligned} \tag{1}$$

where Y_{ivs} is outcome variable of household i in GP v in stratum s, MFI_{vs} is equal to 1 if the MFI sanitation loan was introduced in GP v, 0 otherwise; $MFI\&NGO_{vs}$ equals 1 if NGO awareness creation was introduced along with the MFI sanitation loan, 0 otherwise, and the dichotomous variables SBM^H_{vs} and SBM^L_{vs} indicate respectively whether GP v experienced a high or low SBM-G implementation intensity during our study period. X_{ivs} is a vector of controls selected to maximize precision (by explaining variation in endline toilet ownership among control households), and to account for the sampling strategy; interviewer fixed effects are also included. θ_s are stratum fixed effects and standard errors are clustered at the GP level. Results are robust to excluding X_{ivs}.

From equation (1), the objects of interest are linear combinations of estimated coeffi-

cients. First, we assess whether layering interventions is beneficial by testing whether the incremental effect of adding the NGO component to the sanitation loan is positive. Under high SBM implementation intensity, this incremental effect is given by $\gamma_2 - \gamma_1$, while under low SBM intensity it is given by $\gamma_4 - \gamma_3$. Second, we assess whether fragmented versus coordinated delivery with the government program matters by comparing treatment effects across SBM intensity levels. For the sanitation loan alone, this contrast is $\gamma_1 - \gamma_3$ and for the combined MFI&NGO intervention it is $\gamma_2 - \gamma_4$. Inference on all contrasts is conducted using Wald tests, with standard errors clustered at the GP level.

The relevance of these contrasts may differ across outcomes. In particular, loan take-up reflects households' willingness and ability to borrow, while toilet construction additionally requires coordination with government subsidies and implementation. As a result, complementarities and fragmented delivery may be more salient for construction outcomes than for borrowing decisions. We therefore estimate equation (1) separately for sanitation loan take-up and toilet construction, and interpret differences across outcomes in light of these distinct mechanisms.

Identification Assumptions

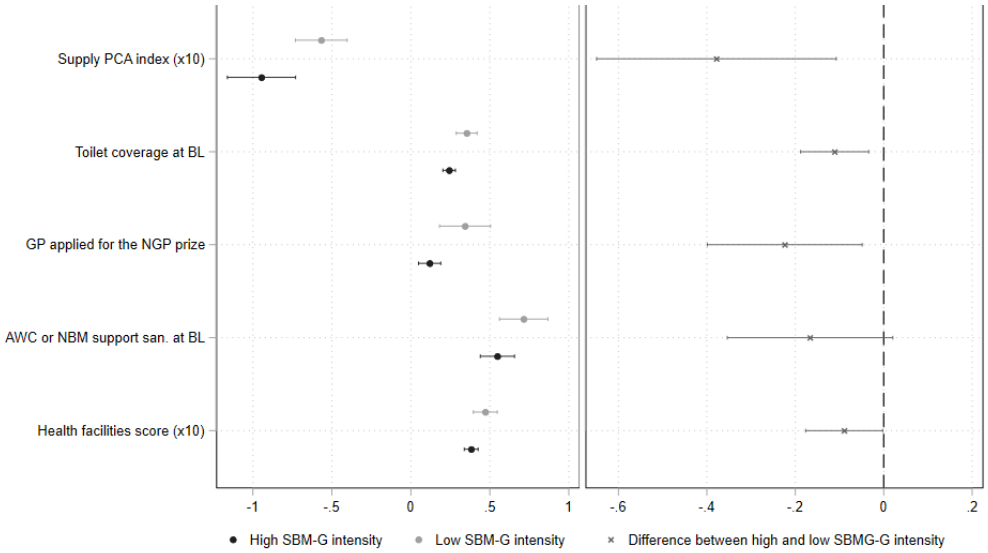
Identification of these contrasts relies on randomized assignment of the MFI and $MFI + NGO$ interventions across GPs, and on the assumption that variation in SBM-G implementation intensity is orthogonal to potential outcomes conditional on strata fixed effects and controls. Columns 3 and 4 of Appendix Table B2 show only minor and mostly statistically insignificant differences in baseline means between the control group and the two treatment arms, confirming that the randomization generated comparable groups.

Though our SBM implementation proxy captures meaningful variation in SBM-G implementation intensity, it is –as discussed earlier– not randomized across study GPs. We therefore discuss the identification assumptions required for causal inference.

A key threat to identification is that variation in SBM-G implementation intensity may

capture pre-existing differences across GPs rather than plausibly exogenous implementation variation. Importantly, high- and low-intensity GPs are otherwise similar across a wide range of pre-intervention village characteristics that households could plausibly observe, as we show below. These include population size, economic activities, accessibility, market availability, and local leadership characteristics.

Figure 4: Balance tests by SBM intensity - Sanitation and health facilities



Notes: For each variable, the left panel plots means and 95% confidence intervals for GPs which high and low SBM implementation intensity; the right panel reports difference between groups. The Supply PCA index combines the following measures using polychoric principal components analysis: i) number of masons, plumbers and carpenters in the GP per client population; ii) distance from sanitary hardware store, brick producer and cement block producer; iii) availability of cement, bricks and concrete rings to purchase within the village. The health facilities score summarized the presence of public and private health infrastructure (Sub Center or AMN, Primary Health Center, Community Health Center, Gvm. Dispensary, Gvm. Hospital, Private clinic, Priv. hospital/doctor, ASHA, traditional birth attendance, Pharmacy, Anganwadi) in the village. Balance tests for the single items used for indexes are available in Appendix D. HH stands for household. Data sources: Listing and baseline HH survey, baseline community survey.

At the same time, high-intensity GPs differ systematically along sanitation-related dimensions that are consistent with deliberate government targeting. Baseline data confirm that high-intensity GPs were, in fact, worse off prior to SBM-G in terms of sanitation conditions and access. As shown in Figure 4 and Table D2, these GPs had lower toilet coverage in 2014 (24% vs 35%), were farther from suppliers of construction materials such as brick producers (20.6 km vs 9.05 km), and were significantly less likely to have

applied for the Nirmal Gram Puraskar (Clean Village) prize (12% vs 35%) or to have received support from earlier government sanitation programs (55% vs 71%). They also had weaker health infrastructure (Table D3). These patterns are consistent with higher-tier authorities prioritizing worse-off GPs when allocating SBM-G support.

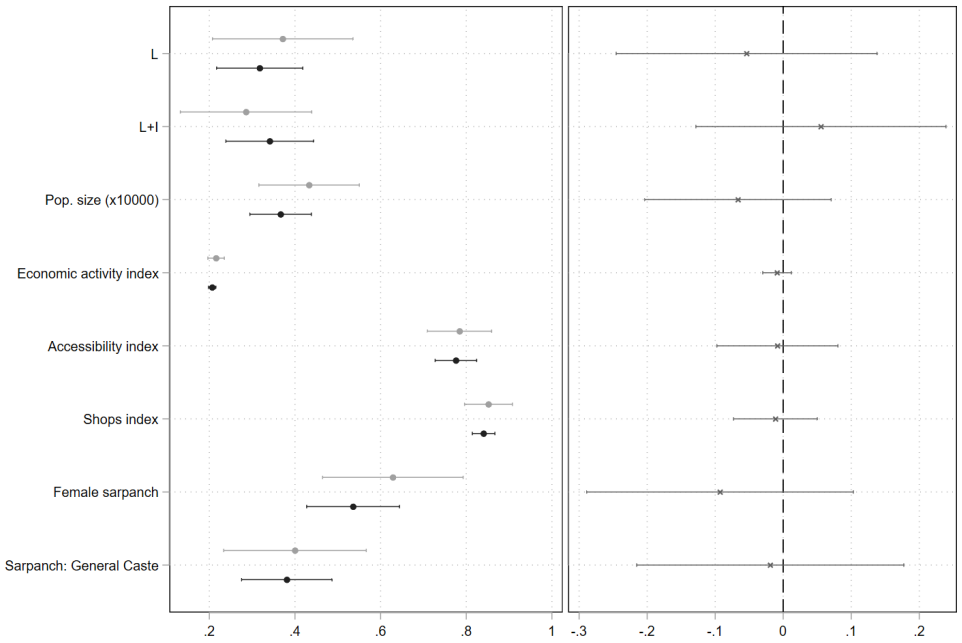
Importantly, because high-intensity GPs started from worse baseline conditions, converting a sanitation loan into a functioning toilet was likely *harder* in these areas. Any positive interaction effects we estimate between intensity of SBM-G implementation, microcredit, and NGO information provision are therefore conservative — representing a lower bound on the potential gains from well-coordinated, complementary interventions.[15]

Crucially, while such targeting implies that implementation intensity is not random at the GP level, it does not threaten our core identification strategy. Households may have been aware of their own sanitation conditions, but the government never published the criteria used for prioritization, nor comparative statistics across GPs. Without this information, households could not benchmark their GP's standing relative to others and thus had little basis to anticipate whether their GP would be prioritized for higher SBM support. Consistent with this, baseline survey data collected after the announcement of SBM-G show no difference across high- and low-intensity GPs in households' reported likelihood of being able to obtain a government sanitation subsidy among households without a toilet (Appendix Table C2). Furthermore, we show that our intensity measure is uncorrelated with a wide range of other observable village characteristics that households could plausibly observe, including population size, dominant economic activities (Appendix Table D4), accessibility in terms of road conditions, public transport distances, time and prices to travel, availability of markets, different types of shops, pharmacies and government fair price shops, characteristics of the GP sarpanch (leader)

[15]A further concern is that this proxy might partly capture anticipated future SBM-G implementation rather than past activity. If lagging GPs in our 2017 survey were more likely to report that they expected to be ODF by 2019 because they anticipated future government support, this would attenuate any measured differential effect of the interventions on loan-to-toilet conversion.

in terms of gender, caste and length in office, as well as availability of other government programs (in particular the work program MNREGA) to households (Appendix Table D5). We show key variables and summary indices in Figure 5. This makes it unlikely that households could foresee the intensity of SBM-G support their GP would ultimately receive and provide, and thus unlikely that such expectations factored into sanitation investment decisions.

Figure 5: Balance tests by SBM intensity - GP characteristics



Notes: For each variable, the left panel plots means and 95% confidence intervals for GPs with high and low SBM implementation intensity; the right panel reports the difference between groups. Index creation follows Anderson (2008). Economic activity index includes identifiers for GP main economic activity (farming or daily wage labour), average wages for males and females, identifiers for main crops, grains, and fruit/vegetables grown,; Accessibility index includes identifier for multiple-villages GPs, conditions of main and internal roads, as well as main transport, average price and time to travel to collectorate, and distances from services not available in GP.; Shops index captures availability of markets, kirana shops, wine shops, fair price shops, paan shops and pharmacies in the village. L equals sanitation loan arm. $L + I$ equals sanitation loan and awareness creation activities. HH stands for household. Balance tests for the single items used for indexes are available in Appendix D. Data sources: Listing and baseline HH survey, baseline community survey.

Taken together, these patterns support our assumption that variation in SBM-G intensity was not predictable to households at the outset. The observed variation is therefore plausibly exogenous to household expectations and decisions, enabling us to interpret treatment effects with greater confidence.

5 Results

Local SBM-G implementation combined elements that could either complement or substitute for the MFI and NGO interventions. Sanitation loans and SBM-G subsidies were potentially complementary: loans could serve as bridge or top-up financing for the subsidy, while subsidy payments could, in turn, be used to repay loans. By contrast, the NGO intervention and SBM-G awareness activities delivered similar messages through similar channels, making them close substitutes.

Table 3 shows our key results.[16] Four findings emerge. First, loan take-up is lowest when sanitation loans are offered in areas with low SBM-G implementation intensity (MFI + SBM^L). Although differences are not statistically significant, the point estimates suggest higher take-up in settings with high SBM-G intensity and/or with additional awareness creation. To the extent that loan take-up is similar in the MFI + NGO and MFI-only arms within a given SBM-G intensity level, this confirms that government and NGO information are broadly substitutable for loan take-up decisions. Taken together, these patterns suggest that variation in SBM-G implementation intensity, rather than information provision per se, is the primary correlate of borrowing decisions.

Second, toilet construction responds most strongly when sanitation loans and SBM-G subsidies are jointly implemented with limited fragmentation. Construction effects are largest in the MFI + SBM^H arm, where roughly half of the sanitation loans translate into new toilets that would not otherwise have been built, corresponding to a 10.7–percentage-point increase in toilet ownership among MFI clients. This pattern is consistent with a strong complementarity between credit and well-functioning subsidies when delivery is coordinated.

[16] In Appendix Table C4, we show that our main findings are robust to including controls for differences in sanitation supply, GP-level toilet coverage, and market access, as documented in Section 4.

Table 3: Intervention impact on main outcomes by SBM intensity

	Sanitation Loan	Functioning toilet
MFI + SBM^H (γ_1)	0.198***	0.107***
	(0.047)	(0.027)
MFI + NGO + SBM^H (γ_2)	0.221***	0.070**
	(0.034)	(0.028)
MFI + SBM^L (γ_3)	0.156***	0.065
	(0.055)	(0.047)
MFI + NGO + SBM^L (γ_4)	0.206***	-0.045
	(0.057)	(0.040)
SBM^H	-0.024	-0.023
	(0.046)	(0.035)
Covariates	Yes	Yes
F-test $\gamma_2 - \gamma_1 \neq 0$	0.590	0.160
F-test $\gamma_4 - \gamma_3 \neq 0$	0.487	0.023
F-test $\gamma_3 - \gamma_1 \neq 0$	0.566	0.445
F-test $\gamma_4 - \gamma_2 \neq 0$	0.816	0.022
Control mean (SBM^H)	0.017	0.355
Control mean (SBM^L)	0.006	0.429
Observations	4222	4222

Notes: The table shows results from estimating equation 1. Standard errors clustered at the village level are shown in parentheses. *, **, *** indicate significance at the 10, 5 and 1 percent level. Covariates: Toilet ownership at baseline, presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size, strata dummies and interviewer fixed effects. MFI equals 1 if GP received sanitation loans, 0 otherwise; $MFI + NGO$ equals 1 if NGO awareness creation is provided in addition to sanitation loans. SBM^H equals 1 if GP experienced high intensity implementation of SBM, 0 otherwise. SBM^L is an indicator variable equal to 1 if GP experienced less intensive SBM implementation.

Third, sanitation credit 'alone' (MFI + SBM^L) and the full three-component package delivered across three separate actors (MFI + NGO + SBM^H) generate similar construction effects, both around 7 percentage points. This pattern is consistent with the interpretation that the fragmentation of delivery across multiple actors, rather than the number of components per se, limits the impact of the intervention bundle. Notably, outcomes differ sharply between settings with the same number of components but different degrees of organizational coordination, isolating fragmentation—rather than

treatment intensity or scope—as the key causal margin.

Fourth, when NGO information highlights complementarities but these fail to materialize ($MFI + NGO + SBM^L$), impacts on construction vanish. In settings with low SBM implementation intensity, adding NGO-led awareness creation yields no detectable increase in toilet construction. Although the estimate is statistically insignificant, it is, if anything, slightly negative. This pattern is consistent with the idea that emphasizing complementarities—captured by the contrast $\gamma_4 - \gamma_3$—may backfire when the institutional conditions required for those complementarities are absent.

5.1 Ignoring SBM implementation - creating a puzzle

The results also give rise to a potential interpretive puzzle. When considered in isolation, the average treatment effects reported in Table 4 could be read as suggesting that adding an NGO-led information campaign attenuates the impact of microcredit on sanitation adoption. In particular, the MFI+NGO arm does not outperform, and in some specifications underperforms, credit provision alone.

This interpretation, however, abstracts from heterogeneity in concurrent government implementation. Once we account for variation in SBM-G implementation intensity, the apparent attenuation reflects sharply different responses across settings rather than a general negative effect of information. In GPs with high SBM-G implementation intensity, where subsidies and government-led information were reliably delivered, the NGO intervention has no additional effect on adoption, consistent with information being largely substitutable. In contrast, in GPs with low SBM-G implementation intensity, the NGO intervention increases sanitation loan take-up but reduces the conversion of loans into toilets, driven by delays in subsidy delivery that distort household expectations.

Thus, the puzzle arises not because information intrinsically undermines credit, but because the effectiveness of information depends on the reliability of complementary interventions delivered by other actors. Averaging across heterogeneous implementation

environments produces the misleading appearance that information attenuates credit impacts.

We next show that this apparent attenuation arises from organizational fragmentation in subsidy delivery, and trace the resulting dynamics using high-frequency loan and construction data.

Table 4: Average impacts of the MFI and NGO interventions

	(1) Sanitation loan	(2) Functioning toilet
MFI	0.184***	0.095***
	(0.037)	(0.023)
MFI + NGO	0.216***	0.038
	(0.029)	(0.024)
Covariates	Yes	Yes
F_test	0.397	0.018
Control mean	0.013	0.379
Observations	4222	4222

Notes: Impact estimates from estimating the equation provided in footnote 12. MFI equals to sanitation loan arm, MFI + NGO to sanitation loan plus information arm. Standard errors clustered at the village level are shown in parentheses. *, **, *** indicate significance at the 10, 5 and 1 percent level. Covariates: Toilet ownership at baseline, presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size, strata dummies and interviewer fixed effects.

5.2 Mechanisms

We proceed in three steps to provide more direct evidence that the patterns presented in Table 3 are driven by fragmented delivery across organizations. First, we show that the NGO awareness intervention increased demand for sanitation loans in the initial months following rollout, when NGO awareness activities were most salient. Second, we show that this initial increase in borrowing did not translated into toilet construction in low SBM-G implementation intensity areas. Third, we demonstrate that this failure of loan-to-toilet conversion is driven by delays in the receipt of government subsidies–a central source of organizational fragmentation in our setting.

Tables 5 and 6 present treatment effects by SBM-G implementation intensity at a bi-monthly frequency over the first 14 months following rollout of the MFI and NGO interventions. Table 5 shows that the NGO awareness intervention led to a rapid increase in sanitation loan take-up in the first few months after rollout, shortly after awareness creation activities were implemented. Notably, this increase is significantly larger in GPs with low SBM-G implementation intensity than in those with higher SBM-G implementation intensity, corresponding to a positive and significant contrast ($\gamma_4 - \gamma_2$). This timing is consistent with the NGO campaign shifting household expectations about the joint availability of credit and subsidies before information about subsidy delays became salient in low-SBM-G areas. As a result, households responded immediately along the borrowing margin, even though the complementary subsidy input was not ultimately delivered.

However, this early surge in sanitation borrowing in the $MFI + NGO + SBM^L$ GPs did not translate into increased toilet ownership relative to the control group, as evident in Table 6. This divergence between borrowing and construction outcomes highlights that increased access to credit alone is insufficient when complementary program components are weakly implemented. In Maharashtra, SBM-G subsidies are disbursed in two tranches, with the initial tranche contingent on verified progress. Households may therefore borrow and initiate construction in anticipation of this first tranche; when this tranche is delayed or fails to materialize -as was common in low SBM-G implementation intensity GPs- construction may stall or be abandoned despite loan take-up.

By contrast, NGO-led awareness activities did not significantly affect loan take-up in the GPs with high SBM-G implementation intensity ($\gamma_2 - \gamma_1$). This pattern is consistent with government implementation in these areas providing more accurate information about subsidy availability, thereby limiting borrowing in anticipation of subsidies that were unlikely to materialize.

Over time, sanitation loan take-up in the $MFI + NGO + SBM^L$ GPs begins to slow–

approximately ten months after intervention rollout–possibly reflecting growing awareness of subsidy delays. In other arms, loan take-up continues to increase, such that by endline, borrowing levels converge across all four groups. Toilet construction, however, increases significantly only in GPs with MFI loans and high SBM implementation intensity, where information, credit, and subsidy are jointly and reliably implemented.

Table 5: Intervention impact on loan uptake by SBM intensity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	2M	4M	6M	8M	10M	12M	14M
MFI + SBM^H (γ_1)	0.000	0.016	0.016	0.037*	0.065*	0.079**	0.145***
	(0.001)	(0.011)	(0.011)	(0.019)	(0.033)	(0.036)	(0.042)
MFI + NGO + SBM^H (γ_2)	0.004	0.018**	0.023***	0.065***	0.081***	0.082***	0.121***
	(0.003)	(0.007)	(0.008)	(0.015)	(0.020)	(0.021)	(0.028)
MFI + SBM^L (γ_3)	0.009	0.017	0.035	0.061**	0.077***	0.099***	0.122**
	(0.008)	(0.015)	(0.022)	(0.026)	(0.028)	(0.035)	(0.049)
MFI + NGO + SBM^L (γ_4)	0.006*	0.069***	0.095***	0.142***	0.175***	0.176***	0.187***
	(0.004)	(0.026)	(0.036)	(0.039)	(0.051)	(0.051)	(0.048)
SBM^H	-0.002	0.005	0.010	0.004	-0.017	-0.011	-0.011
	(0.002)	(0.009)	(0.013)	(0.015)	(0.023)	(0.025)	(0.032)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-test $\gamma_2 - \gamma_1 \neq 0$	0.111	0.903	0.587	0.239	0.630	0.927	0.542
F-test $\gamma_4 - \gamma_3 \neq 0$	0.700	0.086	0.144	0.077	0.077	0.199	0.335
F-test $\gamma_3 - \gamma_1 \neq 0$	0.308	0.946	0.450	0.443	0.781	0.662	0.721
F-test $\gamma_4 - \gamma_2 \neq 0$	0.608	0.059	0.052	0.070	0.089	0.090	0.225
Control mean (SBM^H)	0.000	0.000	0.000	0.000	0.000	0.002	0.015
Control mean (SBM^L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	4222	4222	4222	4222	4222	4222	4222

Notes: MFI equals to MFI sanitation loan arm, $MFI + NGO$ to MFI sanitation loan plus NGO information arm. Standard errors clustered at the village level are shown in parentheses. *, **, *** indicate significance at the 10, 5 and 1 percent level. Covariates: Toilet ownership at baseline, presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size, strata dummies and interviewer fixed effects.

Table 6: Intervention impact on toilet uptake by SBM intensity

	(1) 2M	(2) 4M	(3) 6M	(4) 8M	(5) 10M	(6) 12M	(7) 14M
MFI + SBM^H (γ_1)	0.002	0.022*	0.044***	0.048***	0.056***	0.057***	0.068***
	(0.010)	(0.013)	(0.015)	(0.016)	(0.016)	(0.016)	(0.018)
MFI + NGO + SBM^H (γ_2)	0.015	0.037**	0.047***	0.047**	0.052***	0.055***	0.062***
	(0.012)	(0.018)	(0.018)	(0.019)	(0.019)	(0.019)	(0.022)
MFI + SBM^L (γ_3)	-0.019	0.010	0.020	0.019	0.029	0.028	0.036
	(0.014)	(0.023)	(0.027)	(0.028)	(0.029)	(0.029)	(0.029)
MFI + NGO + SBM^L (γ_4)	0.013	0.020	-0.007	-0.011	-0.009	-0.011	-0.003
	(0.023)	(0.027)	(0.028)	(0.027)	(0.028)	(0.028)	(0.030)
High SBM intensity	-0.005	-0.004	-0.017	-0.016	-0.013	-0.014	-0.012
	(0.013)	(0.018)	(0.019)	(0.019)	(0.021)	(0.020)	(0.023)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-test $\gamma_2 - \gamma_1 \neq 0$	0.273	0.363	0.878	0.984	0.822	0.916	0.792
F-test $\gamma_4 - \gamma_3 \neq 0$	0.206	0.768	0.414	0.372	0.272	0.261	0.258
F-test $\gamma_3 - \gamma_1 \neq 0$	0.232	0.643	0.438	0.384	0.406	0.383	0.358
F-test $\gamma_4 - \gamma_2 \neq 0$	0.939	0.600	0.120	0.090	0.083	0.063	0.088
Observations	4107	4107	4107	4107	4107	4107	4107

Notes: *MFI* equals to MFIsanitation loan arm, *MFI + NGO* to MFI sanitation loan plus NGO information arm. Standard errors clustered at the village level are shown in parentheses. *, **, *** indicate significance at the 10, 5 and 1 percent level. Covariates: Toilet ownership at baseline, presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size, strata dummies and interviewer fixed effects.

Further evidence that a breakdown in the complementarity underlies these patterns comes from heterogeneity by GP-level subsidy delays, shown in Table 7. Using data from the SBM-G officials' survey, we classify GPs according to whether more than 25% of households experienced major delays (e.g. exceeding six months) in receiving a subsidy. Among GPs without major delays, the NGO intervention increased sanitation loan take-up (significant at the 10% level), and yields similar increases in toilet ownership, consistent with effective complementarities between credit and subsidies. This pattern is difficult to reconcile with standard information or liquidity mechanisms alone, but follows directly from an expectations-based complementarity framework under fragmented delivery.

By contrast, in GPs experiencing substantial subsidy delays–our clearest measure of organizational fragmentation–loan take-up is similar with or without the NGO intervention, but toilet ownership increases only in the absence of the NGO-led awareness creation. When the NGO intervention is present, toilet construction does not increase. These results provide direct evidence that highlighting complementarities that fail to

materialize in practice can undermine the conversion of sanitation loans into durable investments.

Table 7: Intervention impact on main outcomes by subsidy delays

	Sanitation loan	Functioning toilet
MFI - No major delays	0.1317**	0.1186***
	(0.0508)	(0.0321)
MFI + NGO - No major delays	0.2349***	0.1359***
	(0.0486)	(0.0343)
MFI - Major delays	0.2133***	0.1094***
	(0.0506)	(0.0277)
MFI + NGO - Major delays	0.2115***	-0.0153
	(0.0369)	(0.0282)
Major delays	0.0411	0.1013***
	(0.0415)	(0.0353)
Covariates	Yes	Yes
F_test (no major delays)	0.087	0.665
F_test (major delays)	0.973	0.000
F_test (MFI)	0.263	0.832
F_test (MFI + NGO)	0.707	0.001
Control mean (no major delays)	0.002	0.294
Control mean (major delays)	0.018	0.417
Observations	4009	4009

Notes: MFI equals to MFI sanitation loan arm, $MFI + NGO$ to MFI sanitation loan plus NGO information arm. Standard errors clustered at the village level are shown in parentheses. *, **, *** indicate significance at the 10, 5 and 1 percent level. Covariates: Toilet ownership at baseline, presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size, strata dummies and interviewer fixed effects. Definition of major subsidy delays: $>$ 25% of subsidy applicants in the GP experienced major delays in disbursement.

6 Conclusion

This study provides a new explanation for why interventions can lose effectiveness at scale. We show that in multi-actor policy environments, organizational fragmentation can turn theoretical complementarities between components that are effective in isolation into practical frictions. Consequently, layering theoretically complementary inter-

ventions can lead to outcomes short of policy objectives.

We establish the importance of this mechanism in the context of the last-mile adoption of toilets in rural India. Drawing on an RCT and quasi-random variation in the intensity of local implementation of an at-scale Government policy, our results show that successful household-level toilet adoption is influenced by interactions between intervention components - credit, information and subsidies - delivered by different actors. Sanitation loan take-up is similar across treatment arms and SBM-G implementation intensities, underscoring binding liquidity constraints. Toilet construction, however, is highest when credit availability coincides with effective government subsidy delivery, revealing complementarities that materialize only when implementation across actors is sufficiently aligned.

Information provision interacts sharply with this environment. Where subsidy implementation is strong, NGO and government information are substitutable, and adding an NGO-led awareness campaign has no effect on adoption. Where implementation is weak, NGO awareness speeds up sanitation loan take-up but does not translate into toilet construction: households borrow in anticipation of subsidies that are delayed or absent, resulting in lower adoption than under credit provision alone. This pattern illustrates how organizational fragmentation can overturn complementarities that exist at the level of individual components.

Our findings show that even when actors pursue aligned objectives and deploy interventions that are effective in isolation, uncoordinated delivery can weaken overall policy impact. Coordination is costly, however, and in many environments these costs may exceed the benefits. Ignoring interactions across implementers can lead to systematically misleading expectations about the returns to expanding or layering programs.

These findings have direct implications for how resources are allocated across interventions and actors. In a context of shrinking aid budgets and fiscal constraints, the relevant question is not only whether an intervention works, but whether it adds value

given what is already being delivered. In our setting, additional NGO involvement was not value-adding for the policy objective, despite being effective in isolation.

Finally, the paper speaks to the design and interpretation of randomized evaluations. By embedding an RCT within an evolving policy environment, we show that treatment effects need not be invariant to concurrent policies. Assuming that other interventions balance out across treatment and control arms may obscure interaction effects that matter precisely when programs are taken to scale. Explicitly accounting for institutional context is therefore central both for interpreting external validity and for designing evaluations in complex implementation environments.

More broadly, our results point to a research agenda on how organizational structure and policy delivery interact to shape economic outcomes. Understanding when fragmentation undermines complementarities—and when diversity of implementers is productive—remains central to explaining why some programs scale successfully while others do not.

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APPENDIX

At Scale Implementation and the Perils of Fragmentation

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A Details on the interventions

Figure A1: Pictures of different awareness creation activities

Community level

MFI and client level

Notes: The top panel pictures show Community-level activities - street plays and wall paintings/banners. The second panel pictures a branch-level client workshop.

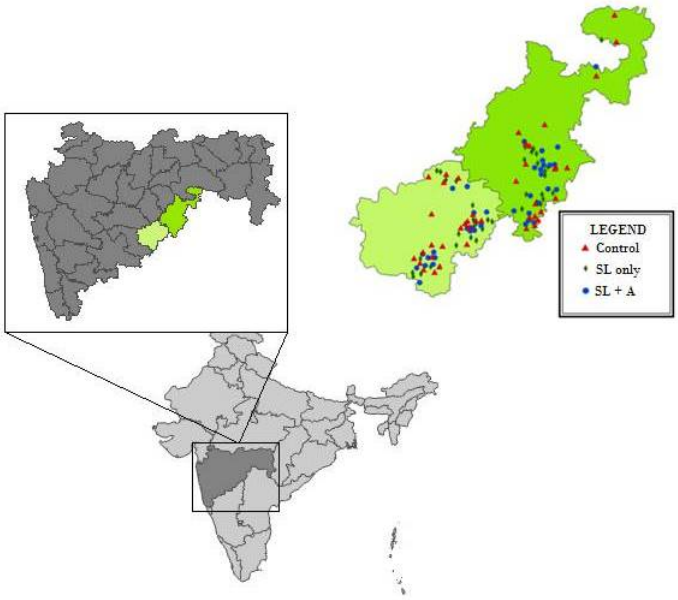
Figure A2: IEC handout

Note: Picture taken by research team.

B Evaluation design

B.1 Study location

Figure B1: Study location

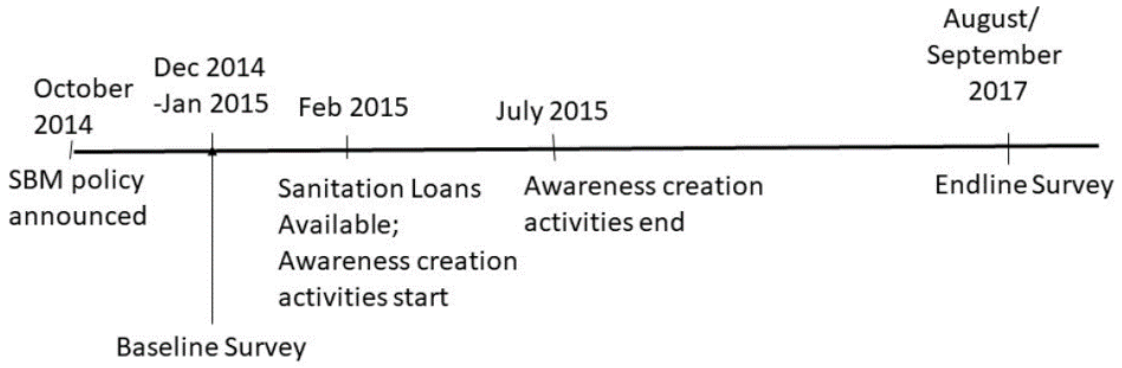


Notes: Figure shows location of Latur and Nanded within Maharasthra (left) and of study GPs within the two districts (right).

B.2 Timelines

Study timeline:

Figure B2: Study timeline



Awareness creation implementation timeline:

Table B1: Intervention roll-out by branch (level of stratification)

	Branch				
	Degloor	**Naigaon**	**Udgir**	**Ahmedpur**	**Nilanga**
Sanitation loan disbursement start	Apr-15	Mar-15	May-15	Aug-15	Aug-15
Awareness creation activities:					
MFI branch staff training	Mar-15	Feb-15	Mar-15	Mar-15	Jan-15
MFI Kendra clients training	May-15	Feb-15	March 2015[1]	July 2015	Jan 2015[2]
Street plays	Mar-15	Mar-15	Mar-15	Mar-15	Mar-15
Wall painting	Mar-15	July 2015	July 2015	July 2015	July 2015
GP officials training	May-15	Mar-15	Mar-15	June 2015	Jan 2015 [3]
Mason training	May-15	Feb-15	June 2015	June 2015	Jan-15
Branch level awareness workshop	Mar-15	May-15	July 2015	July 2015	June 2015

Notes: [1]In 2 out of 9 GPs the GK Kendra clients meeting was delayed until July 2015; [2]In one GP the Kendra client meeting was delayed until March 2015; [3]In one GP the GP official training was delayed until March 2015, and in another until July 2015.

B.3 RCT baseline balancedness

Table B2: Sample descriptives and sample balance: household survey

	(1)	(2)	(3)	(4)	(5)	(6)
		Treatment Status				
	Whole Sample	**Control**	**MFI**	**MFI + NGO**	**F-stat**	**N**
Nr of HH members	5.03	5.01	5.06	5.03	0.059	4222
	(0.030)	(0.083)	(0.073)	(0.068)		
HH religion: Hindu	66.5	67.8	65.5	65.8	0.003	4222
	(0.73)	(3.54)	(3.88)	(4.46)		
HH religion: Islam	21.2	18.6	22.2	23.4	0.038	4222
	(0.63)	(3.86)	(4.02)	(4.94)		
HH religion: Buddhism	11.8	12.8	11.8	10.6	0.162	4222
	(0.50)	(2.38)	(2.27)	(1.72)		
HH caste: Backward	31.5	33.9	31.8	28.6	0.532	4222
	(0.72)	(4.04)	(3.49)	(2.75)		
HH caste: Scheduled castes/tribes	41.9	41.6	40.1	44.0	0.407	4222
	(0.76)	(4.13)	(4.42)	(4.30)		
HH caste: General caste	26.1	24.1	27.3	27.2	0.000	4222
	(0.68)	(4.02)	(4.21)	(4.81)		
Gender HH head (male)	90.7	89.7	91.4	91.2	0.023	4222
	(0.45)	(1.03)	(0.91)	(0.96)		
Age HH head	45.6	45.4	45.5	45.9	0.388	4222
	(0.16)	(0.48)	(0.35)	(0.40)		
Years of education HH head	5.76	5.86	6.00	5.44	3.065*	4222
	(0.073)	(0.20)	(0.20)	(0.25)		
Primary activity HH: Cultivator	19.0	16.5	18.2	22.6*	1.431	4222
	(0.60)	(2.05)	(2.30)	(2.89)		
Primary activity HH: Agriculture wage labour	22.8	22.2	23.2	23.1	0.003	4222
	(0.65)	(2.14)	(2.06)	(2.24)		
Primary activity HH: Allied agriculture	13.4	13.6	14.0	12.4	0.394	4222
	(0.52)	(1.94)	(1.72)	(1.76)		
Primary activity HH: Waged employment	25.7	27.3	25.8	23.6	0.432	4222
	(0.67)	(2.34)	(2.35)	(2.36)		
Primary activity HH: Self-employment	16.9	17.9	16.9	15.8	0.088	4222
	(0.58)	(2.24)	(2.13)	(2.78)		
Dwelling owned by HH	96.4	96.1	96.7	96.3	0.126	4222
	(0.29)	(1.02)	(0.75)	(0.85)		
Dwelling structure: Pucca House	19.8	17.7	20.4	21.5	0.100	4222
	(0.61)	(2.45)	(2.06)	(2.78)		
Dwelling structure: Semi-pucca house	65.2	65.8	64.7	64.9	0.003	4222
	(0.73)	(3.10)	(2.66)	(3.21)		
HH owns BPL card	59.9	59.0	57.9	62.7	1.679	4222
	(0.75)	(2.06)	(2.58)	(2.57)		
HH owned a toilet at baseline (reconstructed) (%)	0.26	0.24	0.27	0.28	0.054	4222
	(0.01)	(0.02)	(0.02)	(0.03)		

Notes: MFI equals MFI sanitation loan arm. MFI+NGO equals MFI sanitation loan and NGO awareness creation activities. *, **, *** indicate significance at the 10, 5 and 1 percent level respectively. HH stands for household. BPL stands for below poverty line. Column 1-4 reports mean and standard deviation (in parentheses) in the whole sample, control, MFI only and $MFI + NGO$ group respectively.

C Robustness checks

C.1 Characteristics of sanitation loan takers

Table C1: Characteristics of sanitation loan takers

	(1) MFI	(2) MFI + NGO	(3) P-value	(4) N
HH head religion: Hinduism (%)	64.3	64.4	0.990	558
	(8.66)	(7.44)		
HH head religion: Islam (%)	30.1	24.9	0.664	558
	(8.87)	(7.91)		
Nr of HH members	5.22	5.08	0.287	558
	(0.099)	(0.086)		
HH head caste: Backward (%)	30.1	23.3	0.317	558
	(5.78)	(3.48)		
HH head caste: Scheduled (%)	30.1	42.7	0.129	558
	(5.74)	(5.81)		
HH head caste: General (%)	39.4	33.7	0.610	558
	(8.68)	(6.94)		
Gender of the HH head - male (%)	92.4	91.9	0.859	558
	(1.36)	(2.18)		
Age of the HH head in years	46.1	45.4	0.423	558
	(0.63)	(0.68)		
Years of education HH head	6.71	6.29	0.404	558
	(0.36)	(0.35)		
Dwelling structure: Pucca House	18.9	21.4	0.661	558
	(3.26)	(4.59)		
HH owns a BPL card (%)	57.8	63.1	0.266	558
	(3.58)	(3.02)		
Primary activity HH: agriculture (%)	58.2	60.2	0.791	558
	(4.24)	(6.01)		
Primary activity HH: Waged employment (%)	20.9	20.7	0.973	558
	(3.48)	(3.71)		
HH owned a toilet at baseline (reconstructed) (%)	28.9	31.1	0.734	558
	(4.88)	(3.96)		
Subsidy eligible HH at EL	50.2	55.3	0.428	558
	(5.25)	(3.69)		

Notes: MFI equals sanitation loan arm. $MFI + NGO$ equals sanitation loan and awareness creation activities. *, **, *** indicate significance at the 10, 5 and 1 percent level respectively. HH stands for household. BPL stands for below poverty line. Column 1 and 2 report mean and standard deviation (in parenthesis) for each variable among clients in MFI and $MFI + NGO$ arm respectively.

C.2 Main results by alternative measures of SBM intensity

Table C2: Intervention impact on main outcomes by whether GP received support from block and district officials regularly

	Sanitation loan	Functioning toilet
MFI - GP received support regularly	0.178***	0.103***
	(0.0537)	(0.0292)
MFI + NGO - GP received support regularly	0.188***	0.0668**
	(0.0373)	(0.0304)
MFI - GP did not receive support regularly	0.206***	0.0865**
	(0.0504)	(0.0369)
MFI + NGO - GP did not receive support regularly	0.256***	0.00515
	(0.0412)	(0.0392)
GP received support regularly	0.0743	-0.000435
	(0.0573)	(0.0469)
Covariates	Yes	Yes
F-test (MFI)	0.697	0.742
F-test (MFI + NGO)	0.231	0.222
F-test (regularly)	0.821	0.293
F-test (not regularly)	0.378	0.0286
Control mean (not regularly)	0.0186	0.440
Control mean (regularly)	0.00889	0.331
N	4222	4222

Notes: MFI equals to MFI sanitation loan arm, $MFI + NGO$ to MFI sanitation loan plus NGO information arm. Standard errors clustered at the village level are shown in parentheses. *, **, *** indicate significance at the 10, 5 and 1 percent level. Covariates: Toilet ownership at baseline, presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size, strata dummies and interviewer fixed effects. Definition of regular support: whether GP received support from block and district officials always or most of the time during the intervention.

Table C3: Intervention impact on main outcomes by whether GP provided support to HHs regularly

	Sanitation loan	Functioning toilet
MFI - GP provided support regularly	0.145***	0.0787***
	(0.0433)	(0.0292)
MFI + NGO - GP provided support regularly	0.179***	0.0478
	(0.0377)	(0.0306)
MFI - GP did not provide support regularly	0.236***	0.117***
	(0.0623)	(0.0352)
MFI + NGO - GP did not provide support regularly	0.270***	0.0203
	(0.0538)	(0.0395)
GP provided support regularly	0.0704	-0.0138
	(0.0583)	(0.0341)
Covariates	Yes	Yes
F_test (MFI)	0.235	0.396
F-test (MFI + NGO)	0.178	0.585
F-test (regularly)	0.451	0.311
F-test (not regularly)	0.617	0.0178
Control mean (not regularly)	0.0180	0.420
Control mean (regularly)	0.00965	0.349
N	4222	4222

Notes: MFI equals to sanitation loan arm, $MFI + NGO$ to sanitation loan plus information arm. Standard errors clustered at the village level are shown in parentheses. *, **, *** indicate significance at the 10, 5 and 1 percent level. Covariates: Toilet ownership at baseline, presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size, strata dummies and interviewer fixed effects. Definition of regular support: whether GP provided support for toilet construction to HHs always or most of the time during the intervention.

C.3 Regression controlling for confounding factors

Table C4: Intervention impact on main outcomes by SBM intensity - controls for confounding factors

	Sanitation loan	Sanitation loan	Functioning toilet	Functioning toilet
MFI + SBM^H γ_1	0.198***	0.220***	0.107***	0.0816***
	(0.0467)	(0.0454)	(0.0269)	(0.0269)
MFI + NGO + SBM^H γ_2	0.221***	0.223***	0.0700**	0.0720***
	(0.0337)	(0.0319)	(0.0280)	(0.0264)
MFI + SBM^L γ_3	0.156***	0.159***	0.0652	0.0679
	(0.0551)	(0.0530)	(0.0465)	(0.0478)
MFI + NGO + SBM^L γ_4	0.206***	0.208***	-0.0448	-0.0227
	(0.0568)	(0.0555)	(0.0399)	(0.0409)
SBM high intensity	-0.0237	-0.0180	-0.0234	-0.0164
	(0.0458)	(0.0474)	(0.0352)	(0.0361)
Sanitation supply	No	Yes	No	Yes
Toilet coverage	No	Yes	No	Yes
Market access	No	Yes	No	Yes
Covariates	Yes	Yes	Yes	Yes
F-test $\gamma_2 - \gamma_1 \neq 0$	0.590	0.932	0.160	0.719
F-test $\gamma_4 - \gamma_3 \neq 0$	0.487	0.473	0.023	0.047
F-test $\gamma_3 - \gamma_1 \neq 0$	0.566	0.383	0.445	0.802
F-test $\gamma_4 - \gamma_2 \neq 0$	0.816	0.799	0.022	0.051
Control mean (high intensity)	0.000	0.017	0.355	0.355
Control mean (low intensity)	0.006	0.006	0.429	0.429
Observations	4222	4211	4222	4211

Notes: MFI equals to sanitation loan arm, $MFI + NGO$ to sanitation loan plus information arm. Standard errors clustered at the village level are shown in parentheses. *, **, *** indicate significance at the 10, 5 and 1 percent level. The sanitation supply at baseline is measured by a pca index that pools together the number of masons, plumbers and carpenters available in the GP on the size of client population, the distance from sanitary hardware store, brick producer, and cement block producer using polychoric principal components analysis. Toilet coverage is the share of households with toilet in the GP measured at baseline. The market accessibility index at baseline is generated following Anderson (2008) combining: identifier for multiple-villages GPs, conditions of main and internal roads, main transport to collectorate, average price and time to travel to collectorate, distance in km. from services not available in the GP. Covariates: Toilet ownership at baseline, presence of a child aged 0 - 2 at baseline, ratio of number of sampled clients to village size, strata dummies and interviewer fixed effects. Column 4 captures toilet utilization by the HH if all HH members regularly use toilet to defecate.

D Low SBM intensity vs. high SBM intensity: balance tests

Table D1: SBM implementation

	(1) Low SBM intensity	(2) High SBM intensity	(3) P-value	(4) N
Any program (gvmnt. or priv.) provided info or awareness on sanit.	0.686	0.812	0.164	120
	(0.079)	(0.043)		
Sanitation awareness or information activities runned by SBM	0.714	0.835	0.167	120
	(0.077)	(0.040)		
GP received support from block officials	0.429	0.682**	0.011	120
	(0.084)	(0.051)		
GP received support from district officials	0.171	0.424***	0.003	120
	(0.064)	(0.054)		
GP offered HHs any support for toilet constr.	0.571	0.776**	0.035	120
	(0.084)	(0.045)		
GP helped households apply for subsidies	0.257	0.459**	0.031	120
	(0.074)	(0.054)		
>25% of sub. applicants experienced major delays in disb.	0.800	0.625**	0.048	115
	(0.068)	(0.054)		
GPs received support from block/district officials most or all of the time	0.343	0.612***	0.006	120
	(0.081)	(0.053)		
GPs received financial support from block/district officials most or all of the time	0.229	0.447**	0.017	120
	(0.071)	(0.054)		
GPs provided support to households most or all of the time	0.486	0.671*	0.066	120
	(0.085)	(0.051)		
Mason knows about SBM	0.714	0.671	0.638	120
	(0.077)	(0.051)		
Mason reports SBM is active in the GP	0.114	0.318***	0.007	120
	(0.054)	(0.051)		
Mason reports SBM was active in the GP before October 2015	0.0571	0.153*	0.089	120
	(0.039)	(0.039)		

Notes: HHs stands for households. *, **, *** indicate significance at the 10, 5 and 1 percent level respectively. Column 1 and 2 reports mean and standard deviation (in parentheses) for each variable in the low and high SBM intensity group, respectively. *Source*: SBM endline survey.

Table D2: SBM targeting: Sanitation and health facilities (1)

	(1) SBM^L	(2) SBM^H	(3) P-value	(4) N
HHs w/o toilet think can get subsidy (%)	37.51	41.29	0.425	120
	(4.17)	(2.17)		
Supply PCA index	-5.674	-9.457***	0.00659	119
	(0.82)	(1.09)		
Nr. Masons per client pop.	0.211	0.313	0.186	119
	(0.054)	(0.053)		
Nr. Plumbers per client pop.	0.0980	0.0511	0.357	119
	(0.050)	(0.0096)		
Nr. Carpenters per client pop.	0.157	0.122	0.427	119
	(0.041)	(0.017)		
Distance from cement block producer	-6.053	-8.355	0.184	119
	(1.10)	(1.31)		
Distance from sanitary hardware store	-8.764	-8.454	0.832	119
	(1.29)	(0.67)		
Distance from brick store	-9.051	-20.640***	0.001	119
	(1.55)	(3.04)		
Cement available for purchase	0.171	0.167	0.950	119
	(0.064)	(0.041)		
Bricks available for purchase	0.143	0.131	0.866	119
	(0.059)	(0.037)		
Concrete ring available for purchase	0.057	0.095	0.457	119
	(0.039)	(0.032)		
Toilet coverage at BL	0.354	0.243***	0.005	107
	(0.033)	(0.020)		
GP applied for the Nirmal Gram Pushkar prize	0.343	0.119**	0.013	119
	(0.081)	(0.035)		
AWC or NBM support sanitation at BL	0.714	0.548*	0.080	119
	(0.077)	(0.055)		

Notes: *, **, *** indicate significance at the 10, 5 and 1 percent level respectively. Column 1 and 2 reports mean and standard deviation (in parentheses) for each variable in low (SBM^L) and high (SBM^H) SBM-G implementation intensity group, respectively. The supply PCA index is generated using polychoric principal components analysis. Source: Baseline listing and community survey.

Table D3: SBM targeting: Sanitation and health facilities (2)

	(1) SBM^L	(2) SBM^H	(3) P-value	(4) N
Health facilities score	4.714	3.821**	0.045	119
	(0.38)	(0.22)		
Sub center or AMN in the village	0.429	0.321	0.280	119
	(0.084)	(0.051)		
Primary Health Center in the village	0.229	0.250	0.804	119
	(0.071)	(0.047)		
Comm. health center in the village	0.171	0.095	0.292	119
	(0.064)	(0.032)		
Gvm. Dispensary in the village	0.000	0.024	0.158	119
	(0.000)	(0.017)		
Gvm. Hospital in the village	0.029	0.048	0.606	119
	(0.028)	(0.023)		
Priv. clinic in the village	0.457	0.286*	0.084	119
	(0.085)	(0.049)		
Priv. hospital/doctor in the village	0.457	0.214**	0.013	119
	(0.085)	(0.045)		
ASHA in the village	1.000	0.905***	0.004	119
	(0.000)	(0.032)		
Trad. birth attendance in the village	0.686	0.500*	0.056	119
	(0.079)	(0.055)		
Pharmacy in the village	0.257	0.190	0.440	119
	(0.074)	(0.043)		
Anganwadi center in the village	1.000	0.988	0.321	119
	(0.000)	(0.012)		

Notes: HHs stands for households. *, **, *** indicate significance at the 10, 5 and 1 percent level respectively. Column 1 and 2 reports mean and standard deviation (in parentheses) for each variable in low (SBM^L) and high (SBM^H) SBM-G implementation intensity group, respectively. The health facilities score summarized the presence in the GP of the facilities listed in the table. *Source*: Baseline listing and community survey.

Table D4: GP characteristics (1)

	(1) SBM^L	(2) SBM^H	(3) P-value	(4) N
MFI	0.371	0.318	0.580	120
	(0.082)	(0.051)		
MFI + NGO	0.286	0.341	0.551	120
	(0.077)	(0.052)		
Pop. size (x10000)	0.433	0.367	0.338	119
	(0.059)	(0.036)		
Economic activity index	0.216	0.207	0.396	119
	(0.010)	(0.004)		
Main GP activity: farming	0.829	0.679*	0.071	119
	(0.064)	(0.051)		
Main GP activity: daily wage lab. (no agr.)	0.057	0.012	0.276	119
	(0.039)	(0.012)		
Wage for main activity (Rs.), males	204.3	212.5	0.301	119
	(5.87)	(5.25)		
Wage for main activity (Rs.), females	124	122.7	0.821	119
	(4.67)	(3.46)		
Two major crops (Groundnut)	0.486	0.321	0.101	119
	(0.085)	(0.051)		
Two major crops (Sugarcane)	0.657	0.440**	0.029	119
	(0.081)	(0.054)		
Two major crops (Cotton)	0.371	0.643***	0.006	119
	(0.082)	(0.053)		
Two major crops (Turmeric)	0.171	0.083	0.218	119
	(0.064)	(0.030)		
Two major crops (Tobacco)	0.029	0.000	0.316	119
	(0.028)	(0.000)		
Two major grains (Sorghum)	0.057	0.095	0.457	119
	(0.039)	(0.032)		
Two major grains (Staple dhal)	0.886	0.929	0.485	119
	(0.054)	(0.028)		
Two major grains (Wheat)	0.257	0.357	0.275	119
	(0.074)	(0.053)		
Two major grains (Rice)	0.029	0.024	0.885	119
	(0.028)	(0.017)		
Two major grains (Jowar)	0.886	0.833	0.443	119
	(0.054)	(0.041)		
Two major fruits/vegetables (Tomatoes)	0.857	0.750	0.163	119
	(0.059)	(0.047)		
Two major fruits/vegetables (Cauliflower)	0.314	0.333	0.841	119
	(0.079)	(0.052)		
Two major fruits/vegetables (Okra)	0.629	0.571	0.564	119
	(0.082)	(0.054)		
Two major fruits/vegetables (Cluster)	0.229	0.202	0.756	119
	(0.071)	(0.044)		
Two major fruits/vegetables (Mangoes)	0.086	0.107	0.715	119
	(0.048)	(0.034)		
Two major fruits/vegetables (Grapes)	0.000	0.012	0.321	119
	(0.000)	(0.012)		

Notes: MFI equals MFI sanitation loan arm. MFI+NGO equals MFI sanitation loan and NGO awareness creation activities. *, **, *** indicate significance at the 10, 5 and 1 percent level respectively. Column 1 and 2 reports mean and standard deviation (in parentheses) for each variable in low (SBM^L) and high (SBM^H) SBM-G implementation intensity group, respectively. The index is generated following Anderson (2008) combining the baseline GP characteristics listed in the table. Source: Baseline community survey.

Table D5: GP characteristics: accessibility (2)

	(1) SBM^L	(2) SBM^H	(3) P-value	(4) N
Accessibility index	0.784	0.776	0.850	119
	(0.037)	(0.024)		
GP with only one village	0.800	0.845	0.568	119
	(0.068)	(0.040)		
Main road good condition	0.771	0.726	0.603	119
	(0.071)	(0.049)		
Int. road good condition	0.743	0.679	0.479	119
	(0.074)	(0.051)		
Main tr. to collect.: Bus	0.543	0.595	0.604	119
	(0.085)	(0.054)		
Price to travel to collectorate (Rs.)	88.03	82.79	0.321	119
	(4.02)	(3.36)		
Time to travel to collectorate (min.)	117.9	126.6	0.322	119
	(6.31)	(5.98)		
Distance from services not available in the GP	88.09	82.13	0.641	119
	(11.8)	(4.59)		
Shops index	0.852	0.840	0.713	119
	(0.028)	(0.013)		
Market in the village	0.143	0.119	0.732	119
	(0.059)	(0.035)		
Kirana shop in the village	0.943	0.929	0.770	119
	(0.039)	(0.028)		
Wine shop in the village	0.286	0.238	0.598	119
	(0.077)	(0.047)		
Fair price shop in the village	0.943	0.976	0.440	119
	(0.039)	(0.017)		
Paan shop in the village	0.971	0.810***	0.002	119
	(0.028)	(0.043)		
Pharmacy in the village	0.257	0.190	0.440	119
	(0.074)	(0.043)		
Female sarpanch	0.629	0.536	0.350	119
	(0.082)	(0.055)		
Sarpanch: General Caste	0.400	0.381	0.848	119
	(0.083)	(0.053)		
First time sarpanch in position	0.94	0.97	0.447	119
	(0.041)	(0.018)		
Villagers participated in MNREGA	0.54	0.57	0.778	119
	(0.085)	(0.054)		

Notes: *, **, *** indicate significance at the 10, 5 and 1 percent level respectively. Column 1 and 2 reports mean and standard deviation (in parentheses) for each variable in low (SBM^L) and high (SBM^H) SBM-G implementation intensity group, respectively. The accessibility and shops index are generated following Anderson (2008) combining the baseline GP characteristics listed in the table. Source: Baseline community survey.