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The Combined Role of Subsidy and Discussion Intervention in the Demand for a Stigmatized Product

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The Combined Role of Subsidy and Discussion Intervention in the Demand for a Stigmatized Product*

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Abstract

This paper studies the joint role of subsidization and group discussion intervention in increasing the demand for sanitary pads – a product that is widely available but whose demand may be curtailed due to the psychological cost associated with menstrual stigmatization. The study deploys a field experiment in Nepal to randomly allocate discount coupons of various values so that participants face exogeneous variation in the effective price of sanitary pads. In addition, a randomly selected group of women in the sample participate in menstrual health-related group discussion intervention. The findings suggest that an increase in subsidy level increases the probability of adoption across both groups of women – those receiving only a subsidy and those participating in the discussion intervention coupled with a subsidy. Also, women participating in the discussion intervention have a higher adoption rate. The effects of group discussion intervention are concentrated among women with high psychological cost, whose purchase decisions are more likely to be affected by societal stigma. The results suggest that combining a subsidy with group discussion could provide a cost-effective strategy to increase the adoption of health technology whose demand is constrained by social norms.

JEL Code: I15, D12, O33, I26

Key words: price subsidies, societal stigma, group discussion intervention, estimating elasticity, menstrual health

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‡Economic Research Institute for ASEAN and East Asia (ERIA), Email: *rashesh.shrestha@eria.org*. The views expressed in this paper are that of the authors. The supplementary online appendix is available with this article at the *World Bank Economic Review* website. We would like to offer our sincere gratitude to Dipasha Bista, Barsa Budhathoki, Ashma Gautam, Rita Ghatani, Shanti Ghimere, Malati Gurung, Situ Kapali, Aastha Shrestha Neupane, Ranju Pandey, Sandhya Pathak, Sari Khatiwada, Sarita Regmi, Pratibha Shrestha, Sapana Shrestha, Shreeju Shrestha, and Prativa Thapa for helping us throughout the experiment phase as research assistants. We thank Raju Amatya and Pranish Shrestha for providing logistical guidance, without which it would not have been possible to conduct this study. We would like to thank Anja Benshaul-Tolonen, Eric Edmonds, Seth Gitter, Paul Glewwe, Swetha Peteru, Rakshya Gorkhali, participants at the Mid-West International Development Economics Conference, DIAL Conference on Development Economics, and anonymous referees for valuable comments. Also, we are thankful to Towson University for providing us with the grant to support this study. Remaining errors are our own.

1 Introduction

Many areas of health are governed by traditional beliefs and taboos, which can affect the demand and utilization of health products and services due to societal stigma.[1] Unlike cases where lack of information causes individuals to underestimate the marginal benefit of health products (Luby et al., 2004, 2005; Cairncross et al., 2005; Jalan and Somanathan, 2008; Madajewicz et al., 2007; Dupas, 2011), stigmatization can limit the adoption of even well-known health products by giving rise to psychological cost.[2] Consequently, subsidies that have proved successful in increasing take-up of health products (Ashraf et al., 2010; Meredith et al., 2013; Dupas, 2014b) may not be as effective in the case of products associated with taboo issues. Pairing subsidies with an additional intervention designed to reduce the underlying psychological cost may be necessary. Public health research indicates that providing a platform for group discussion and information-sharing can be effective in reducing stigma-related psychological costs (Brown and Bradley, 2002; Creel et al., 2011; Johnston-Robledo and Chrisler, 2013; Henderson et al., 2017; Bobel et al., 2020).

In this paper, we report results from a randomized controlled trial conducted to evaluate the relative effectiveness of subsidy-only intervention against a combined intervention that pairs a subsidy with group discussion (subsidy-plus-discussion intervention) in increasing the demand for disposable sanitary pads. In many developing countries, as in our study setting of Nepal, menstruation is highly stigmatized due to deeply-rooted sociocultural norms and religious beliefs. Despite sanitary pads being fairly well-known and commonly available, they are not universally adopted. Rags, cotton, or wool are used instead (Budhathoki et al., 2018), which if improperly used can be detrimental to one's immediate health and long-term well-being.[3] Sommer et al. (2015) note that a

[1] We define stigma following the research of Link and Phelan (2001). It involves elements including labeling differences, stereotyping, separating groups ("them" vs. "us"), status loss, and discrimination in the situation of power that allows linkage of these elements. Psychological costs among people in the stigmatized group occur due to the process that forms stigma.

[2] In developed countries, similar role of stigma influencing economic behavior has been shown in the context of participation in welfare programs (Moffitt, 1983; Contini and Richiardi, 2012). Communication related to family planning, including contraceptives and sex-related discussion, have been historically taboo (Himes, 1936; Stycos et al., 1977; Liao and Dollin, 2012; Bailey, 2013). In many developing parts of the world, stigma against contraceptive devices still acts as a barrier to adoption (Frank et al., 2012). The role of stigmatization has also been explored in topics such as HIV testing and male circumcision (Young et al., 2007; Young and Bendavid, 2010).

[3] Using unhygienic cloths can affect a girl's psychological development by hindering social dignity and comfort due to leakage, odor, and chafing (Sommer, 2010; Mason et al., 2013) as well as increasing the risk of reproductive tract infections (Phillips-Howard et al., 2016). Lack of access to menstrual hygiene may create an impediment to girls' school attendance (Montgomery et al., 2012; Dolan et al., 2014; Benshaul-Tolonen et al., 2021). The Benshaul-Tolonen et al. (2021) study highlights that access to disposable sanitary pads improve physical mobility as well as the emotional, social, and educational well-being of females.

combination of high cost, budget constraints, and menstrual stigma could explain poor menstrual health management and the low adoption rate of sanitary pads. While menstrual health products themselves are not taboo, societal stigma around menstruation creates product stigma (Klintner, 2021).

Stigma can inhibit demand for menstrual products regardless of a women's knowledge about the product's benefits. For those unfamiliar with the product, stigma creates a social environment that discourages them from gathering relevant information by discussing the matter with peers. Learning from peers is an important step in the adoption of new health products (Oster and Thornton, 2012; Meredith et al., 2013), a channel that is curtailed for products associated with a stigma. Even for those with adequate information, menstrual stigma may dissuade them from taking the public action of purchasing the product from a local shop due to the shame or embarrassment connected to "unmentionables" or "controversial products" (Wilson and West, 1981). Stigma leads to concern about social image or status, which is exacerbated when the action is public (Jensen, 2006; Bursztyn and Jensen, 2017). In our baseline survey, 32% of non-regular users of sanitary pads cite being uncomfortable during purchase as a reason for non-frequent use while 23% cite price as the parimary obstacle.[4] Thus, in addition to budget constraints, the under use of sanitary pads can to some extent be attributed to the psychological costs created by stigma. Designing effective policies aimed at increasing the adoption of sanitary pads therefore requires an understanding of the relative importance of price and psychological costs.

We hypothesize that a reduction in psychological costs created by the stigma, achieved through participation in group discussion intervention, will make women more responsive to subsidies. To test this, we create two treatment groups – the first group receives a subsidy of a random value ("subsidy-only treatment") and the second group receives a subsidy as well as an invitation to participate in a group discussion intervention session ("subsidy-plus-discussion treatment"). The discount coupon can be redeemed at local pharmacies and take one of five values (10%, 25%, 50%, 75%, or 90%).[5] The random variation in price allows us to trace the demand curve. In the group

[4]The issue of shame associated with purchasing menstrual health products has also been found in other contexts. A 2016 survey of women found that on average one in four women feel uncomfortable buying sanitary pads. The survey included both developing and developed countries: India, China, Mexico, Russia, Italy, United Kingdom, USA, Germany, France, Netherlands, Sweden, and Spain (Svenska Cellulosa Aktiebolaget (SCA) and Water Supply and Sanitation Collaborative Council (WSSCC), 2016).

[5]So, effectively, we have a total of 10 treatment arms – 5 among the subsidy-only group and 5 among the subsidy-plus-discussion group.

discussion session, to which half of the study participants are invited, a health professional provides information about women's health, including but not limited to menstrual hygiene and related social beliefs as well as discussion of the stigma surrounding menstruation. Using information on coupon redemption, we estimate the demand curves and the price elasticities of demand for sanitary pads across the subsidy-only and subsidy-plus-discussion intervention groups.

Two features of our group discussion intervention need to be emphasized. First, it is not intended as an advertisement campaign for the product. Indeed, given that sanitary pads are widely known (85% of women in our sample already know about sanitary pads), the advertisement component of this treatment, if any, is likely to be small. The primary objective of the discussion intervention is to help reduce participants' psychological costs of taking an action they consider to be stigmatized. Studies have argued that lack of discussion regarding menstruation creates a culture of shame (Johnston-Robledo and Chrisler, 2013; McHugh, 2020). Therefore, normalizing conversations around menstruation can be effective in lowering the internal guilt or perceived risk of social ostracization (Klintner, 2021; Molina et al., 2021). As such, we focus on group discussion intervention in contrast to the door-to-door campaign done by Ashraf et al. (2013) and Meredith et al. (2013). The intervention creates an opportunity for women to openly discuss menstrual health issues, including the norm of stereotyping and the labeling of menstruating women as "impure" with an associated stigma. Second, we do not expect the discussion treatment to immediately reduce deeply-rooted menstrual stigma in the society, which is very difficult to do (Link and Phelan, 2001; Gronholm et al., 2017). While the discussion intervention could have improved the adoption of menstrual health product through a reduction in societal stigma, this is not necessary. As long as it is able to reduce the psychological costs arising due to menstrual stigma, women in the subsidy-plus-discussion treatment arm can use (redeem) sanitary pads in greater numbers even when the society's menstrual stigma remains unchanged.[6]

One estimation challenge is that we only have 67% compliance in our discussion treatment. While the assignment of households to various treatment arms was done beforehand,[7] discount coupons were distributed to participants at the end of the discussion session. Therefore, non-

[6]Unfortunately, we were not able to collect information on the measures of psychological cost following the treatment interventions, so we are unable to assess its actual reduction.

[7]After enlisting all the households, we used a randomization program in Stata to assign households to each treatment arm. This includes the assignment of individuals to the subsidy-plus-discussion vs. subsidy-only groups as well as the allocation of discount coupons.

compliers did not receive their assigned discount coupons.[8] As we argue in detail in a later section, this does not impact the estimation of the price elasticities of demand separately for the subsidy-only and subsidy-plus-discussion groups (assuming a linear demand curve) because the allocation of the discount is still random within the two groups and compliance is unrelated to discount levels. The estimates of the difference between the elasticities of the two groups could be biased due to self-selection. To account for the issue of non-compliance in our main results, we predict the propensity to comply (using the subsidy-plus-discussion treatment sample) and correct for selection by including the probability of compliance as a control variable. In other methods, we adopt Heckman's two-step approach (Heckman, 1976) and conduct multiple imputations on missing redemption values among non-compliers using compliers with a similar compliance probability and discount level. The main results are robust to these alternative empirical strategies; detailed discussion is provided in Section 4 and Appendix A. Despite our attempt to rectify the potential bias due to non-compliance, we note this to be an important caveat to the results.

The findings suggest that the use of disposable sanitary pads increases as the after-discount price falls across both the subsidy-only and the subsidy-plus-discussion intervention groups. The effects within the subsidy-only group are larger when moving from the 10% to 25% and 50% to 75% discount levels, where the adoption rate increases by more than 25 percentage points. Women participating in discussion interventions have a higher adoption rate at the respective subsidy levels in comparison to the subsidy-only group and the adoption rate within this group is largest when moving from the 10% to 25% and 25% to 50% discount levels. However, even within the subsidy-plus-discussion intervention group, the adoption rate is only 70% at the highest discount level (90% discount). This finding is in sharp contrast to those products unaffected by societal stigma and not solely designed for females (e.g., bednets, water purification technology, rubber shoes to prevent hookworm infection), for which take-up is much higher at low market prices (Ashraf et al., 2010; Meredith et al., 2013; Dupas, 2014b).

If the impact of participating in discussion intervention resulted in the reduction of psychological costs associated with stigma, we should find a larger impact on women with higher (indirectly measured) psychological costs. We check this supposition by interacting the subsidy level and

[8]For the subsidy-only group, coupons were distributed door-to-door while the group discussion intervention was taking place.

discussion treatment indicator with proxies of baseline psychological costs. The results show that women in the subsidy-plus-discussion treatment group with high psychological costs were more affected by the combined intervention – the demand curve for the women high psychological costs is shifted more to the right. Overall, our results indicate that while budget constraints are an important determinant of demand for sanitary products, pairing subsidies with discussion about overcoming psychological costs imposed by social norms could be even more effective in boosting the adoption rate of these hygiene products.

One possible confounding factor affecting the interpretation of our result is the difference in how we distribute discount coupons to the two treatment groups. If distribution of coupons in the subsidy-plus-discussion treatment arm allows participants to compare the level of discounts each receives, it may cause resentment among those with less of a discount. Such comparison would suppress demand at higher price levels, making it harder to determine the impact of the discussion intervention at the lower discount levels. However, we find an adoption rate of 19% even at the lowest discount (10%) for participants in the subsidy-plus-discussion group, so this channel does not seem to be important. Another confounding factor is that the group setting may exaggerate the effectiveness of the discussion treatment due to the presence of peer effects. If the peer effects are comprised only of social spillover related to menstruation, we consider this to be a part of the mechanism through which discussion intervention should affect psychological costs. However, the group setting may have allowed peers to share information unrelated to menstrual health (e.g., the location of pharmacies where coupons can be redeemed). If this is the case, the effects of discussion intervention may be overstated. We argue that this is unlikely to be a major issue as necessary information regarding the logistics of redeeming the coupon was clearly provided to all participants by the research team. Priming may also explain some of the differences in redemption rates between the subsidy-plus-treatment and subsidy-only groups (Haaland et al., 2020). Actively inducing participants to discuss menstruation may influence them to redeem coupons by bringing the issue to the forefront of their cognition. While this is certainly possible, priming alone would not account for our findings that women in the subsidy-plus-discussion treatment group with high psychological costs are more responsive to price subsidies.

Our paper contributes to the literature studying the adoption of health products by highlighting the importance of pairing group discussion intervention with price subsidies to increase the demand

for those health products whose use is curtailed by stigma. Past studies have found that welfare-enhancing technologies have sub-optimal adoption in many settings, which may be attributed to an individual's valuation of health or the attributes of the technology itself (Kremer and Miguel, 2007; Foster and Rosenzweig, 2010). A few studies evaluate the combined effects of subsidies and information interventions, with mixed findings. Ashraf et al. (2013) find that providing information substantially increases the effect of price subsidies on demand for an unfamiliar water purification technology. In contrast, Meredith et al. (2013) find that information or an increase in knowledge did not affect the purchasing decision for shoes, which prevent soil-transmitted helminths in Kenya, Guatemala, India, and Uganda. However, these results do not speak to situations where societal stigma influences the adoption of health technology and thus imposes psychological costs. Given that social norms and perceptions are considered to be an important driver of economic behavior (Akerlof and Kranton, 2000; Bisin and Verdier, 2011; Moffitt, 1983; Polinsky and Shavell, 2000), they should be incorporated in our understanding of the demand for health products.

Our finding, that discussion intervention combined with subsidization of products can increase demand more effectively than only providing a subsidy, has implications for devising cost-effective strategies to increase the usage of health products in situations where societal stigma reduces demand. Some previous academic studies directly distribute menstrual hygiene products and assess the outcome (Oster and Thornton, 2012; Benshaul-Tolonen et al., 2021), but do not consider the role of psychological costs weighing down on the demand for such products. On the policy front, price reductions of menstrual products have been implemented. In India, a scheme called *Yojana Ranjit*, aimed at providing subsidized sanitary napkins to both girls in rural areas and those attending district council schools, was launched in March 2018 (Joshi, 2018). Likewise, the Indian Tax Council announced a complete reduction of the tax rate on sanitary napkins from 12% to 0% in order to increase usage (Singh, 2018). The Kenyan government repealed the sales tax on sanitary pads and tampons in 2004, which was followed by budgeting in 2011 that allocated $3 million each year towards sanitary pads for schoolgirls in relatively poor communities (Geertz et al., 2016). Recently, the Nepalese government allocated a budget to distribute free sanitary pads in government schools (Free sanitary pads for public schools, 2019). Our results indicate that it may be more cost-effective to provide relatively lower levels of a subsidy coupled with a program of group discussion, rather than providing high levels of subsidy without complementary discussion programs.

Finally, interventions usually provide menstrual products to school-age girls (Oster and Thornton, 2011) and such interventions may have a limited effect as girls do not have much control over household expenditure. Instead, by focusing on adult females who have comparatively more decision-making power (although perhaps not a total control over their finances), we find large effects with program interventions. Given the evidence of intergenerational transmission of knowledge, greater adoption of products by mothers is likely to have spillover effects on the sanitary pad usage of their daughters and may help remove a significant impediment to schooling caused by poor menstrual hygiene (Dolan et al., 2014; Montgomery et al., 2016; Benshaul-Tolonen et al., 2021).

The rest of the paper is organized as follows. Section 2 describes the experimental design. Section 3 describes the estimation strategy, demand for the group discussion program, and correction for non-compliance. Section 4 discusses the results. Section 5 concludes the paper. Section A in the Appendix provides additional robustness exercises and Section B presents a simple model that illustrates how the presence of psychological cost affects women's response to subsidization and the role of discussion intervention.

2 Experimental Design

Our study was conducted in five villages of Bidur municipality of Nuwakot district, located 61 kilometers northwest of Nepal's capital, Kathmandu.[9] We began by administering a baseline questionnaire to all eligible households. In addition to a household's demographic and socioeconomic characteristics, one female aged 15-50 from each household was asked questions about their menstrual health.[10] The questionnaire also included several questions related to the societal stigma or norms associated with menstruation. We collected a total of 707 observations in the sample, although a few have missing information on some key variables and were therefore not used.

[9]The study sites were selected considering two main aspects: 1) The need for the non-urban area to assure that regular usage of sanitary pads is not widespread, and 2) Areas with feasible access to transportation. Figures C1 in Appendix C show the geographic location of Nuwakot in relation to Kathmandu, the VDCs and Bidur municipality in Nuwakot, and Bidur's administrative sub-divisions. The location of study sites are shown by the square markers in Figure C1.

[10]Translated survey instruments, originally drafted in the Nepali language, are reproduced in Appendix D. Due to sensitivity of the issues, the survey was administered by twelve female research enumerators hired locally. Likewise, the enumerators were instructed to isolate the respondent. As a result, we got a high response rate for menstruation-related questions. Women who were pregnant at the time were excluded from the study.

2.1 Subsidy treatment

Our subsidy treatment closely resembles those implemented by Ashraf et al. (2010), Cohen and Dupas (2010), and Kremer and Miguel (2007). All households were randomly assigned a discount coupon for either 10, 25, 50, 75, or 90 percent for a specific brand of sanitary pad.[11] The price of sanitary pads is Rs. 70 ($0.62) for a pack containing six pads. Women normally use 3-4 packs per cycle, which means the total expenditure at the full price would be Rs. 210-280 ($1.85-$2.47). The majority of women in our sample belonged to a family with a monthly income of less than Rs. 25,000 (see the summary statistics of the baseline characteristics in Table 1), so the expenditure on sanitary pads would represent *over* 3% of the household's monthly income. The discount coupon could be used to purchase up to five packs of sanitary pads, enough for one cycle.

The coupon had to be redeemed within forty-five days at one of two local pharmacies. These pharmacies were conveniently located at the main marketplace, allowing easy access from all villages in the study. The average distance from the five experiment villages to the marketplace where the pharmacies were located is approximately two kilometers. The pharmacies also held an adequate stock of sanitary pads and had qualified staff to keep detailed logs of the number of pads that were sold. The pharmacies were reimbursed for the expected number of redemptions at the list price of the product in advance, with a stipulation that the sales would be recorded accurately and the final tally returned to the researchers. To ensure that these pharmacies reported accurately, they were required to collect the discount coupons and redeemers' signatures, in addition to maintaining a logbook. Research assistants corroborated the registration in the logbook by using discount coupons; in this way the discount coupons also acted as receipts for the transactions. This gives us confidence that the pharmacies did not have an incentive to misrepresent the sales.

An important point to highlight is that participants did not know about the subsidy treatment and their assigned level of subsidy in advance. For the subsidy-plus-discussion treatment group, coupons were distributed at the end of the discussion session according to the pre-assigned discount levels. Thus, incentive to attend the event did not vary by assigned discount rate. While the discussion intervention was taking place, individuals in the subsidy-only group within the community

[11] The discount levels were chosen to enable us to estimate the quantity demanded at roughly equal intervals between the full price and free distribution. Due to the study's intention of combining subsidies with discussion intervention in a market setting, we did not include free distribution. We therefore do not have "pure control" (those who did not receive any discount) since it was not feasible for the study team to keep track of purchases at the full market price.

received their assigned discount coupons.

2.2 Subsidy-plus-discussion treatment

We paired the subsidy treatment with a discussion treatment in order to address the psychological costs due to menstrual stigma. While subsidy-only treatment has proved successful in many cases, it may be less effective for stigmatized products like sanitary pads. Furthermore, in general, the size of subsidies necessary to induce meaningful adoption are found to be very large (Dupas, 2014a), which could be partly due to non-pecuniary factors inhibiting demand. If it is possible to identify and influence these factors, a smaller amount of subsidization might be sufficient to achieve the targeted adoption rate.

Using computer-based randomization, participants were allocated into either a subsidy-only or subsidy-plus-discussion group after stratifying on whether they had received menstruation-related awareness through NGOs in the post-earthquake era (pre-treatment).[12] We invited the households assigned to receive the discussion treatment to attend the session. The households were given a physical invitation card, which they had to bring to the program so that we could track attendance. The discussion intervention was organized at a local school closest to the study site and lasted for three hours.[13] The intervention was administered by four female health workers from Kathmandu and a nurse from the Nuwakot district hospital.

The design of the group discussion intervention was motivated by the notion that while information about sanitary pads is widespread, menstrual stigma might be affecting their widespread use. Borrowing from the public health literature, we focused on "normalizing" conversations regarding menstruation by fostering an environment to promote discussions.[14] Open discussion about

[12]The district was heavily affected by the 2015 earthquake, which was a major natural disaster. Relevant for our study, some areas had been exposed to campaigns related to WASH (water, sanitation, and hygiene) and, more importantly, menstrual hygiene education done by non-governmental organizations after the earthquake. This may affect our study and we therefore took this into consideration when designing our randomization by stratifying on whether an individual was exposed to a menstrual health and hygiene campaign, which is gleaned from the baseline survey. The survey revealed that about 33% of the households were exposed to hygiene-related awareness.

[13]The discussion treatment was not clustered by villages, which increases the possibility of spillover effects from the subsidy-plus-discussion group to the subsidy-only group. Although unable to identify the spillover effects in the context of this study setting, we note that the existence of spillover will bias the effects of discussion intervention downwards.

[14]We note that campaigns to promote conversation regarding issues and products associated with stigma has been conducted in the past. For example, Dupas (2011) analyzes the impact of providing information and discussion about the relative risk of HIV transmission to teenage girls in Kenya on their sexual behavior. Frank et al. (2012) focus on the Condom Normalization Campaign, aimed at promoting the use of the word "condom".

menstruation is considered inappropriate in many societal settings (Lee and Sasser-Coen, 1996; Houppert, 1999). A group intervention, as opposed to disseminating information individually, is more likely to achieve normalization. Interpersonal communications that take place between participants in a group setting are also likely to generate peer-support, which is important in stripping away any shame associated with a stigmatized action or product (Tomori et al., 2014; Parikh et al., 2018; Aghaei et al., 2020).

To stimulate discussion, the presenters highlighted how menstrual stigma lowered female well-being. This included (but was not limited to): *i*) The social tradition of monthly isolation during menstruation, usually in the shed (*Chaupadi*); *ii*) Stereotypical beliefs that menstruating females are "unclean" or "impure," which aids the persistence of conventional traditions such as restricting menstruating women from entering the kitchen or places of worship and from touching male members of the household (temporarily considered "untouchable"); and *iii*) The role of stigma in suppressing conversations around menstruation. It was also discussed that proper menstrual health management is a human right. To provide evidence of changes occuring at the legislative level, the participants were informed that the act of *Chaupadi* (the tradition of monthly isolation) was criminalized in 2017. Throughout the session, the participants interacted by sharing their personal experiences regarding barriers to proper menstrual health management and issues that arise during their menstrual cycle.[15]

The discussion session also provided information about general female health and hygiene, including but not limited to menstrual hygiene. This included discussions regarding women's health concerns related to pregnancy, uterine prolapse, and breast cancer. We focused on providing general information about female health rather than explaining the feature of the product itself as sanitary pads were already very well-known among our sample. Therefore, we do not believe that our discussion intervention provided any meaningful advertisement cues about the product itself.

We do not have any evidence on whether the stigma surrounding menstruation was actually diminished by our intervention, but given what we know about the evolution of social norms, this is highly unlikely. Gronholm et al. (2017) notes that societal stigma is a complex phenomenon and that short-term interventions tend to have only short-lived, if any, impact. Furthermore, given that

[15]Many participants brought to light concerns such as an irregular menstrual cycle, menstrual pain, and lack of support during the period of menstruation. They voiced that they were unable (or did not want) to ask for help because they felt inappropriate or akward discussing menstruation-related concerns.

men are usually responsible for policing adherence to social norms, our intervention, which targeted women, would have a limited impact on the overall stigma at best. However, the intervention likely reduced the psychological costs produced by the stigma; which may make women more likely to adopt sanitary pads.

2.3 Baseline characteristics and randomization check

The summary statistics for the variables from the baseline survey are presented in Table 1. Almost 80% of the women in our sample are Hindus. The average age in the sample is 30 years and the average education level is the 7^{th} grade. Seventy percent of the sample have a household income below Rs. 25,000. As with many communities in Nepal, traditional norms inform ideas around menstruation among many women in our study location. Menstruating women are colloquially referred to as becoming (temporarily) "untouchable," as reported by over one-third of the respondents. In most cases, menstruating women in the community are prohibited from touching other household members and entering the kitchen or religious spaces; about 60% of our respondents were not permitted to enter their kitchen during menstruation. Some communities believe that menstruating women can cause bad luck, resulting in family illness or harvest failure. As such, a form of *Chaupadi* practice includes forcing them to sleep outside of the house (in a shed, usually with livestock), which exposes them to dangers including death due to snake bites and asphyxiation.[16] In our sample, over 56% of the women reported being kept in the shed during their period. Knowledge of menstruation was also not universal; while 74% of respondents reported menstruation as a physiological process, only 53% of individuals correctly identified the uterus as its source. Regarding use of sanitary pads, while over 75% of women reported ever using a sanitary pad, only 41% reported using them on a regular basis and 56% used them during their last menstruation.[17] Clearly, there is still room for improvements in the usage of sanitary pads in the study locations.

There are in total 10 treatment arms in this study, with five different discount levels across the subsidy-only and subsidy-plus-discussion treatment groups. For all estimations, the omitted category in the regressions are comprised of those women who were assigned a 10% discount and

[16] This practice has recently received widespread attention in the international media (for example Lamsal, 2017; Preiss, 2017).

[17] In Table C1, we regress sanitary pad usage on various baseline characteristics and find that previous exposure to menstrual health campaign, education, and income are strong predictors of use.

were not invited to the discussion sessions.[18] We check for balance across these treatment arms by regressing various baseline covariates on all interactions between the discussion treatment and discount coupon level indicators.[19] The results are reported in Tables 2 (for main demographic characteristics) and 3 (for menstrual health-related variables). In general, we find that the covariates are balanced across all dimensions of randomization. Among estimates of 126 (14 variables $\times$ 9 coefficients) regressors, 6 estimates are statistically significant (three at 10% and three below 10% levels), which is likely by pure chance. Furthermore, we present at the bottom of each table the F-statistics pertaining to the null hypothesis under the restrictions that the coefficients on the interaction terms between discount coupon indicators and discussion intervention treatment group are jointly equal to zero. Based on the F-statistic for each respective variable, we are unable to reject the null hypothesis. This provides further evidence regarding the proper implementation of treatment assignments.[20]

2.4 Compliance

Participation in the discussion session was voluntary and therefore not universal; 67% of women who were assigned to the discussion treatment group attended the event. Table 5 reports the number of individuals in different randomization bins, with those in the subsidy-plus-discussion treatment group further divided into compliers and non-compliers. Non-compliance may pose selection problems and affect the interpretation of the treatment effect (Ye et al., 2014). For our study, an additional issue is that the non-compliers did not receive their assigned discount coupon at all since coupons were distributed at the end of the discussion session (to reiterate, for those in the subsidy-only group, coupons were distributed door-to-door while the discussion intervention program was ongoing).[21] Hence, we are unable to observe whether the non-compliers would have redeemed their coupons. It is problematic if unobserved factors contributing to non-compliance

[18] Since the lowest discount offered was 10%, there are no "pure controls" in the study – with zero discount and not exposed to discussion intervention.

[19] These specifications also control for whether an individual was exposed to menstrual health campaigns following the earthquake of 2015 but prior to the discussion intervention of this study, which is the only stratification variable.

[20] Across Tables 2 and 3, we are testing a total of 126 hypotheses, which raise issues related to multiple hypothesis testing. The p-values on individual coefficients need to be adjusted (usually up) to avoid false rejections by chance, which increases as more outcome measures are tested. To account for the False Discovery Rate, we present q-values based on Storey (2002) and Storey et al. (2004), which are obtained from pooling all specifications presented in Tables 2 and 3. The q-values (not shown but available upon request) does not change the inference.

[21] In hindsight, discount coupons could have been distributed to non-compliers as well by, for example, distributing them door-to-door.

also systematically affect coupon redemption. We discuss the potential problem of non-compliance and discuss our solutions in the next section, with additional robustness tests reported in Appendix A.

3 Estimation

With randomization, we can estimate the price effects and the impact of attending the discussion session on the adoption rate of sanitary pads by estimating the following equation:

$$Y_i = \alpha + \sum_{j=2}^{5} \gamma_j D_{ij} + \sum_{j=1}^{5} \beta_j \left[D_{ij} \times T_i \right] + \eta S_i + \delta X_i + \epsilon_i. \tag{1}$$

The dependent variable, Y_i, is an indicator that takes a value of 1 if an individual i redeems her coupon, and 0 otherwise. The explanatory variables include categories of discount D_{ij} (following the first summation in equation 1), which takes a value in {1, 2, 3, 4, 5} for the corresponding discount percents in {10, 25, 50, 75, 90}. Coefficients on γ_j show the effect of effective price on the probability of redeeming the coupon among women in the subsidy-only group, where the omitted category includes individuals receiving a 10 percent discount. For example, γ_2 evaluates the effect of receiving a 25% discount coupon on the redemption rate compared to individuals receiving a 10% discount. In the second summation in equation (1), the discussion intervention status T_i is interacts with discount indicators. β_j $(j = 1, 2, .., 5)$ evaluates the difference in the redemption rate for those women who participate in the group discussion intervention compared to the subsidy-only group within a specific discount rate. For example, β_1 estimates the probability of coupon redemption among women in the subsidy-plus-discussion group who received a 10% discount compared to individuals in the subsidy-only group with a 10% discount. The sum of γ_j and β_j gives the redemption rate for women in the subsidy-plus-discussion group with the subsidy level j. S_i indicates whether an individual is exposed to a campaign regarding menstrual health and hygiene following the 2015 earthquake (stratification variable).

X_i is a vector of controls. Our parsimonious model specification only includes an indicator of whether an individual has ever used a sanitary pad as well as caste dummies. In the additional estimation, we also control for individual and household covariates including father's education

level, mother's education level, age and age squared, indicators of income level, and relationship status with respect to the household head. We also include controls related to beliefs and practices about menstruation such as: *i*) Whether an individual is confined to a shed during the time of menstruation (tradition of *Chaupadi*); *ii*) If she is deemed as untouchable; *iii*) Perceived cause of menstruation (hormones); and *iv*) Source of menstruation (uterus).

The estimation uses a linear probability model. Given the setting of multiple hypotheses in the model specification, we report q-values that adjust for the False Discovery Rate (false positive) (Storey, 2002; Storey et al., 2004). Additionally, we report the F-statistic from the joint hypothesis testing of whether coefficients on the interaction terms ($\beta_j,\ j \in \{1, .., 5\}$) are jointly equal to zero.

3.1 Elasticity calculation

To calculate the elasticity of the demand curve, we assume linearity in each segment of the demand curve between two adjacent effective price-points created by the coupons. The four segments are defined by discount-percent pairs (10, 25), (25, 50), (50, 75), and (75, 90). Thus for each of the two demand curves pertaining to the subsidy-plus-discussion and subsidy-only groups, we get four elasticity estimates. For each segment, elasticity is defined as the ratio of proportionate change in the redemption rate and proportionate change in price. The proportions are calculated from the baseline of the lower price (and the respective quantity demanded) of the segment. For example, for a segment defined by the discount percent (10, 25),

$$\eta_1^T = \frac{(E[Y_i|D_i = 10, T_i] - E[Y_i|D_i = 25, T_i])/E[Y_i|D_i = 25, T_i]}{(P_i(10) - P_i(25))/P_i(25)}$$

where $P_i(D)$ denotes the price level associated with discount D. This information can be directly derived from the coefficients in equation 1. For example, consider the segment between (10, 25),

$$E[Y_i|D_i = 10, T_i] - E[Y_i|D_i = 25, T_i] = \begin{cases} \beta_1 - (\beta_2 + \gamma_2) & \text{if } T_i = 1 \\ -\gamma_2 & \text{if } T_i = 0. \end{cases} \tag{2}$$

$$\frac{P_i(10) - P_i(25)}{P_i(25)} = \frac{0.15}{0.75}$$

3.2 Demand for information: compliers vs. non-compliers

One concern about non-compliance among the subsidy-plus-discussion group is that there could be self-selection in attending the discussion session.[22] Table 6 compares the baseline characteristics between compliers and non-compliers. Although compliers and non-compliers are not statistically different across the majority of baseline variables, we find that compliers are more likely to have have used sanitary pads in the past. This is because compliers are more likely to fall in the higher income bracket (Rs. 25,000-39,000) compared to non-compliers.[23] The two groups may differ in other unobservables that determine redemption behavior. Given the possibility of systematic differences between compliers and non-compliers, we consider whether and how non-compliance affects our estimates.

To conceptualize the effect of non-random compliance in our elasticity estimates, consider a linear demand for sanitary pads (a simplified form of equation 1):

$$Y_i = \beta_0 + \beta_1 H_i + \beta_2 A_i + \beta_3 (H_i \times A_i) + e_i \tag{3}$$

where H_i denotes a high discount ($H_i \in \{0, 1\}$ for simplicity), $A_i \in \{0, 1\}$ denotes the discussion intervention status, and e_i are unobservables affecting demand. β_0 is represented as the population mean of Y_i for the subsidy-only group ($A_i = 0$) and low discount ($H_i = 0$). The randomization of discussion intervention and discount treatments allows us to assign treatment effects such that β_1 is defined as the average treatment effect on the treated group receiving a high discount on Y_i, β_2 is the effect of discussion intervention coupled with a low discount, and β_3 represents the interaction effect of discussion intervention and a high discount.

To calculate the elasticity of demand for the subsidy-plus-discussion group, denoted by ϕ_1, we

[22] The invitation letter distributed among women in the subsidy-plus-discussion group did not explicitly provide information regarding the specific type of discussion session that was to be conducted. While distributing the invitation letter it was verbally conveyed that the session was related to women's health and hygiene, and would be conducted by a local nurse and female health workers.

[23] The results showing the correlates of sanitary pads presented in Table C1 in the Appendix indicates that a higher income bracket is associated with an increment in the usage of sanitary pads in the baseline by about 12 percentage points.

can use the formula similar to Section 3.1:

$$\begin{aligned}\phi_1 &= \left(\frac{\mathbb{E}[Y_i|H_i=1,A_i=1]-\mathbb{E}[Y_i|H_i=0,A_i=1]}{\mathbb{E}[Y_i|H_i=0,A_i=1]}\right)/\Delta P \\ &= \frac{\beta_0+\beta_1+\beta_2+\beta_3+\mathbb{E}[e_i]-(\beta_0+\beta_2+\mathbb{E}[e_i])}{\beta_0+\beta_2+\mathbb{E}[e_i]}/\Delta P \\ &= \left(\frac{\beta_1+\beta_3}{\beta_0+\beta_2+\mathbb{E}[e_i]}\right)/\Delta P\end{aligned} \tag{4}$$

The second equality utilizes the fact that $\mathbb{E}[e_i|H_i=0,A_i=1]=\mathbb{E}[e_i|H_i=1,A_i=1]=0$ due to the random assignment to the subsidy treatment arms.[24]

A similar calculation to equation (4) shows that for the subsidy-only group elasticity ϕ_0 is given as below.

$$\phi_0 = \left(\frac{\beta_1}{\beta_0+\mathbb{E}[e_i]}\right)/\Delta P \tag{5}$$

From the equality established in equation (4), it is clear that the impact of discussion intervention on elasticity is due to changes in slope (β_3) and the location of the demand curve (β_2).

The effect of non-compliance is such that we are compelled to estimate ϕ_1 using a sample of individuals who chose to comply. Let $C_i=1$ for compliers and $C_i=0$ for non-compliers. In our selected sample due to partial non-compliance, our elasticity estimates for the treatment group, $\hat{\phi_1}$, is given by

$$\hat{\phi_1} = \left(\frac{\beta_1+\beta_3}{\beta_0+\beta_2+\mathbb{E}[e_i|C_i=1]}\right)/\Delta P \tag{6}$$

The key issue is that if $\mathbb{E}[e_i|C_i=1]\neq\mathbb{E}[e_i]$, it creates a bias in the elasticity estimates. This arises if compliance is systematically selected or related to potential outcome; i.e, $Pr(C_i=1|Y_i(1))\neq Pr(C_i=0|Y_i(1))$ and $Pr(C_i=1|Y_i(0))\neq Pr(C_i=0|Y_i(0))$, where $Y_i(1)$ and $Y_i(0)$ are the potential outcomes for compliers and non-compliers, respectively.

To correct for the effect of non-compliance in our sample, consider a latent model for compliance:

[24] This can be understood as follows: $\mathbb{E}[e_i|H_i=0,A_i=1]=E[Y_i-(\beta_0+\beta_2)|H_i=0,A_i=1]=0$, where $\beta_0+\beta_2$ is the effect of discussion intervention treatment ($A_i=1$) for the low discount group ($H_i=0$). Similarly, $\mathbb{E}[e_i|H_i=1,A_i=1]=E[Y_i-(\beta_0+\beta_1+\beta_2+\beta_3)|H_i=1,A_i=1]=0$. Without loss of generality, we can assume that $\mathbb{E}[e_i]=0$ in a regression with a constant term. This gives $\mathbb{E}[e_i|H_i=0,A_i=1]=\mathbb{E}[e_i|H_i=1,A_i=1]=E[e_i]=0$.

$$C_i^* = W_i\gamma + u_i \tag{7}$$
$$C_i = 1 \qquad if\ C_i^* > 0$$
$$C_i = 0 \qquad if\ C_i^* \leq 0$$

where C_i^* is the latent utility of compliance and W_i is a vector of individual characteristics, which may include variables that affect demand.

Then, the estimated elasticity using the selected sample of compliers given in equation (6) can be written as:

$$\hat{\phi_1} = \left(\frac{\beta_1 + \beta_3}{\beta_0 + \beta_2 + \mathbb{E}[e_i | u_i > -W_i\gamma]} \right) / \Delta P \tag{8}$$

Given that e_i and u_i are correlated, then $E[e_i|u_i > -W_i\gamma] \neq E[e_i]$. In other words, if unobserved factors affecting compliance also affect the demand for sanitary pads, then the elasticity estimates of the subsidy-plus-discussion group will be biased.

Note that we can estimate equation 7 using our subsidy-plus-discussion group to get consistent estimates of γ. Since households were randomly assigned to the treatment arms, we expect similar compliance behavior even in the subsidy-only group had they been invited to the discussion intervention. Thus the estimates $\hat{\gamma}$ derived from the subsidy-plus-discussion sample can be used to predict the compliance probabilities for the whole sample regardless of the treatment status. Using these predicted compliance probabilities, it is possible to correct for the potential bias created by non-compliance.

3.2.1 Computing compliance probability

To predict compliance probability, we closely follow procedure to estimate the propensity score as highlighted in Imbens and Rubin (2015).[25] We use a logit model with the final specification including covariates pertaining to the following factors: *i*) Variables affecting the cost of attending the group discussion campaign (log of distance to the closest college, and marital status); *ii*) Knowledge regarding women's health (education, whether she received any health-related awareness

[25] Appendix A provides a detailed discussion regarding how the variables to be included in the final specification were selected.

following the earthquake, whether she reported the uterus as the source of menstruation); *iii*) Socioeconomic status (caste, income); *iv*) Past usage of sanitary pads (ever used sanitary pads, repeatedly used); *v*) Stigma endured regarding menstruation (kept in a shed during menstruation, considered temporarily untouchable during menstruation); and *vi*) Benefits from attending the health campaign (the number of females in a household).

In Figure C2a in the Appendix, we plot the empirical cumulative distribution function (ECDF) of compliance probability for both the subsidy-plus-discussion and subsidy-only groups. The ECDFs for these two groups coincide, suggesting that individuals in the subsidy-only group would have responded similarly had they been invited to the discussion intervention program.

3.3 Estimation sample and robustness checks

For our main results, we estimate the specification given in equation 1 by excluding non-compliers from the sample, while accounting for the compliance probability as an additional control in an auxiliary model specification. In addition, we implement Heckman's two-step approach to account for selection (Heckman, 1976), where the first step predicts the compliance probability using a probit model and the second step controls for the inverse Mill's ratio. Additionally, we adapt a multiple imputation approach by imputing the values on coupon redemption among non-compliers by using a random sampling from compliers with similar compliance probabilities within each discount category. These auxiliary exercises are discussed in the following section and details are provided in Appendix A.

4 Results

In Figure 1, we plot the redemption rate against prices corresponding to each discount level (excluding non-compliers). Figure 1a shows the demand for sanitary pads for the pooled sample; the 95% confidence intervals are shown by the dotted lines. Figure 1b plots the demand curves for the subsidy-only and subsidy-plus-discussion treatment groups. The horizontal bars indicate the 95% confidence intervals of the difference in redemption rates between the treatment groups at each price level.

Figures 1a and 1b show that adoption of sanitary pads increases as the effective price falls,

but different patterns emerge across the two types of treatment groups. Overall, in Figure 1a, there is a sharp increase in redemption from 7% to 35% when the discount rate increases from 10% to 25%; however, the responsiveness to further reductions in price is more muted. Even at a 90% discount rate, redemption is only 26 percentage points higher than redemption at the 25% discount rate. The implication is that very high subsidies may not induce much of an additional adoption rate than moderate ones. In fact, as seen in Figure 1b, a moderate subsidy of 50% when combined with discussion led to a larger redemption than a 90% subsidy without discussion. There is a rightward shift in the demand curve due to participation in group discussion, although the difference is statistically significant only at 10% and 50% discount rates. We did not find evidence that the horizontal difference between the two demand curves vary by the price level. We note that since this graph is constructed from the sample that excludes non-compliers, the difference between the two demand curves may be overstated. As discussed below, we find do evidence on the relative effectiveness of combined intervention after accounting for other variables and correcting for non-compliance.

Table 7 presents the findings after estimating equation (1). The results in Column (1) are based on the parsimonious specification that includes specific discount rate indicators, their interactions with the discussion treatment status, the stratification variable, caste dummies, and an indicator representing whether an individual has ever used sanitary pads. The 10% discount coupon is the omitted category. Additional controls are introduced in subsequent columns but the coefficients do not change much across these specifications, which is expected in an RCT study.

We report both heteroskedasticity-robust standard errors in parentheses as well as the q-stats in square brackets. The q-values are obtained after correcting for the False Discovery Rate – in each specification, we are conducting nine hypotheses tests (four indicators for discount levels and five interaction terms) and some of them could turn out to be statistically significant just by chance. We also report the F-statistic on the joint test of significance of the five interaction terms to assess whether the effect of the discussion intervention is jointly different from zero.

The regression results confirm the downward sloping demand curve, demonstrating responsiveness to price subsidies. In the subsidy-only group, increasing the discount rate from 10% to 25% leads to 29 percentage points additional redemption. Likewise, moving from the 10% to 50% discount rate increases redemption by 32 percentage points, which is only 3 percentage points higher;

the additional 25 percentage point discount does not induce much of an additional adoption rate. It is only when moving to a 75% discount rate that redemption increased substantially to 47 percentage points. A further 15 percentage points discount (to 90%) increases the redemption rate only by an additional 4 percentage points. In summary, the magnitudes of subsidy treatment are larger when moving from 10% to 25% and 50% to 75% discount levels.

Looking at the coefficients on the interaction terms, we see that the effect of discussion intervention treatment induce more redemption across all discount levels. At the 10% discount level, there are 14 percentage points additional redemption than the subsidy-only group. At the 25% discount level, there are 9 percentage points additional redemption. The strongest effect is found at the 50% discount level, in which the discussion treatment induces an additional 22 percentage points redemption. Finally, at both the 75% and 90% discount levels, we observe an additional 15 percentage points redemption. Although the coefficients on these interaction terms have different magnitudes, we cannot statistically reject the null that they are equal to one another. Since each treatment bin contains limited observations, our study lacks the power to formally detect a heterogeneous effect of the discussion intervention at different price levels.[26]

Our main results are robust to inclusion of additional covariates. Column (2) in Table 7 includes household and personal characteristics such as the father's level of schooling, mother's level of schooling, income, relationship status (dummies), age and age squared, as well as baseline variables pertaining to the household's attitude and one's knowledge regarding menstruation. Additionally, Column (3) controls for access to basic amenities such as the household's distance to the nearest college and market distance (where pharmacies are located), respectively. Finally, Column (4) adds the area fixed effects. The estimates are similar across Columns (2)-(4) in Table 7.

Columns (5)-(7) in Table 7 accounts for non-compliance using various techniques. Column (5) controls for the compliance probability in the model specification.[27] Column (6) controls for the

[26]Nonetheless, it is theoretically possible to have a heterogeneous effect of the discussion intervention treatment such that the largest impact is at the mid-level discount. One possibility is if the underlying psychological cost follows a bimodal distribution. We illustrate this in Figure 2. The figure shows two cumulative distribution functions of the psychological cost characterized by a bimodal distribution. The discussion intervention treatment shifts the psychological cost distribution to the left. The vertical lines locate the cut-off points at which women redeem their coupons, with larger discounts needed to induce redemption from women with higher psychological costs. The vertical distance between the two curves at each cut-off point is the estimated discussion intervention treatment effect at that discount level. Due to a low mass between the cut-offs pertaining to 25% and 50% discount levels in the subsidy-only group, the impacts of a subsidy-only treatment are similar at these two levels. The discussion intervention treatment adds mass in this region of the distribution, leading to a larger treatment effect at the 50% discount level.

[27]The process of generating the compliance probability is discussed in Section 3.2 and more detailed discussion is

neighborhood-specific turnout (tol) for the discussion session to account for the rate of compliance across neighborhoods, and Column (7) controls for the inverse mills ratio (IMR).[28] The estimates presented in Columns (5)-(7) are not affected by additional controls capturing compliance. This adds to our confidence that the effects of group discussion intervention are not severely driven by self-selection in participating in the discussion intervention program.

The results that adoption rates are relatively low even for those individuals in the subsidy-plus-discussion treatment group and receiving the highest discount rate of 90% are in contrast to studies focusing on bednets (Dupas, 2014b; Cohen and Dupas, 2010; Tarozzi et al., 2014), water purification solutions (Ashraf et al., 2010), and rubber shoes to prevent hookworm infection (Meredith et al., 2013) – for which the adoption rate is much higher at lower prices. As mentioned in Kremer and Miguel (2007), who find fairly low levels of the adoption of deworming medicine, women may have low private valuation for sanitary pads. Unlike the health products in aforementioned studies, menstrual health products are exclusively for women, whose adoption is significantly affected not only by social stigma associated with menstruation and psychological cost involved during the purchase of menstrual health products, but also by their bargaining and decision-making power. These components can further explain relatively lower adoption rates even at the lowest price. In fact, Table 4 shows that among non-regular users of sanitary pads, 32% report discomfort while purchasing sanitary pads as a major hurdle, while 24% percent report financial constraint as a deterrent. Consistent with the findings from other studies (Cohen and Dupas, 2010; Ashraf et al., 2013; Dupas, 2014b,a; Berry et al., 2020), the results demonstrate that the quantity of the product demanded drops rapidly as price increases.

One possibility is that the observed difference between the two treatment groups may have resulted from the two different ways we distributed the discount coupons. To the extent that this resulted from knowledge spillovers or peer-support, as is commonly discussed in the literature on peer effects, we argue that this is part of our intended mechanism. Group discussion intervention was precisely chosen in favor of a door-to-door distribution program to normalize discussion and to promote interpersonal communication regarding menstruation in a setting where discussion of

presented in Appendix A.2.1.

[28] Column 7 corrects for selection using Heckman's two-step estimator (Heckman, 1976). The first step estimates the probit model for compliance using the subsidy-plus-discussion sample. The second step accounts for the inverse mills ratio (IMR).

menstrual topics is regarded as inappropriate due to societal stigma.

An unintended consequence of group distribution could be that it promotes a comparison of coupon levels across peers, which may influence behavior for non-price and non-menstrual health reasons (resentment, jealousy, etc.). While we expect that even the lowest level of discount should trigger a non-negative response to demand, those who were assigned to receive the lowest discount (thus facing the highest price) compared to their peers may refrain from redeeming (i.e., due to resentment) even when the marginal benefit of redemption is positive. Such behavior would suppress redemption at the lowest discount level. However, we find that the effect of discussion intervention treatment is in fact economically significant at the lowest discount level (10%). Thus, we do not expect this response to be prevalent in our sample. Moreover, we cannot rule out communication among members within the control group. In fact, our study setting involves tight-knit communities where information about the discount levels could be easily shared (although admittedly less immediately than among the treatment group). Additionally, communication between subsidy-only and subsidy-plus-discussion group is also possible. If anything, spillover of information from the subsidy-plus-discussion treatment group to subsidy-only group will likely bias the estimates of discussion intervention downwards.

The results presented so far only include compliers in the subsidy-plus-discussion treatment group. To evaluate whether the exclusion of non-compliers drives the main results, we first conduct estimations using the multiple imputation method based on the propensity of compliance.[29] As described in greater detail in Section A.2, this method indicates the division of the subsidy-plus-discussion sample into four blocks based on the quartiles of the compliance probability, such that the within-block compliance probability is similar between compliers and non-compliers. The underlying assumption governing this method is that non-compliers would have responded similarly to compliers facing the same level of discount within each block had they complied with the discussion intervention. We impute redemption status among non-compliers using random sampling (with replacement) of the compliers' redemption values at the respective discount levels within each block based on the propensity score (of compliance) and estimate the model specification as given by Table 7 (Column 6) using the partially-imputed sample. This process is reiterated 1,000 times

[29]The process of selecting the specification used to estimate the compliance probability is discussed in Appendix A.2.1.

to obtain the distribution of estimates at each discount level. The distribution of estimates using the multiple imputation method are presented in Figure A2 in the Appendix. The blue and green vertical lines represent the mean value of the estimates from the multiple imputation method and main estimates from Table 7 (Column 6) at the respective discount levels. The magnitude of the mean values and the main estimates are close to one another, with the main estimates well bounded within the 5^{th} and 95^{th} percentiles of the distribution of estimates obtained from partially imputed samples.

Next, we divide the sample into ten equal bins of the same width based on the compliance probability and plot the number of units across these bins, as shown in Figure A3. The difference in frequency between the subsidy-only and subsidy-plus-discussion groups is largest at the bin with a compliance probability of 0.6-0.7. Using random sampling (with replacement), we sample the subsidy-only units to match the bin-specific number of observations in the subsidy-plus-discussion group and re-estimate the model specification given by Table 7 (Column 7) in the trimmed sample. This process is replicated 1,000 times. The results from such an approach using the trimmed sample (of the subsidy-only group) are shown in Figure A4. The magnitude of mean estimates from this approach are similar to the estimates obtained from the multiple imputation method in Figure A2. These alternative exercises further add to the evidence that the main results are not severely driven by the selection of compliers in the subsidy-plus-discussion sample.

In the next exercise, we specifically focus on women in the lowest family income bracket (Rs. 0–24,999). This serves two specific purposes. First, it allows shifting the focus of interventions among women facing relatively tight budget constraint. Second, this exercise alleviates differences in baseline usage of sanitary pads between subsidy-only and subsidy-plus-discussion samples arising due to the difference in income across the compliers' vs. non-compliers' sample.[30]

The results for women in the lowest income bracket are presented in Table C6. The effects of subsidies on take-up for women in subsidy-alone group is similar to the findings reported in Table 7. However, the effects of discussion intervention are more pronounced at the lowest and highest

[30]As previously mentioned, compliers are more likely to be from a higher family income bracket compared to non-compliers. This explains the difference in the usage of sanitary pads in the baseline across compliers vs. non-compliers. When focusing on women in the lowest income bracket (0-Rs. 24,999), Table C4 shows that the mean of the listed variables are similar across the subsidy-only and subsidy-plus-discussion samples. Concerning the usage of sanitary pads in the baseline, 53% and 54% of women reported using sanitary pads during the last menstrual cycle across the subsidy-plus-discussion and subsidy-only group, respectively.

levels of subsidy (10% and 90% discount) across the reported specifications. Column (1) indicates that the group discussion intervention increased take-up rate by 25 and 21 percentage points among women with 10 % and 90 % discount coupon. For discount levels of 25% and 50%, the effects of discussion intervention are around 12 percentage points. The F-statistics presented at the bottom of the table suggests that the effects of the group discussion intervention is statistically different from zero at the conventional levels of significance.

4.1 Elasticity Estimates

The elasticity estimates for both treatment groups are calculated as described in section 3.1, based on the point estimates given in Table 7, Column (6). The estimates are presented in Table 8.[31] The demand is inelastic for both groups for prices below Rs. 52.5. This result is consistent with low elasticity of health technologies at relatively low prices (Berry et al., 2020). The table shows that the elasticity estimates are similar across subsidy-only and subsidy-plus-discussion groups for the lowest segment of the demand curve (e.g., between discount rates 75% and 90%). It is interesting to note that at the demand is highly elastic at the highest price segment; the elasticity estimates for subsidy-only and subsidy-plus-discussion groups are -4.56 and -2.57, respectively.

4.2 Heterogenous effects by psychological cost

As a way to demonstrate the role of the psychological costs due to menstrual stigma on redemption behavior, we examine the heterogeneous effects of interventions by levels of psychological costs. Due to a lack of a direct measure, we infer psychological costs by selected baseline characteristics and construct a dummy indicating a high psychological cost measure. We consider four plausible proxies of high psychological costs: housed in a shed during menstruation, viewed as untouchable, lacking recent experience with the product, and having a high index value for stigmatization. In the third case, those who did not self-purchase sanitary pads (by themselves) in the past cycle are classified into the high cost group, while in the fourth case we use an index of available measures of stigma to define high versus low stigma groups.

[31] Note that the elasticity estimates at different price points compared to the next lowest price and the corresponding redemption rate are shown in Table 8. For example, when calculating the elasticity at a segment of Rs. 63 (10% discount) and Rs. 52.5 (25% discount), price and quantity demanded at Rs. 52.5 (25% discount) is taken as the relative point.

Consider the impact of participating in the discussion session among women in high versus low psychological cost groups.[32] The agent decides whether to purchase sanitary pads by comparing the marginal benefit of sanitary pads to two distinct types of marginal costs: the utility loss from reduction in other consumption and the psychological costs associated with purchasing sanitary pads. The subsidy-only treatment works by lowering the utility loss from reducing other consumption, whereas the discussion intervention treatment additionally lowers the psychological costs.

These two marginal costs work differently for the low and high psychological cost groups. While both types of costs are important for the high psychological cost subgroup, the utility cost is much more relevant than psychological cost for those with low psychological cost. Thus, we expect to find larger impacts of discussion intervention treatment among women bearing high psychological costs. Likewise, the demand curve for the high psychological cost subgroup should be to the left of the low cost subgroup in the absence of discussion treatment intervention. Following the discussion treatment, we would expect to see a rightward shift in the demand with effects concentrated among those with higher psychological cost.

We test these predictions by estimating an econometric model that includes interaction the between discount levels, the discussion intervention treatment indicator (T_i), and high stigma (high psychological cost) indicator (S_i). The discount levels are collapsed into high ($High = \{75,\ 90\}$ %), mid ($Mid = 50\%$), and low categories ($Low = \{10,\ 25\}$ %) to ensure that we have enough observations in each cell. Altogether, we have 12 (3 discount levels $\times$ 2 treatment groups $\times$ 2 psychological cost groups) cells. We run the following regression:

$$\begin{aligned} Y_i = \alpha + \delta_1 Mid_i + \delta_2 High_i + \\ \kappa_1(Low_i \times T_i) + \kappa_2(Mid_i \times T_i) + \kappa_3(High_i \times T_i) + \\ \beta_1(Low_i \times S_i) + \beta_2(Mid_i \times S_i) + \beta_3(High_i \times S_i) + \\ \gamma_1(Low_i \times S_i \times T_i) + \gamma_2(Mid_i \times S_i \times T_i) + \gamma_3(High_i \times S_i \times T_i) + \\ \mu X_i + \epsilon_i \end{aligned} \tag{9}$$

The omitted category is composed of women with a low psychological cost in the subsidy-only

[32] A stylized model clarifying how psychological costs can affect demand is presented in Appendix B.

group who receive a low discount coupon. The estimate of δ_1 (δ_2) shows the effect of receiving a mid-level (high-level) discount coupon for this group of women (compared to the omitted category). Similarly, the κs depict the additional effect of discussion intervention on the low psychological cost women at each discount level. Next, the βs estimate the difference in the redemption behavior between women with low and high psychological costs in the subsidy-only group at each discount level. Finally, $(\kappa + \gamma)$s estimate the redemption behavior of high psychological cost women in the subsidy-plus-discussion group compared to high psychological cost women in the subsidy-only group at the corresponding discount levels. The estimates of γs show whether the subsidy-plus-discussion treatment effects for high psychological cost women are different from those for low psychological cost women. The predicted redemption for each subgroup can be obtained from the designated coefficients.[33]

It should be noted that the proxies we use for unobserved psychological costs are correlated with demographic characteristics that may also impact redemption behavior. Table C7 in the Appendix shows the correlates of high psychological cost. We find that each proxy of high psychological cost varies in their association with baseline characteristics. Being housed in a shed (Column 1) is strongly related to caste, family income, and age, but not education. Individuals in *Newar* and *Janjati* households, girls or women in high income households, and relatively younger individuals are less likely to be housed in a shed during menstruation. Being considered untouchable (Column 2) is mostly a caste-specific practice and not highly correlated with education, income, or age. Finally, not purchasing sanitary pads in the previous cycle is determined by schooling and family income, but not by caste membership.

The results from estimating equation 9 are presented in Table 9. The dependent variable in each column is the redemption indicator. The column headings indicate the proxy used to categorize women into the high psychological cost group. The odd columns present results with basic controls and the even columns control for demographic variables. The redemption rate for women in the low psychological cost group with a low discount coupon is around 20 percent across all columns. The point estimates of the coefficients vary somewhat between different proxies for psychological cost, but are broadly consistent. The redemption rates for high psychological cost women within

[33]For instance, for the subgroup with high discount, high psychological cost, and in subsidy-plus-discussion group: $E[Y_i|High_i = 1,\ S_i = 1,\ T_i = 1] = \alpha + \delta_2 + \kappa_3 + \beta_3 + \gamma_3 + \mu X_i$.

the subsidy-plus-discussion treatment group compared to high psychological cost women with the subsidy-only treatment group are positive across all subsidy levels and are represented by the sum of the coefficient on the double interaction term (*discount level* × *discussion*) and the coefficient on the triple interaction term at the respective subsidy level. The joint test rejects the null in most cases – the coefficients pertaining to the high psychological cost group with discussion intervention are similar to those of the high psychological cost group receiving only the subsidy treatment at the conventional levels of significance, as shown in Table C8.

For ease of exposition, we use the estimates in Table 9 and construct predicted redemption values to plot the demand curves for four groups of women formed by combining the levels of psychological cost and discussion intervention treatment status. Results are shown in Figure 3. Panel A plots the demand curve when being housed in a shed is used as the proxy for high psychological cost (corresponding to estimates in Column 2 of Table 9). Panel B shows the demand curves when using the past purchase history as the proxy (corresponding to estimates in Column 6). Also, panel C shows the results when an index measure constructed from available stigma-related variables is used to categorize the high stigma group (corresponding to estimates in Column 8). The results vary slightly across the three proxies, most likely due to differences in the accuracy of classification.

We find different demand curves for women with low and high psychological costs in the subsidy-only group, indicating that the level of psychological cost is an important influence in their responsiveness to price changes. Panel B shows that women in the subsidy-only group who do not have a recent history of purchasing sanitary pads (high psychological cost group) are least responsive to additional discounts. Their expected redemption increases from 0.2 to 0.43 when moving from the lowest to the highest discount levels. On the other hand, for the same price change, women in the subsidy-only treatment group who have a purchase history (low psychological cost group) increase their redemption from 0.2 to 0.6. These findings are consistent with the hypothesis that women in the low psychological cost subgroup are more responsive to discount subsidies.

Women in both the low and high psychological cost groups respond to the group discussion intervention treatment by shifting their demand to the right, with a larger shift for high psychological cost women. Also, for both low and high psychological cost groups participating in the discussion treatment, the redemption rate at the mid-level discount exceeds what is observed with high-level discount in the subsidy-only case. Participating in the discussion intervention but receiving the

lowest discount is also not as effective. The expected redemption value for low psychological cost women receiving a low discount subsidy and joining the discussion intervention session is 28 percent as shown in Panel B. The responsiveness to the discussion treatment among women with high psychological costs at the low discount level is higher, which increases when combined with higher subsidy levels. For instance, the expected redemption rate for high psychological cost women with the discussion treatment is 59 and 70 percent at the mid and high discount levels, respectively. The results using an index measure to represent the high psychological cost category, presented in Figure 3c, are broadly consistent with the findings presented in earlier subfigures.

What might explain the greater responsiveness from high psychological cost women to the discussion treatment such that the demand is to the right when compared to the low psychological cost subgroup with the same treatment? One possible explanation is that some learning occurs for women with high psychological costs. In other words, they are relatively new to using the product, so the discount coupled with discussion intervention treatment may increase their willingness to experiment with the product. To test this possibility, we re-estimate the demand curves as shown in Subfigure 3b by restricting the sample to those who reported having previously known about sanitary pads in the baseline. The results from this auxiliary exercise show similar patterns as in Figure 3b, providing suggestive evidence that an increase in responsiveness among the high psychological cost subgroup undergoing the discussion treatment is not being driven due to the novelty of the product.[34]

The important finding from out heterogeneous analysis is that the subsidy-plus-discussion treatment intervention is consistently more effective for the sub-sample of individuals who are likely to have higher psychological cost. This finding provides suggestive evidence that discussion intervention treatment used in the study increases redemption through a reduction in the psychological cost associated with menstruation. However, we caution that the analysis uses imperfect proxies to identify women with high versus low psychological cost. Future studies can benefit from directly eliciting the underlying psychological costs.

[34] About 85% of respondents reported that they know about sanitary pads in the baseline. The results are shown in Appendix Figure C3.

5 Conclusion

In this study, we use a randomized controlled experiment to evaluate the relative effectiveness of the subsidy-only intervention against an intervention that combines subsidization with group discussion in inducing adoption of sanitary pads, a product whose demand is likely curtailed due to stigma surrounding menstruation. The study is based in rural Nepalese villages, where regular use of sanitary pads is limited. We find that the demand for sanitary pads is downward sloping for both the subsidy-only and subsidy-plus-discussion groups. Moreover, women invited to participate in the group discussion intervention have a higher overall demand for the product. These effects are also observed among women belonging to the lowest family income bracket (Rs. 0-24,999 per month), who arguably face tighter budget constraints. We also find that the impact of discussion treatment is concentrated among women who are likely exposed to higher levels of stigma in the baseline and thus have higher psychological costs.

Our results complement the findings of Ashraf et al. (2010), who find that information coupled with subsidies can increase the demand for an unfamiliar health product (a water purification product in their case). By extending the existing literature, we focus on the adoption rate of menstrual health products, which are already well-known among the participants in the study setting. Thus, the results of this study informs the design of policies aimed at increasing the adoption of health products whose demand may be partly affected by stigma associated with the relevant health issue by emphasizing that group discussion should be provided concurrently with subsidies. The group discussion helps women overcome any barriers imposed by social stigma and make them more responsive to price subsidies. From a cost-benefit perspective, the findings of this study highlight that lower levels of subsidization combined with discussion intervention can help reduce the cost of providing health subsidies, assuming that the additional cost of delivering the program is lower than the realized savings.

We recognize several gaps in our study that could be filled in future studies. First, only women were invited to attend the discussion campaign. As the societal stigma clearly governs the treatment of girls and women during menstruation, it is necessary that the discussion or information programs target men as well. Second, this study focuses on the short-term effects of the program; however, discussion intervention may have long-term impacts through learning (Dupas, 2014b, 2011). Finally,

this study did not attempt to measure reduction in the societal stigma itself. Question as to whether group discussion intervention programs can influence societal stigma about health warrants a rigorous investigation. These are some extensions that we look forward to incorporate in future studies.

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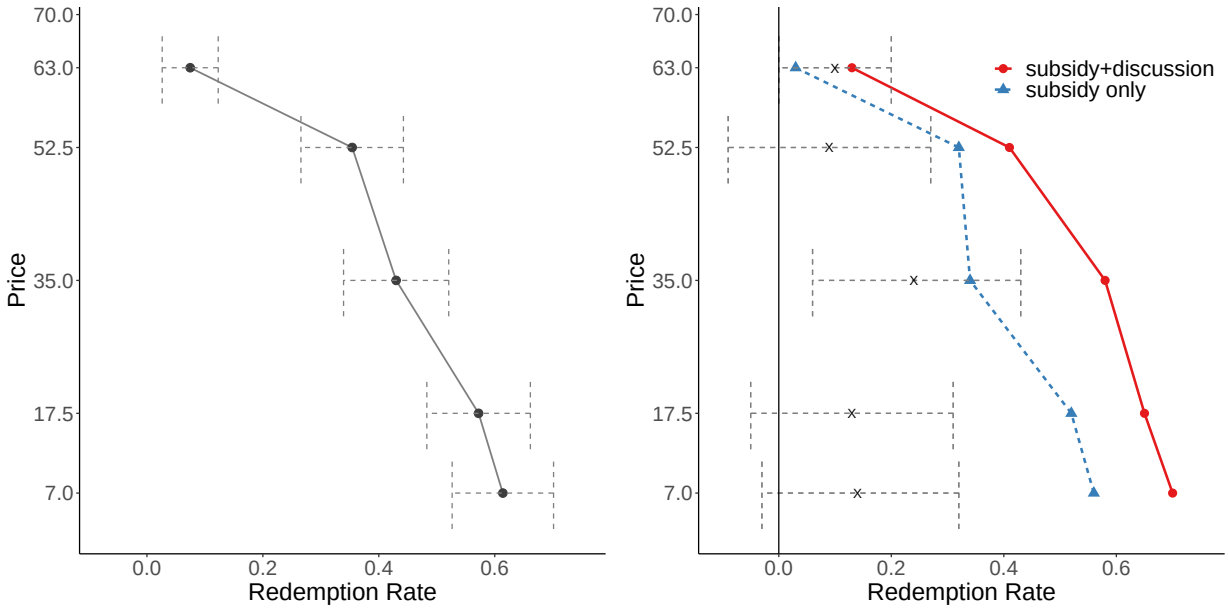
Figures



(A) Pooled (B) By treatment groups

FIGURE 1: Demand Curve for Sanitary Pads

Source: Authors' calculations.

Note: Figures 1a and 1b plot redemption rates by discount levels after excluding non-compliers. The sample is pooled in sub-figure 1a. The solid line and dotted bars represent the means and 95% confidence intervals, respectively. In sub-figure 1b, we show separate redemption rates among the subsidy-plus-discussion and subsidy-only groups. The markers × in Figure 1b show the magnitude of difference in redemption rates between the subsidy-plus-discussion versus subsidy-only groups, with the horizontal dotted bars representing the 95% confidence interval for the difference.

(Return to Section 4)

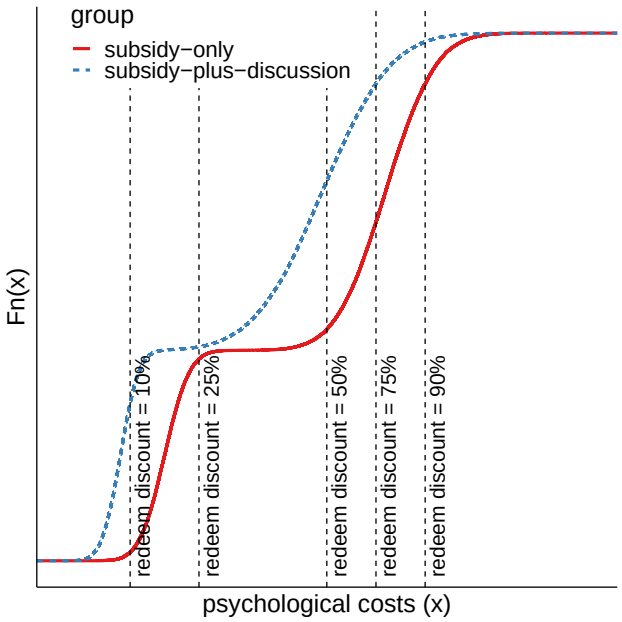
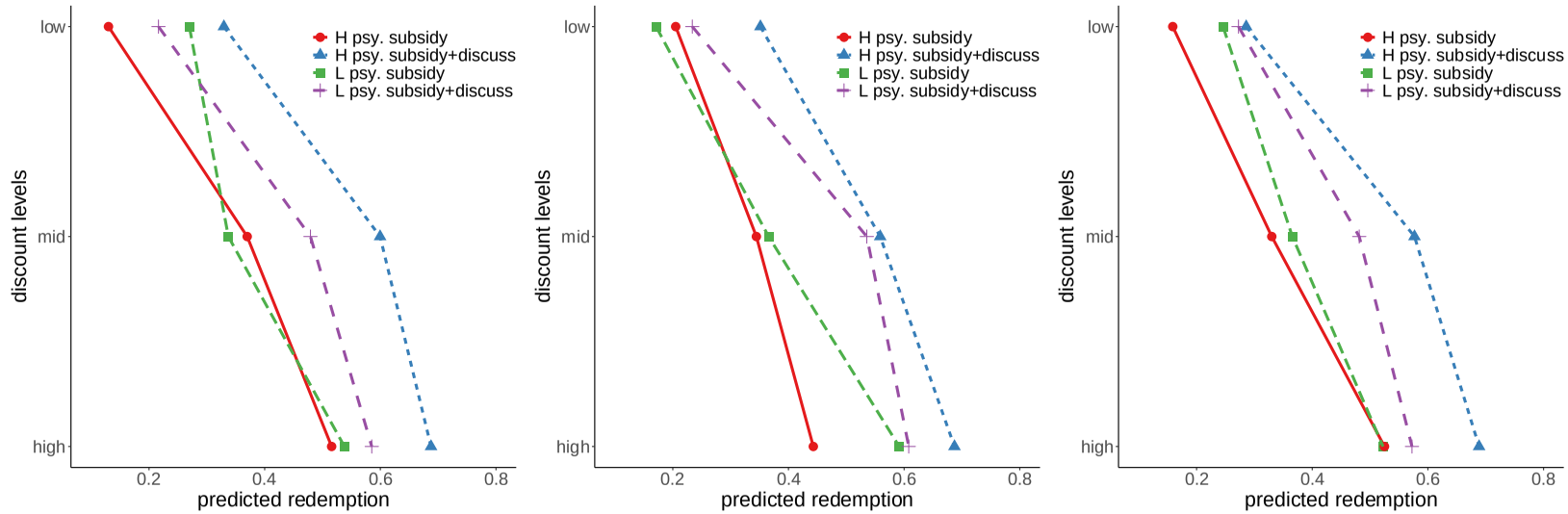


FIGURE 2: Illustration of Redemption Probability with Hypothetical Bimodal Distribution of Psychological Cost

Source: Authors' simulation.

Note: The figure shows the possible effect of price and group discussion intervention treatment when the underlying distribution of psychological cost is bimodal. The red (solid) line is the cumulative distribution function (CDF) of the subsidy-only group and the blue (dashed) line is the CDF of the subsidy-plus-discussion group. Vertical lines indicate the cut-off values for redemption at each discount level. For instance, individuals with a psychological cost less than (or equal) to the redemption value designated by the 90% discount coupon will redeem at this discount level; however, the proportions vary across the subsidy-plus-discussion and subsidy-only groups due to the difference in the distribution of psychological cost following the discussion intervention.

(Return to Section 4)



(A) High psy. cost: kept in shed (B) High psy. cost: no previous purchase (C) High psy. cost: index

FIGURE 3: Predicted redemption levels by baseline stigma

Source: Authors' calculations.

Note: The figures show the predicted redemption across subgroups when stigma is defined as: *i*) Being kept in a shed in subfigure 3a; *ii*) Did not self-purchase sanitary pads during the last menstrual cycle in subfigure 3b; *iii*) Using an index from available stigma measures in subfigure 3c. All use the baseline information. In subfigure 3c, high stigma is categorized from the index constructed using the sum of the following indicator variables: *i*)Kept in a shed; *ii*) Not permitted in kitchen; *iii*) Not permitted in holy places; *iv*) Considered untouchable during menstruation; and *v*) Did not purchase a pad during the last cycle. The high stigma category represents an index value greater than 2, which yields 348 and 228 individuals in the high and low stigma categories in panel 3c, respectively. "H psy." and "L psy." on the figure legend refers to high and low psychological cost groups, respectively. The coefficients from Table 9, Columns (2), (6), and (8) are used for prediction for subfigures 3a, 3b, and 3c, respectively. The average values of predicted probability for each subgroup is taken to depict the proportion of predicted redemption. The discount levels of 90% and 75% represent a high discount; 50% is a mid-level discount; 10% and 25% pertain to the low discount category.

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Tables

TABLE 1: Summary Statistics of Baseline Variables

	Variable	mean	sd	N
1	Hindu	0.789	0.408	697
2	Chhetri	0.242	0.429	697
3	Brahmin	0.22	0.414	697
4	Age	29.936	9.032	697
5	Married	0.812	0.391	696
6	Number of girls in household	2.036	1.144	697
7	Number of boys in household	1.991	1.177	664
8	Highest Education	6.957	5.207	692
9	Father's Education	2.748	4.791	694
10	Mother's Education	1.414	4.199	694
11	Family income (0-Rs. 24,999)	0.693	0.462	697
12	Family income (Rs. 25,000–40,000)	0.231	0.422	697
13	Family income (Rs. $>$ 40,000)	0.076	0.265	697
14	Has toilet	0.891	0.311	580
15	Own land	0.925	0.526	695
16	Stigma: Not permitted kitchen	0.607	0.489	697
17	Stigma: Not permitted holy Place	0.945	0.228	695
18	Stigma: kept in Shed	0.569	0.496	694
19	Stigma: Untouchable	0.361	0.489	696
20	Knowledge: Source uterus	0.535	0.499	697
21	Knowledge: Source vagina	0.134	0.341	695
22	Knowledge: Source bladder	0.023	0.15	695
23	Knowledge: Source abdomen	0.053	0.225	695
24	Knowledge: Source unaware	0.253	0.435	695
25	Knowledge: Cause pathological	0.052	0.222	696
26	Knowledge: Cause curse	0.016	0.125	696
27	Knowledge: Cause physiological	0.749	0.434	696
28	Knowledge: Cause do not know	0.184	0.388	696
29	Usage: Ever use sanitary pad	0.763	0.426	696
30	Usage: Frequently use pad	0.405	0.491	697
31	Usage: Use last	0.564	0.496	697

Source: Authors' calculation from survey.
(Return to Section 2.3)

TABLE 2: Balance Exercise Across Treatment Arms - demographic characteristics

	Dependent variable:							
	brahmin	chhetri	age	educ.	father educ.	family income	hindu	married
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
25 percent discount	0.037	−0.064	0.057	0.011	0.380	0.012	−0.068	−0.012
	(0.071)	(0.073)	(1.546)	(0.894)	(0.816)	(0.079)	(0.070)	(0.067)
50 percent discount	0.013	−0.056	0.781	−0.762	0.152	0.005	0.010	−0.055
	(0.070)	(0.073)	(1.533)	(0.890)	(0.812)	(0.078)	(0.070)	(0.067)
75 percent discount	0.049	0.020	1.239	0.958	−0.522	0.032	0.040	0.025
	(0.072)	(0.074)	(1.564)	(0.908)	(0.825)	(0.080)	(0.071)	(0.068)
90 percent discount	−0.074	0.077	2.484	−0.188	−1.040	−0.003	−0.018	−0.006
	(0.072)	(0.074)	(1.559)	(0.902)	(0.823)	(0.079)	(0.071)	(0.068)
10 percent discount×discussion	−0.014	−0.056	0.741	−0.227	0.240	−0.104	−0.004	−0.067
	(0.072)	(0.074)	(1.560)	(0.906)	(0.823)	(0.079)	(0.071)	(0.068)
25 percent discount×discussion	−0.037	0.008	1.798	−0.884	−0.067	−0.040	0.048	0.019
	(0.071)	(0.074)	(1.548)	(0.899)	(0.814)	(0.079)	(0.070)	(0.067)
50 percent discount×discussion	−0.036	0.080	1.691	0.537	−1.270	−0.027	0.060	0.033
	(0.071)	(0.073)	(1.544)	(0.900)	(0.818)	(0.079)	(0.070)	(0.067)
75 percent discount×discussion	−0.064	−0.021	−0.319	−0.784	0.856	−0.069	−0.030	−0.118*
	(0.071)	(0.073)	(1.537)	(0.893)	(0.808)	(0.078)	(0.070)	(0.067)
90 percent discount×discussion	0.037	−0.077	−1.386	0.152	1.124	−0.150*	−0.041	−0.033
	(0.070)	(0.072)	(1.516)	(0.877)	(0.797)	(0.077)	(0.069)	(0.066)
F-statistics	0.334	0.574	0.708	0.443	1.226	1.283	0.362	0.925
Pr($> F$)	0.892	0.72	0.618	0.818	0.295	0.269	0.874	0.464
Observations	687	687	687	682	684	687	687	686

Source: Authors' calculation.
Note: The table shows the balance across different treatment arms on demographic characteristics. The characteristic indicated in the column headings is regressed on treatment dummies. The columns include the following variables: (1) Brahmin household; (2) Chettri household; (3) Age; (4) Years of schooling; (5) Years of father's schooling; (6) Family income between Rs. 0-25,000 per month; (7) Hindu religion; and (8) Whether an individual is married. The F-statistics are from the joint hypothesis testing under the null that the coefficients on the subsidy-plus-discussion group are jointly equal to zero. The p-values corresponding to the respective F-statistic are reported. Standard errors are presented in parentheses. All regressions account for the stratification variable. Table C2 in the Appendix performs a similar balance exercise to the table above; however after excluding non-compliers in the subsidy-plus-discussion group. *(Return to Section 2.3)*

TABLE 3: Balance Exercise Across Treatment Arms - Menstruation Related Variables

	Dependent variable:					
	kept in shed	not allowed in kitchen	untouchable	source uterus	use last pad	frequent use
	(1)	(2)	(3)	(4)	(5)	(6)
25 percent discount	−0.046	−0.060	−0.043	0.043	0.094	−0.007
	(0.085)	(0.084)	(0.084)	(0.086)	(0.084)	(0.084)
50 percent discount	−0.041	−0.025	−0.022	0.046	0.237***	0.112
	(0.084)	(0.083)	(0.083)	(0.085)	(0.083)	(0.083)
75 percent discount	0.115	−0.018	−0.045	0.068	0.092	0.012
	(0.086)	(0.085)	(0.085)	(0.087)	(0.085)	(0.085)
90 percent discount	−0.029	−0.025	−0.009	0.044	0.063	0.041
	(0.086)	(0.085)	(0.085)	(0.086)	(0.085)	(0.085)
10 percent discount×discussion	−0.059	−0.128	0.033	0.059	0.023	−0.045
	(0.086)	(0.085)	(0.085)	(0.086)	(0.085)	(0.085)
25 percent discount×discussion	0.047	0.037	−0.0002	−0.163*	0.066	0.023
	(0.085)	(0.084)	(0.084)	(0.086)	(0.084)	(0.084)
50 percent discount×discussion	−0.002	0.030	0.078	−0.138	−0.219***	−0.083
	(0.085)	(0.084)	(0.084)	(0.085)	(0.084)	(0.084)
75 percent discount×discussion	−0.170**	0.021	0.036	−0.008	−0.022	−0.011
	(0.085)	(0.084)	(0.084)	(0.085)	(0.083)	(0.084)
90 percent discount×discussion	−0.074	−0.015	0.040	−0.033	0.026	0.042
	(0.084)	(0.082)	(0.083)	(0.084)	(0.082)	(0.082)
F-statistics	1.176	0.534	0.291	1.378	1.602	0.316
Pr($> F$)	0.319	0.75	0.918	0.231	0.157	0.903
Observations	685	687	686	687	687	687

Note: *p<0.1; **p<0.05; ***p<0.01

Source: Authors' calculation.
Note: The table shows the balance across stigma and knowledge-related variables including whether the respondent: 1) Was kept in shed during menstruation; 2) Not allowed in the kitchen; 3) Regarded as untouchable; 4) Reported menstruation source is the uterus; 5) Used sanitary pads during the last menstrual cycle; and 6) Uses sanitary pad frequently. The F-statistics are from the joint hypothesis testing under the null that the coefficients on the subsidy-plus-discussion group are jointly equal to zero with the corresponding p-values. Standard errors are presented in parentheses. All regressions account for the stratification variable. Table C3 in the Appendix replicates a similar balance exercise to the table above, but excludes non-compliers in the subsidy-plus-discussion group. *(Return to Section 2.3)*

TABLE 4: Reason for Non-Frequent Use

Reason	**Proportion**
Don't know	0.008
Uncomfortable while purchasing	0.326
Parents disapprove use	0.005
Cannot afford	0.234
Lack of access	0.199
Prefer cloth	0.225

Source: Authors' calculations.
Note: The table describes reasons for non-regular usage of sanitary pads among non-frequent users. About 60% of respondents reported not using sanitary pads frequently.

TABLE 5: Number of Observations by Randomization and Compliance Status

Discount %	Subsidy-only	Subsidy-plus-discussion	Discussion - by compliance	
			Compliers	Non-compliers
10	68	68	43	25
25	70	68	45	23
50	72	67	44	23
75	68	72	51	21
90	68	76	51	25

Source: Authors' calculation.
Note: The table shows the number of individuals by treatment combination. Compliers include individuals in the subdisy-plus-discussion treatment group who attended the discussion intervention session and non-compliers represent individuals who were invited but did not attend the session. Approximately 67% of individuals assigned to receive discussion intervention attended the discussion campaign. Compliance is not dependent on the discount levels.
(Return to Section 2.4)

TABLE 6: Comparison Across Compliers versus Non-Compliers (subsidy-plus-treatment sample)

	Variable	mean (Comply)	sd. (Comply)	mean (Non-Complier)	sd. (Non-Complier)	p. val
1	Hindu	0.816	0.388	0.752	0.434	0.186
2	Chhetri	0.244	0.43	0.231	0.423	0.947
3	Brahmin	0.201	0.401	0.222	0.418	0.586
4	Age	29.872	9.393	30.957	8.823	0.286
5	Married	0.803	0.398	0.786	0.412	0.629
6	Number of girls in household	2.132	1.148	1.991	1.163	0.279
7	Number of boys in household	2	1.157	1.839	1.242	0.286
8	Highest Education	7.065	5.104	6.47	5.559	0.35
9	Father's Education	3.017	5.033	2.462	4.576	0.364
10	Mother's Education	1.489	4.301	0.769	3.035	0.122
11	Family Income (0-Rs. 24,999)	0.615	0.488	0.726	0.448	0.027
12	Rs. 25,000-40,000	0.321	0.468	0.197	0.399	0.008
13	Has toilet	0.888	0.316	0.881	0.325	0.937
14	Own land	0.914	0.281	0.922	0.42	0.991
15	Stigma: Not permitted kitchen	0.598	0.491	0.615	0.489	0.686
16	Stigma: Not permitted holy place	0.948	0.221	0.949	0.222	0.94
17	Stigma: kept in shed	0.545	0.499	0.538	0.501	0.892
18	Stigma: Untouchable	0.356	0.48	0.427	0.546	0.245
19	Knowledge: Source uterus	0.538	0.5	0.453	0.5	0.137
20	Knowledge: Source vagina	0.124	0.331	0.181	0.387	0.146
21	Knowledge: Source bladder	0.026	0.159	0.017	0.131	0.661
22	Knowledge: Source abdomen	0.06	0.238	0.06	0.239	0.775
23	Knowledge: Source unaware	0.249	0.433	0.284	0.453	0.609
24	Knowledge: Cause pathological	0.056	0.23	0.051	0.222	0.925
25	Knowledge: Cause curse	0.021	0.145	0.026	0.159	0.786
26	Knowledge: Cause physiological	0.742	0.438	0.726	0.448	0.675
27	Knowledge: Cause do not know	0.18	0.385	0.197	0.399	0.67
28	Usage: Use Sanitary Pad	0.798	0.402	0.684	0.467	0.026
29	Usage: Frequently Use Pad	0.423	0.495	0.342	0.476	0.176
30	Usage: Used in last menstrual cycle	0.577	0.495	0.487	0.502	0.129
31	Discount 10%	0.184	0.388	0.214	0.412	0.527
32	Discount 25%	0.192	0.395	0.197	0.399	0.964
33	Discount 50%	0.188	0.392	0.197	0.399	0.711
34	Discount 75%	0.218	0.414	0.179	0.385	0.333
35	Discount 90%	0.218	0.414	0.214	0.412	0.962

Source: Authors' calculation.
Note: The table only includes the subsidy-plus-discussion group, divided by compliers and non-compliers. The p. val is the p-value of the hypothesis test that there is no difference in the mean between the two groups. *(Return to Section 3.2)*

TABLE 7: The Effect of Price Subsidies and a Discussion Intervention Program on the Redemption of Coupons

	Dependent Variable: Redemption						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
25% discount	0.296***	0.284***	0.302***	0.291***	0.310***	0.303***	0.308***
	(0.077)[0.00]	(0.078)[0.001]	(0.077)[0.00]	(0.076)[0.00]	(0.076)[0.00]	(0.074)[0.00]	(0.076)[0.00]
50% discount	0.324***	0.305***	0.299***	0.302***	0.325***	0.277***	0.318***
	(0.077)[0.00]	(0.078)[0.00]	(0.077)[0.00]	(0.077)[0.00]	(0.076)[0.00]	(0.075)[0.001]	(0.077)[0.00]
75% discount	0.469***	0.467***	0.454***	0.438***	0.469***	0.467***	0.471***
	(0.078)[0.00]	(0.079)[0.00]	(0.077)[0.00]	(0.077)[0.00]	(0.077)[0.00]	(0.075)[0.00]	(0.078)[0.00]
90% discount	0.512***	0.481***	0.496***	0.471***	0.497***	0.508***	0.488***
	(0.078)[0.00]	(0.079)[0.00]	(0.078)[0.00]	(0.077)[0.00]	(0.077)[0.00]	(0.075)[0.00]	(0.078)[0.00]
10% discount×discuss	0.139	0.146	0.188**	0.172*	0.158*	0.162*	0.156*
	(0.089)[0.135]	(0.093)[0.149]	(0.091)[0.06]	(0.091)[0.065]	(0.092)[0.123]	(0.089)[0.096]	(0.092)[0.129]
25% discount×discuss	0.091	0.087	0.093	0.095	0.065	0.061	0.054
	(0.087)[0.293]	(0.09)[0.332]	(0.089)[0.296]	(0.088)[0.281]	(0.089)[0.461]	(0.086)[0.482]	(0.088)[0.54]
50% discount×discuss	0.217**	0.211**	0.211**	0.206**	0.198**	0.227***	0.202**
	(0.088)[0.026]	(0.091)[0.038]	(0.09)[0.034]	(0.089)[0.037]	(0.09)[0.05]	(0.087)[0.016]	(0.09)[0.044]
75% discount×discuss	0.150*	0.130	0.166*	0.164*	0.136	0.136	0.130
	(0.084)[0.101]	(0.088)[0.156]	(0.086)[0.061]	(0.085)[0.065]	(0.087)[0.132]	(0.083)[0.118]	(0.086)[0.15]
90% discount×discuss	0.149*	0.154*	0.179*	0.179**	0.153*	0.160*	0.150
	(0.084)[0.101]	(0.093)[0.145]	(0.092)[0.061]	(0.091)[0.065]	(0.091)[0.123]	(0.09)[0.096]	(0.091)[0.129]
predicted compliance					0.343**		
					(0.135)		
turnout						0.603***	
						(0.102)	
IMR							−1.160***
							(0.285)
HH controls		X	X	X	X	X	X
Knowledge+Stigma		X	X	X		X	
Distance controls			X	X		X	
Area FE				X			
Prop 10% redeem	0.029						
F-statistics	3.417	2.061	2.789	2.725	2.053	2.408	2.032
Pr(> F)	0.005	0.069	0.017	0.019	0.07	0.036	0.073
Observations	568	564	551	551	561	551	555
R^2	0.198	0.239	0.284	0.300	0.240	0.330	0.254

Source: Authors' calculation. Note: All specifications account for the stratification variable, caste indicators, and a baseline indicator depicting whether an individual has used sanitary pads in the past. Column (2) adds household and personal controls such as father's education, mother's education, family income, relationship dummies, age, and age squared, as well as variables from the baseline survey pertaining to the household's attitude and one's knowledge regarding menstruation. Column (3) adds indicators representing whether the household's distance to the nearest college and market is less than 30 minutes on foot, and Column (4) includes area fixed effects. Additionally, Columns (5), (6), and (7) account for the compliance probability, rate of turnout specific to a neighborhood ($\frac{number\ attended}{number\ invited}$), and inverse mills ratio (IMR), respectively. White standard error robust to heteroskedasticity are presented in parentheses. Q-values adjusted for the False Discovery Rate based on Storey (2002) and Storey et al. (2004) are presented in brackets. The F-statistics and $Pr(> F)$ are from the joint hypothesis testing under the null that the coefficients on the interaction terms are jointly equal to zero. The proportion of redemption for the 10% discount in the subsidy-only group (omitted category) is 2.9%. *p<0.1; **p<0.05; ***p<0.01

(Return to Section 4)

TABLE 8: Elasticity Estimates

Segment	Subsidy only	Subsidy+Discuss
10-25 percent	-4.563	-2.571
	[-5, -4.404]	[-3.244, 0.09]
25-50 percent	0.163	-0.53
	[-0.457, 0.901]	[-1.207, -0.42]
50-75 percent	-0.381	-0.154
	[-0.505, -0.134]	[-0.388, -0.073]
75-90 percent	-0.052	-0.063
	[-0.171, 0.078]	[-0.182, -0.002]

Source: Authors' calculation.
Note: The elasticity estimates for the subsidy-only and subsidy-plus-discussion groups are based on estimates from Table 7, Column 6. Section 3.1 discusses the calculation method. The 90% confidence intervals obtained from the bootstrapped distribution of elasticity estimates with 1,000 replications are reported in the brackets.
(Return to Section 4.1)

TABLE 9: Discussion Intervention, Discount and Coupon Redemption by Baseline Psychological Cost

	Dependent variable:							
	Redemption							
	kept in shed	kept in shed	temp. untouch	temp. untouch	did not purchase	did not purchase	stigma index	stigma index
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mid discount	0.095	0.067	0.165**	0.178**	0.213**	0.195**	0.147	0.120
	(0.101)	(0.101)	(0.082)	(0.082)	(0.090)	(0.091)	(0.106)	(0.106)
high discount	0.288***	0.268***	0.364***	0.356***	0.434***	0.420***	0.296***	0.277***
	(0.089)	(0.088)	(0.068)	(0.068)	(0.079)	(0.080)	(0.093)	(0.092)
low discount × discussion	−0.011	−0.053	0.087	0.053	0.084	0.063	0.056	0.027
	(0.096)	(0.095)	(0.076)	(0.077)	(0.086)	(0.087)	(0.098)	(0.099)
mid discount × discussion	0.133	0.142	0.154	0.075	0.146	0.170	0.144	0.116
	(0.137)	(0.137)	(0.110)	(0.113)	(0.125)	(0.125)	(0.151)	(0.154)
high discount × discussion	0.071	0.047	0.061	0.035	0.029	0.016	0.067	0.050
	(0.092)	(0.093)	(0.076)	(0.076)	(0.080)	(0.080)	(0.095)	(0.095)
low discount × high stigma	−0.108	−0.140*	−0.010	0.013	0.016	0.034	−0.083	−0.087
	(0.083)	(0.083)	(0.083)	(0.083)	(0.079)	(0.080)	(0.085)	(0.085)
mid discount × high stigma	0.022	0.033	0.004	−0.018	−0.090	−0.021	−0.068	−0.036
	(0.109)	(0.110)	(0.113)	(0.112)	(0.111)	(0.115)	(0.110)	(0.111)
high discount × high stigma	−0.011	−0.022	−0.068	−0.048	−0.178**	−0.149*	−0.010	0.003
	(0.084)	(0.085)	(0.084)	(0.084)	(0.079)	(0.080)	(0.084)	(0.084)
low discount × high stigma × discussion	0.220*	0.253**	0.088	0.116	0.086	0.084	0.094	0.100
	(0.127)	(0.127)	(0.134)	(0.134)	(0.127)	(0.128)	(0.129)	(0.128)
mid discount × high stigma × discussion	0.145	0.088	0.182	0.310*	0.162	0.044	0.134	0.131
	(0.180)	(0.181)	(0.185)	(0.186)	(0.179)	(0.183)	(0.188)	(0.191)
high discount × high stigma × discussion	0.144	0.125	0.230*	0.205	0.276**	0.228*	0.139	0.113
	(0.123)	(0.122)	(0.125)	(0.125)	(0.121)	(0.122)	(0.124)	(0.122)
Add Controls		X		X		X		X
prop. redeem low discount	0.19		0.176		0.188		0.204	
obs. low discount cell	58		91		64		49	
Observations	568	561	569	561	570	561	567	560
R^2	0.174	0.212	0.174	0.214	0.179	0.211	0.169	0.208

Note: *p<0.1; **p<0.05; ***p<0.01

Source: Authors' calculations.

Note: The first two columns use the status of being kept in a shed to define the high psychological cost subgroup in the baseline. Columns (3)-(4) use whether an individual is considered temporarily untouchable during menstruation to denote the high psychological cost subgroup. Columns (5)-(6) consider individuals who purchased sanitary pads by themselves during the last menstrual cycle in the low psychological cost subgroup. Columns (7)-(8) use available stigma measures to create an index, which is then used to categorize the high psychological cost group (high stigma group). Specifically, for Columns (7)-(8) we use the sum of following indicator variables to form an index of stigma: *i*) Kept in shed; *ii*) Not permitted in kitchen; *iii*) Not permitted in holy places; *iv*) Considered untouchable during menstruation; *v*) Did not purchase pad during the last cycle. The high stigma category represents an index value greater than 2. All specifications control for the stratification variable. Additionally, the even columns include controls for compliance probability, caste indicators, education, age, age squared, and family income indicators. White's standard errors, which accounts for heteroskedasticity, are presented in parentheses.

(Return to Section 4.2)

Appendices

A Adjusting for non-compliance

The main analysis excludes non-compliers while estimating the effects of the discussion intervention treatment coupled with subsidization on coupon redemption. As previously discussed, one concern is that if compliance is determined by factors that also dictate coupon redemption, then systematic selection of compliers in the sample will bias the effects of discussion intervention. In this section, we conduct a battery of exercises to check the robustness of our main results.

A.1 Subsample of women who have used sanitary pads

As a simple robustness exercise, we estimate the main results by limiting the sample to individuals who reported having used sanitary pads before, under the assumption that these women are more likely to have similar characteristics that determine compliance. Following the terminology in Section 3.2, the assumption here is that $\mathbb{E}[e_i|A_i = 1, C_i = 1, P_i = 1] = \mathbb{E}[e_i|A_i = 0, P_i = 1]$, where P_i indicates the history of sanitary pad use. The results are shown in Table A1. These findings are consistent with our main results. Even within this restricted sample, individuals receiving the discussion intervention treatment are more likely to redeem a coupon compared to individuals in the subsidy-only group with the same discount coupon. In fact, the coefficient on the interaction between the discount of 50% and discussion intervention is larger than the respective coefficients presented in Table 7. This suggests that group discussion intervention may act as positive reinforcement to pre-existing preferences for sanitary pads.

A.2 Multiple imputation with propensity score

We impute the missing redemption status for non-compliers by drawing from a sample of individuals who share similar baseline characteristics to those of non-compliers (Lavori et al., 1995). Briefly, the process first assigns the propensity of compliance (attending or not attending the discussion session) based on the covariates to each individual in the subsidy-plus-discussion intervention treatment sample. The procedure for estimating compliance probability is based on the approach highlighted in Imbens and Rubin (2015) and is discussed in Section A.2.1.

Following the prediction of compliance probability (propensity score), we first divide the subsidy-plus-discussion intervention treatment sample into two blocks based on the median value of the log linearized propensity score. To assess balance between the compliers and non-compliers within each block, we calculate the t-statistic for each block as defined in Section A.2.1. In this case, t-statistics for both blocks are greater than 2, depicting that the estimated propensity score varies significantly within a block. Thus, we split each initial block into two additional blocks using the within block median value of the log linear propensity score and calculate the t-statistic for each block. All four values of t-statistic are less than 2, which indicates little variation in the propensity to comply within a given block across two groups (compliers vs. non-compliers).

The notion here is that within each block we have individuals (compliers and non-compliers) sharing similar values of a predicted compliance probability. By using the sub-sample of compliers in each block, we impute redemption status ($0 = did\,not\,redeem$, $1 = redeemed$) for non-compliers at every discount level. Within each block, we follow three main steps.

1. First, we form a new dataset by randomly drawing observations from compliers with replacement, such that the number of draws equals the number of compliers in each block. This is

the bootstrapped sample.

2. Second, using the bootstrapped sample from (1), we impute the redemption status for non-compliers at each discount level. In this step, we randomly draw a redemption value from the bootstrapped sample at a specific discount rate and use this to impute a missing value on redemption status for a non-complier with the same discount rate. This is repeated until all the missing values pertaining to non-compliers are imputed. This process gives us a partially-imputed dataset (original compliers plus non-compliers with imputed redemption status). The assumption here is that within each block, the redemption behavior of non-compliers would be determined by the same data generating process as compliers, conditional upon observables.

3. Third, using this partially-imputed dataset, we run the regression model as specified by Column (6) of Table 7.

   Steps 1-3 are repeated 1,000 times to generate a distribution of the main estimates.

A.2.1 Estimating compliance propensity

To estimate the propensity score of compliance, we closely follow Imbens and Rubin (2015). First, we declare some basic covariates that are *a priori* viewed as important in determining the probability of attending the discussion intervention session. This includes six pre-treatment covariates: i) Education level (dummy of $0-4^{th}$ grade, $5^{th}-8^{th}$ grade, and upper secondary levels); ii) Family income; iii) An indicator of whether an individual was exposed to health campaigns including menstrual health hygiene following the 2015 earthquake (stratification variable); iv) Age; v) Whether an individual ever used sanitary pads *(ever_use)*, and vi) Whether an individual was placed in a shed during the time of menstruation *(shed)*.

In the second round, we consider caste (Brahmin, Chhetri, Janjati, other caste), age squared *(age_sq)*, an indicator if a person correctly answered uterus as the source of menstruation *(source_uterus)*, whether the person attended any hygiene-related awareness prior to the study *(hygiene)*, an indicator representing hormones as the cause of menstruation *(cause_hormones)*, whether the respondent is regarded as untouchable during menstruation *(untouchable)*, and the log of the distance from a person's house to the closest college and market. These variables are entered linearly in the model specification defined in the first round one by one. For each specification, we calculate the likelihood ratio statistic based on the null hypothesis; namely, that the newly added covariate in the second round has a zero coefficient. We check whether the likelihood statistic is greater than 2; if such is the case, the variable with the largest likelihood ratio statistic is retained. Next, other variables are considered and this process is repeated until all covariates with a likelihood ratio statistic of greater than 2 are included in the model. This process includes picking *Janjati*, *untouchable*, and log distance to the nearest college as additional covariates (all with the likelihood statistics greater than 3).

In the third round, we decide on the interaction terms to be included in the model specification. We check for the interactions between an indicator of whether the respondent ever used a sanitary pad *ever_use* and the following variables: i) Education; ii) Family income; iii) Untouchability; iv) Age; and v) Whether an individual was placed in the shed during menstruation *(shed)*. We enter these terms one by one in the model specification as defined in round two and record the likelihood ratio statistic. If the largest likelihood ratio statistic is greater than 2, we include that interaction term in the model. This process leads us to include interactions defined by *ever used pad* $\times$ *untouchability* (*ever_use* and *untouchable*). In this way, we construct the final specification used to

estimate the propensity score of attending the discussion intervention session. Using the estimated log linear propensity score, we drop the subsidy-alone units with an estimated propensity score of less than the minimum value among the subsidy-plus-discussion units. Similarly, we also drop the subsidy-plus-discussion units with an estimated propensity score greater than the maximum value among the subsidy-only units. The log linear propensity score is given as $\hat{l} = ln(\frac{e\hat{(x)}}{1-e\hat{(x)}})$, where $e\hat{(x)}$ is the estimated propensity score.

Next, we assess the adequacy of the propensity score by selecting blocks with respect to the median of the linearized propensity score and confirming the within-block equality of means by calculating the t-statistic using $t_j = \frac{l_t(j)-l_c(j)}{\sqrt{S_l^2(j).(1/N_c(j)+1/N_t(j))}}$. Here, j is the block number; $l_t(j)$ and $l_c(j)$ are the averages of block-specific propensity scores by compliers and non-compliers, respectively; and S^2 is the block-specific sample variance. This process suggests picking 4 blocks (divided by the quartile of the linearized propensity score). All the blocks are well-balanced, with the t-statistic less than 2 (0.162, 1.56, 1.48, and 0.18) for the first, second, third and fourth blocks, respectively). Multiple imputations within each block and a specific discount value are carried out as described previously. Figure A1 (Panel B) shows the linearized propensity score ($\hat{l}$) across compliers and non-compliers in the subsidy-plus-discussion intervention treatment group within each of the four blocks.

A.2.2 Results from multiple imputation

The distribution of coefficients on the interaction term between the discussion intervention treatment and the respective discount rate are shown in Figure A2 for each discount rate. The underlying assumption governing the multiple imputation technique is that non-compliers with a similar probability of compliance to compliers would have responded similarly to compliers within each discount cell had they attended the discussion intervention sessions. The red dotted lines show the 5^{th} and 95^{th} percentiles of the estimates obtained following the multiple imputation process and the blue dotted line represents the mean value of the estimates. The green dotted lines show the estimates (of interaction between the discussion intervention and respective discount rate on redemption status) from Table 7, Column 6. The estimates from Table 7 (Column 6) are close to the mean estimates in sub-figures A2 and are well bounded within the 5^{th} and 95^{th} percentile of the distribution of estimates obtained from multiple imputation.

A.3 Trimming the sample in the subsidy-only group

Another exercise that we conduct involves adjusting the sample in the subsidy-only treatment group based on the propensity score of compliance. Figure A3 shows the distribution of subsidy-plus-discussion treatment units (compliers) and subsidy-only units, based on the compliance probability divided into 10 bins. As expected, there are more observations in the subsidy-only group across all bins compared to the subsidy-plus-discussion treatment (compliers) sample. However, the difference in the number of observations between the two groups is largest at bin (0.6-0.7]. We adjust the sample in the subsidy-only group by extracting a random sample from the subsidy-only group to match the bin-specific number of observations in subsidy-plus-discussion treatment group. Using the trimmed sample, we estimate model specification as depicted in Table 7, Column 6. This process is replicated 1,000 times.

The results from this approach are presented in Figure A4, which plots the distribution of point estimates for the subsidy-plus-discussion treatment group at each discount level using the trimmed sample. The sub-figures show that the preferred estimates from Table 7, Column 6 (green dotted

lines) are well bounded within the 5^{th} and 95^{th} percentile of the distribution of estimates. Also, the mean of the estimates are very close to the preferred estimates.

These imputation exercises together provide evidence in favor of the claim that the main results pertaining to the subsidy-plus-discussion treatment group are not driven by selective compliance.

A.4 Imputation using the predicted redemption values

Another possible approach that can be used to impute the redemption values among non-compliers includes using redemption probabilities to designate the redemption status among non-compliers. This approach uses an estimation of the following specification using the subsidy-only group:

$$Y_i = \alpha + \beta_j \sum_{j=2}^{5} D_{ij} + \gamma_j \sum_{j=1}^{5} \hat{C}_i \times D_{ij} + \nu_i \tag{1}$$

where Y_i is the redemption status, D_{ij} is the discount coupon, and $\hat{C}_i$ is the predicted compliance probability of an individual i in the subsidy-plus-treatment group. Here, both the discount level and compliance probability are allowed to influence the redemption status and the discount indicator (D_{ij}) is interacted with the predicted compliance probability ($\hat{C}_i$) to allow for varying effects of compliance across discount levels. The coefficients obtained from estimating equation (1) for the subsidy-plus-discussion sample is used to generate redemption probabilities for the whole sample. Using the redemption probability and a cut-off value $\tilde{p}_j$ for discount level j, redemption status among non-compliers is assigned as a value of "1" if the redemption probability is greater than or equal to $\tilde{p_j}$, and "0" otherwise.

We use the subsidy-only group as a training sample to pick the cut-off value ($\tilde{p}$) in order to maximize the probability of the goodness-of-fit in the training data, while also keeping in mind that the prediction errors (false positives and false negatives) are not systematically different in magnitude. This can be explained by using the following auxiliary table.

Control Sample	Pseudo Control	
	redeem	no redeem
redeem	X1	Y2
no redeem	Y1	X2

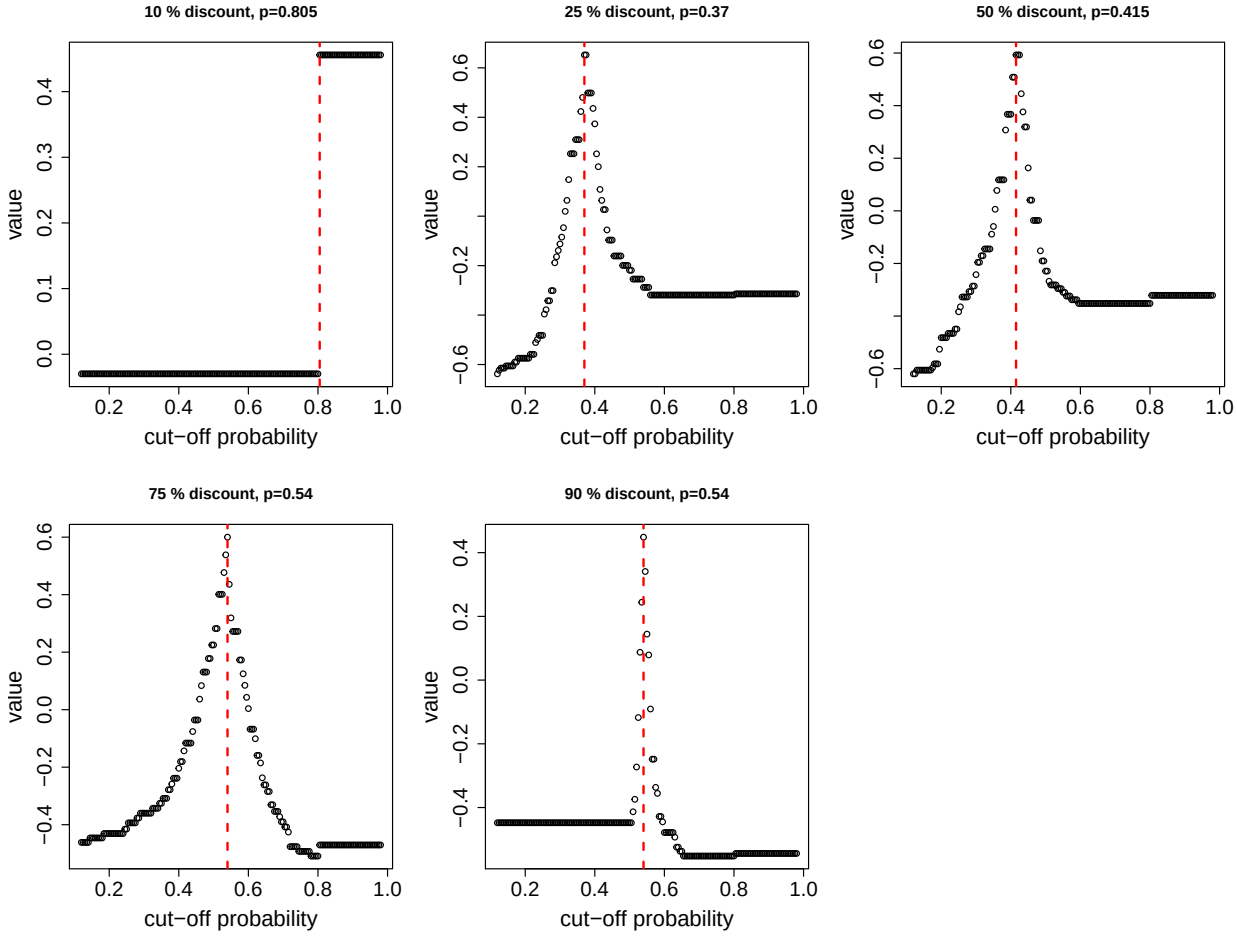
The actual redemption status of the subsidy-only sample is known, whereas the cut-off value p of the redemption probability is used to assign "1" or "0" to represent the redemption status in a pseudo subsidy-alone sample for each discount cell. In the table, $X1$ and $X2$ represent the number of correct predictions, whereas $Y1$ and $Y2$ are the number of incorrect predictions. For instance, $Y1$ represents the number of actual non-redeemers in the subsidy-alone sample that were predicted to be redeemers using the predicted redemption probability based on the cut-off value.

Our objective is to increase the goodness-of-fit (proportion of correct prediction) as well as ensure that incorrect predictions (i.e., false negatives and false positives) are more or less similar in magnitude. For instance, the gap between $Y1$ (false positive) and $Y2$ (false negative) should not be large, which if this is0 the case, would signify that the prediction error systematically favors a given criteria (i.e., is more likely to term non-redeemers as redeemers compared to redeemers as non-redeemers). We write down a value function dependent on the selection of the cut-off probability

p as:

$$V(p) = \frac{X1 + X2}{X1 + X2 + Y1 + Y2} - \alpha \times |Y1 - Y2| \tag{2}$$

Here, the first term is the goodness-of-fit or the proportion of observations correctly classified. The second term, $\alpha \times |Y1 - Y2|$, reflects the penalty, where α indicates the weight for the penalty. The magnitude of the penalty increases with the absolute difference between $Y1$ and $Y2$. We normalize the maximum penalty magnitude to 1 by selecting α as $max(Y1,\ Y2)$. Our next objective is to pick the cut-off probability for each discount cell such that the selection of $\tilde{p}$ maximizes the value function.



The figure above shows the relationship between the choice of cut-off probabilities and values where the red dotted line represents $\tilde{p}$, which maximizes the value function within a discount level. Hence, using the cut-off values that maximize the value function, we impute redemption status among the non-compliers in the subsidy-plus-discussion treatment intervention group.[35]

The results obtained using this partial imputation are shown in Table A2. The treatment effects on the 50% and 90% discount coupons are similar in magnitude to the main results. However,

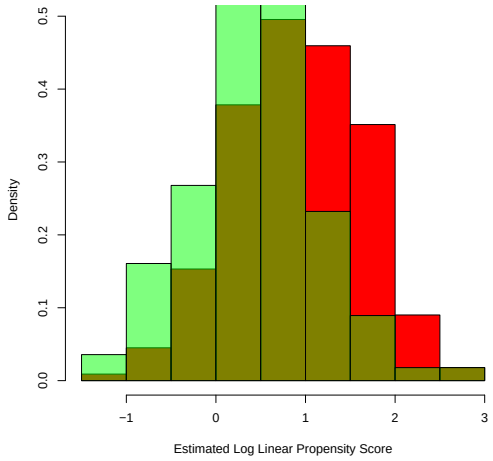
[35]For example, if the predicted redemption probability of a non-complier with 50% discount is greater than or equal to 0.415, then the redemption status is imputed as "1," otherwise "0." Note that this imputation strategy strictly assumes that the discussion intervention treatment would have zero effect on non-compliers, which is another drawback of this method.

other coefficients on the interaction terms are smaller. Such differences can be attributed to the implicit assumption in Table A2 that the discussion intervention treatment has no effect among non-compliers and non-compliers in the subsidy-plus-discussion treatment group would behave similarly to counterfactual non-compliers in the subsidy-only group had they participated in the group discussion intervention. Due to this strict and quite impractical assumption, which assigns a zero treatment effect among the non-compliers by construction, we do not use this kind of imputation method in the main manuscript but simply document the approach and results for the purpose of transparency.

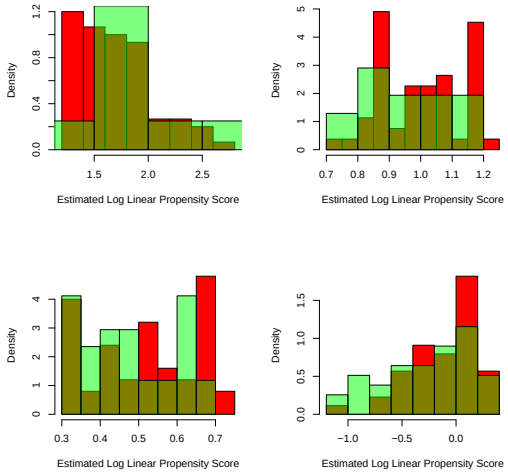
Figures and Tables (Appendix A)

FIGURE A1: Log Linear Propensity Score

(A) Compliers vs. Non-Compliers



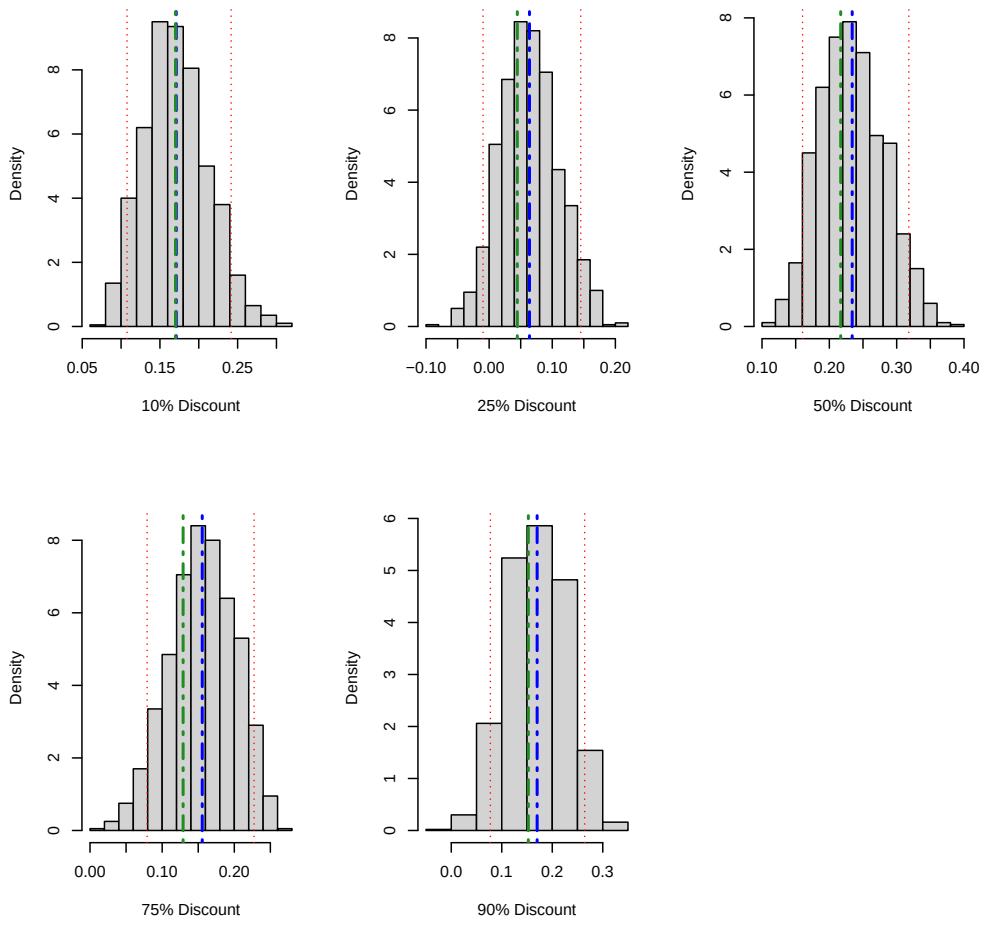
(B) Compliers vs. Non-Compliers by Block



Source: Authors' calculations.

Note: Panel A shows the distribution of the estimated log linear propensity score divided by compliers vs. non-compliers in the subsidy-plus-discussion treatment group. The light green and red bars represent the log linear propensity scores for non-compliers and compliers, respectively, whereas the dark green bars show the overlap in the distribution. Panel B plots the distribution of the log linear propensity score across four groups divided by the quartile of the estimated compliance probability.

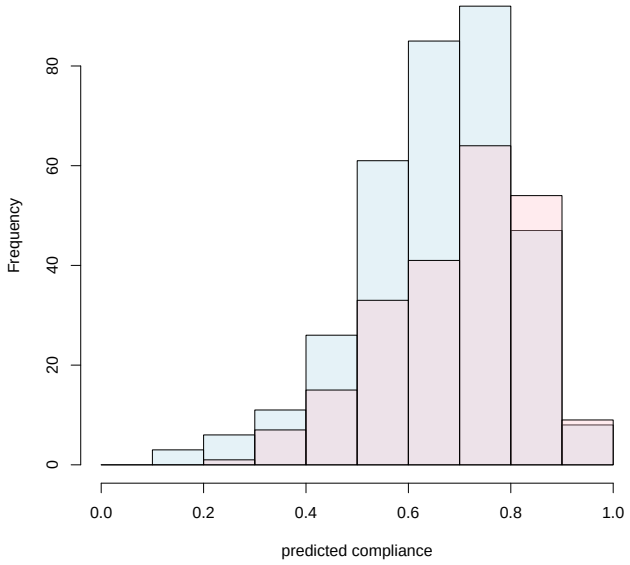
FIGURE A2: Distribution of Estimates from 1,000 Replications (Multiple Imputation Method)



Source: Authors' calculations.

Note: The figure shows the distribution of estimates pertaining to discussion intervention for each discount level, obtained from 1,000 replications after imputing the redemption status of non-compliers using the multiple imputation approach based on the propensity score method described in Section A.2. The vertical red dotted lines represent the 5^{th} and 95^{th} percentile of the estimates. The blue dotted line represents the mean of the estimates and the green dotted line corresponds to the coefficient on the interaction term between the respective discount rate and the discussion group (*discount level* × *discussion*), obtained from Table 7, Column (6).

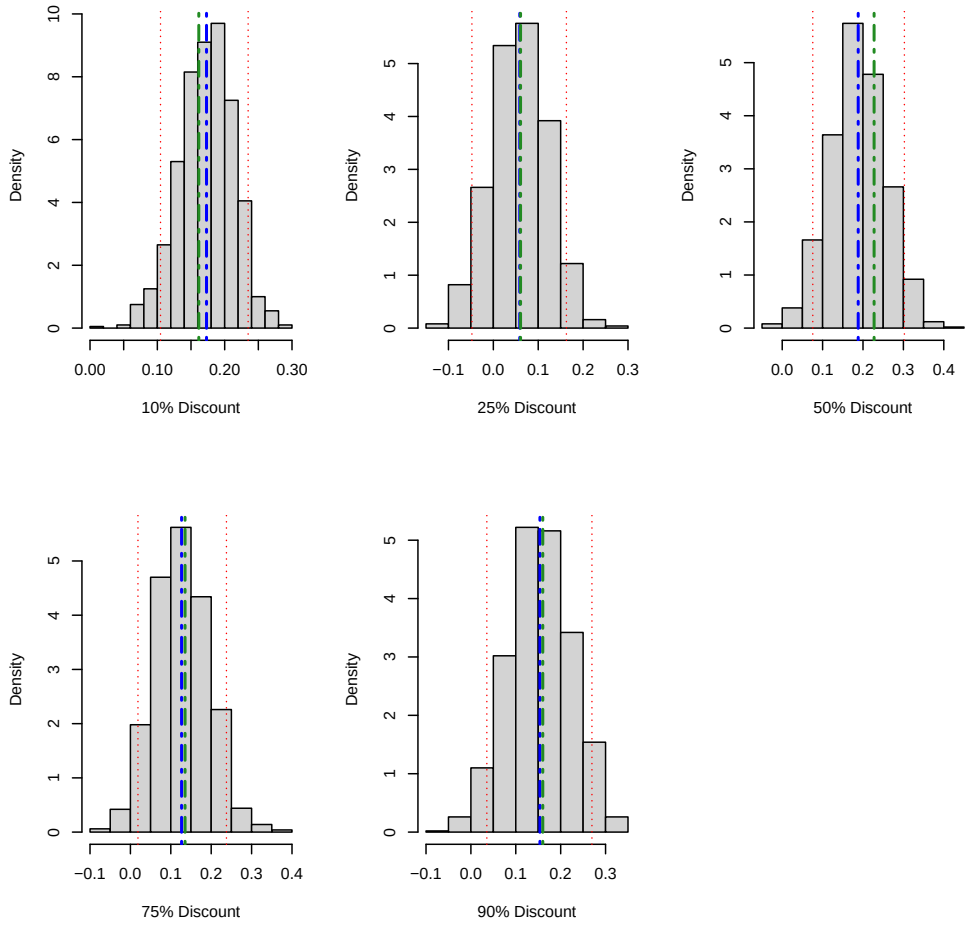
FIGURE A3: Distribution of Subsidy-Only vs. Subsidy-Plus-Discussion (Compliers) Units



Source: Authors' calculations.

Note: The figure shows the frequency of the subsidy-only units vs. subsidy-plus-discussion (only compliers) units based on the compliance probability divided into 10 bins.

FIGURE A4: Distribution of Estimates (Adjusting the Subsidy-Only Sample)



Source: Authors' calculations.

Note: The figure shows the histogram of estimates obtained from 1,000 replications after trimming the sample in the subsidy-only group to match the distribution of the subsidy-plus-discussion treatment group (compliers) as described in Section A.3. The vertical red dotted lines represent the 5^{th} and 95^{th} percentile of the estimates. The blue dotted line represents the mean of the estimates and the green dotted line corresponds to the coefficient on the interaction term between the respective discount rate and the discussion group (*discount level* × *discussion*) obtained from Table 7, Column (6).

TABLE A1: The Effect of Subsidies and Discussion Intervention on Coupon Redemption (Ever Used)

	Dependent variable:							
	Redemption							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
25 % discount	0.385***	0.406***	0.385***	0.410***	0.406***	0.410***	0.388***	0.415***
	(0.092)	(0.090)	(0.091)	(0.089)	(0.089)	(0.091)	(0.086)	(0.090)
50 % discount	0.335***	0.322***	0.317***	0.296***	0.307***	0.358***	0.266***	0.324***
	(0.090)	(0.089)	(0.089)	(0.088)	(0.087)	(0.089)	(0.085)	(0.089)
75 % discount	0.521***	0.533***	0.540***	0.519***	0.511***	0.526***	0.519***	0.528***
	(0.091)	(0.090)	(0.090)	(0.088)	(0.087)	(0.091)	(0.085)	(0.090)
90 % discount	0.611***	0.600***	0.597***	0.617***	0.602***	0.621***	0.605***	0.607***
	(0.091)	(0.090)	(0.090)	(0.088)	(0.088)	(0.091)	(0.085)	(0.090)
10 % discount×discussion	0.088	0.101	0.100	0.129	0.125	0.078	0.069	0.092
	(0.105)	(0.109)	(0.109)	(0.106)	(0.106)	(0.106)	(0.103)	(0.110)
25 % discount×discussion	0.042	0.027	0.025	0.030	0.027	−0.003	0.009	−0.009
	(0.096)	(0.097)	(0.099)	(0.097)	(0.096)	(0.096)	(0.093)	(0.098)
50 % discount×discussion	0.296***	0.320***	0.314***	0.306***	0.286***	0.272***	0.315***	0.306***
	(0.105)	(0.106)	(0.106)	(0.103)	(0.103)	(0.105)	(0.100)	(0.105)
75 % discount×discussion	0.152*	0.127	0.110	0.153*	0.153*	0.141	0.115	0.125
	(0.091)	(0.094)	(0.095)	(0.092)	(0.091)	(0.091)	(0.089)	(0.093)
90 % discount×discussion	0.084	0.077	0.075	0.097	0.092	0.056	0.089	0.065
	(0.090)	(0.097)	(0.099)	(0.098)	(0.098)	(0.090)	(0.095)	(0.098)
predicted compliance						0.439***		
						(0.165)		
turnout							0.629***	
							(0.114)	
IMR								−1.067***
								(0.331)
Stratification	X	X	X	X	X	X	X	X
HH Controls		X	X	X	X		X	X
Baseline Knowledge Stigma			X	X	X		X	
Distance Controls				X	X		X	
Area FE					X			
Prop 10% discount redeem	0							
F-statistics	2.71	2.038	1.852	2.363	2.172	2.119	2.126	1.957
Observations	443	443	441	428	428	440	428	434
R^2	0.227	0.276	0.293	0.354	0.364	0.252	0.401	0.294

Note: *p<0.1; **p<0.05; ***p<0.01

Source: Authors' calculation. The sample is restricted to those individuals who reported having used sanitary pads in the baseline survey. The table is structured similarly to Table 7. Robust White's standard errors adjusted for heteroskedasticity are presented in parentheses.

TABLE A2: Awareness, Discount and Coupon Redemption (Partially Imputed Sample using Redemption Probabilities)

	Dependent Variable: Redemption			
	(1)	(2)	(3)	(4)
25 % discount	0.320***	0.306***	0.313***	0.301***
	(0.076)	(0.076)	(0.076)	(0.075)
50 % discount	0.355***	0.338***	0.321***	0.324***
	(0.076)	(0.076)	(0.076)	(0.076)
75 % discount	0.514***	0.510***	0.500***	0.488***
	(0.077)	(0.077)	(0.076)	(0.075)
90 % discount	0.514***	0.488***	0.501***	0.480***
	(0.077)	(0.077)	(0.076)	(0.076)
10 % discount×discussion	0.062	0.014	0.039	0.023
	(0.077)	(0.079)	(0.079)	(0.078)
25 % discount×discussion	0.018	−0.014	0.009	0.006
	(0.077)	(0.080)	(0.080)	(0.079)
50 % discount×discussion	0.189**	0.160**	0.185**	0.178**
	(0.078)	(0.081)	(0.080)	(0.080)
75 % discount×discussion	0.045	0.002	0.036	0.037
	(0.075)	(0.077)	(0.076)	(0.076)
90 % discount×discussion	0.212***	0.184**	0.216***	0.218***
	(0.075)	(0.078)	(0.078)	(0.077)
HH Controls		X	X	X
Knowledge+Stigma		X	X	X
Distance Controls			X	X
Area FE				X
Prop 10% redeem	0.029			
F-statistics	2.947	1.672	2.243	2.224
Pr($> F$)	0.012	0.139	0.049	0.05
Observations	680	676	661	661
R^2	0.219	0.258	0.292	0.302

Source: Authors' calculations.

Note: The sample includes non-compliers whose redemption status are imputed using the redemption probabilities, with the threshold probability ($\tilde{p}$) documented in Section A.4 for each discount level. All specifications account for the stratification variable, caste indicators, and a baseline indicator depicting whether an individual has used sanitary pads in the past. Column (2) adds household and personal controls such as the father's education, mother's education, family income, relationship dummies, age, and age squared, as well as variables from the baseline survey pertaining to the household's attitude and one's knowledge regarding menstruation. Column (3) adds indicators representing whether a household's distance to the nearest college and market is less than 30 minutes by feet (respectively) and Column (4) includes area fixed effects. The F-statistics shown are from the joint hypothesis testing under the null that the coefficients on the interaction terms are jointly equal to zero with the corresponding p-values. *p<0.1; **p<0.05; ***p<0.01.

B Model with psychological cost due to stigma

To understand the mechanisms driving the results, we develop a stylized theoretical model that incorporates the psychological costs associated with the decision to purchase stigmatized products. Following Moffitt (1983), who analyzed the case of welfare stigma, we conceptualize menstrual stigma creating a disutility from using sanitary pads. The agent's decision is based on the standard utility-maximization framework, where utility depends on consumption c and menstrual health stock m. The utility flow from the menstrual health stock could be interpreted as consumption benefits from having good menstrual health. The utility function is additively separable in logs and is given by:

$$\max_{c_i, m_i} log(c_i) + log(m_i) \tag{3}$$

where i denotes individual-level variables, which we distinguish from exogenous factors that are represented without the i subscript. The consumption choice set is continuous on the set of positive real numbers $\mathbb{R}^+$. The level of menstrual health stock takes on two values and depends on the agent's choice of menstrual hygiene products $r \in \{0, 1\}$ and is given by

$$m_i = m_0 + r_i(m_1 - S_i) \tag{4}$$

where m_0 is the base level of the health stock without the use of sanitary pads and m_1 is the marginal increase in health stock due to the use of sanitary pads, which kicks in when $r_i = 1$. So, the agent i can choose between two levels of health stock: m_0 if $r_i = 0$ and $m_0 + m_1 - S_i$ if $r_i = 1$.

The purchase of sanitary pads involves psychological (psychic) costs S_i, expressed in the equivalent unit of health stock, whose presence reduces the marginal benefit of sanitary pads over traditional methods. While $m_0, m_1 > 0$ are the same for all women, the level of S_i varies across women and is the primary source of heterogeneity in behavior regarding redemption of coupons for sanitary pads.

We assume the following structure for S_i:

$$S_i = \phi \times S(k_i, \mathbb{E}[r_{-i}]) \qquad \frac{\partial S}{\partial k_i} < 0, \frac{\partial^2 S}{\partial k_i^2} > 0, \frac{\partial S}{\partial \mathbb{E}[r_{-i}]} < 0 \tag{5}$$

With this structure, we posit three factors that determine the level of disutility from purchasing sanitary pads:

1. The level of social stigma $\phi_i \in \{0, 1\}$: Factor ϕ indicates the presence of social stigma is due to the prevailing social norms and attitudes and changes very slowly. When ϕ takes a value of 0, the psychological cost is zero for any values of k_i and $\mathbb{E}[r_{-i}]$, these factors become irrelevant to the decision. In other words, the case of menstrual health products becomes similar to other products without stigma. But if $\phi = 1$, then psychological cost depends on the other two factors k_i and $\mathbb{E}[r_{-i}]$.

2. Knowledge of menstrual health k_i: Intuitively, greater knowledge of menstrual health lowers psychological costs even in the presence of stigma. This variable could be determined by formal education and other family background characteristics and it can also be influenced by awareness and other short-term programs. However, it is partly endogenous as it can increase with prior experience of using the product.[36]

[36] We can also conceptualize k_i having an influence by increasing (the agent's perception of) m_i.

3. Expectations about others' behavior ($\mathbb{E}[r_{-i}]$): Expectations about peers' behavior, $\mathbb{E}[r_{-i}]$ also regulates the individual-level psychological costs. If many peers adopt the use of sanitary pads despite menstrual stigma, the psychological costs for the individual i is also lower.

A group discussion intervention campaign can influence S_i through changes in k_i or $\mathbb{E}[r_{-i}]$ (or both), with the latter being more likely in our study's context. By creating a platform for group discussion and information sharing, women obtain greater information about behavior and the practice of their peers.

Regarding the decision of the agent i to purchase sanitary pads, there are two cases to consider:

1. $m_1 - S_i < 0$: In this case, the agent will never purchase menstrual pads and her decisions are independent of the product's price level. This group would *not* benefit from price subsidies because it is not optimal for them to buy sanitary pads at any price. The group discussion intervention program decreases psychic cost S_i by increasing k_i, which induces some women from this group to respond to offered discount rates.

2. $m_1 - S_i > 0$: In this case, the agent will be responsive to changes in the price of sanitary pads, subject to the constraint imposed by her income Y and market price of the sanitary pad p. The purchase decision is based on a comparison of the following two utilities:

   - $U|_{r_i=0} = log(Y) + log(m_0)$
   - $U|_{r_i=1} = log(Y - p) + log(m_0 + m_1 - S_i)$

   Thus, the benefits of using sanitary pads net of reduction of other consumption due to positive price must be large enough to cover the loss from psychic cost. Comparing the two utility functions give the following decision rule for $r = 1$:

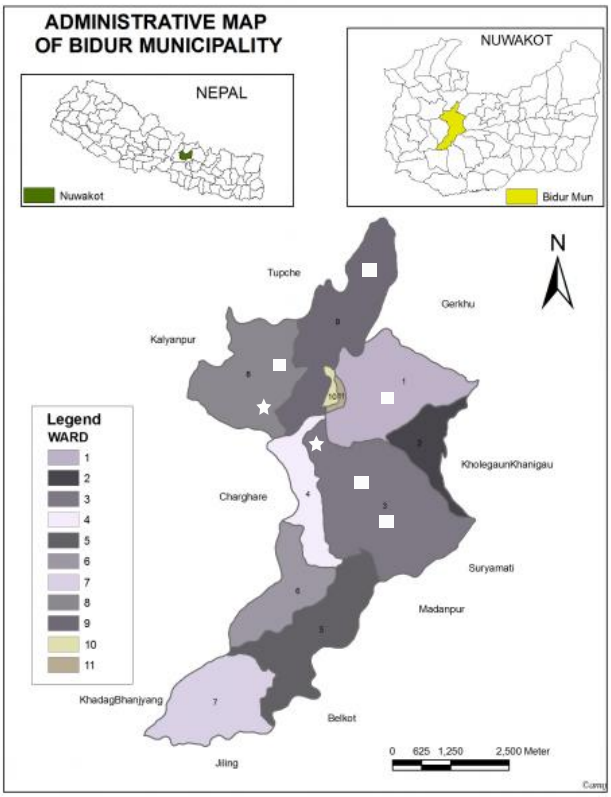
$$\frac{m_0 + m_1 - S_i}{m_0} > \frac{Y_i}{Y - p} \Rightarrow S_i < S^* = m_0 + m_1 - \frac{m_0 Y}{(Y_i - p)} = m_1 - m_0 \frac{p}{Y - p} \tag{6}$$

In the second case, the decision of whether to redeem sanitary pads is governed by the threshold S^*, which depends on $m_1,\ m_0,\ p$, and Y. A woman will redeem the discount coupon if the psychic cost S_i is less than S^*. According to the decision rule, conditional on the psychic cost being lower than m_1, the price of the product plays a role in determining the choice. If price p falls, then the term $\frac{p}{Y-p}$ decreases, which means that the threshold for redemption is higher $\left(\frac{\partial S^*}{\partial p} > 0\right)$. In other words, if the price is lowered through a discount subsidy, then women with higher level of psychological cost will redeem the coupon, compared to the setting with no subsidy.

Note that the effectiveness of subsidy-only intervention depends on the share of women for whom $m_i > S_i$. If this share is small, the adoption rate due to the subsidy will also be small as it will not impact the other group with $m_i < S_i$. The group discussion intervention would increase the share of women who are responsive to price reductions. Likewise, discussion-only intervention (without subsidy) may increase the share of women for whom $m_i > S_i$, but redemption may still be low if the (undiscounted) price is high. Thus, the key takeaway from the model is that a combination of discussion intervention and price subsidization is more effective in increasing the adoption rate of stigmatized health products.

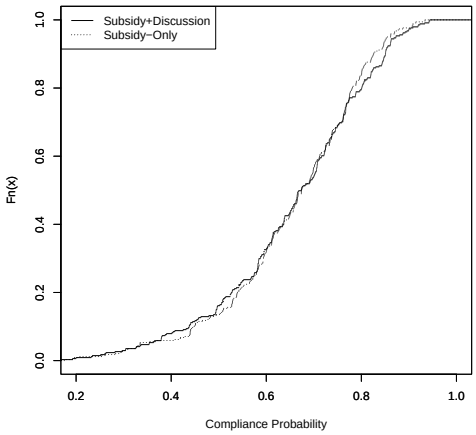
C Additional Figures and Tables

FIGURE C1: Study Location



Source: Map is taken from the Bidur Municipal government website (http://bidurmun.gov.np/ne/node/186), with the authors' annotations added to mark study sites.
Note: Map shows the location of the study site relative to Bidur municipality. A ward is the smallest administrative unit in Nepal, which comprises of several villages. We picked 5 such villages in different wards and all households within these villages were included in the study. The white square markers identify approximate locations of the study sites. The star markers show the approximate location of pharmacies where the discount coupon could be redeemed. The group discussion intervention sessions were held in schools located within each of the five study locations.

(Return to Section 2)



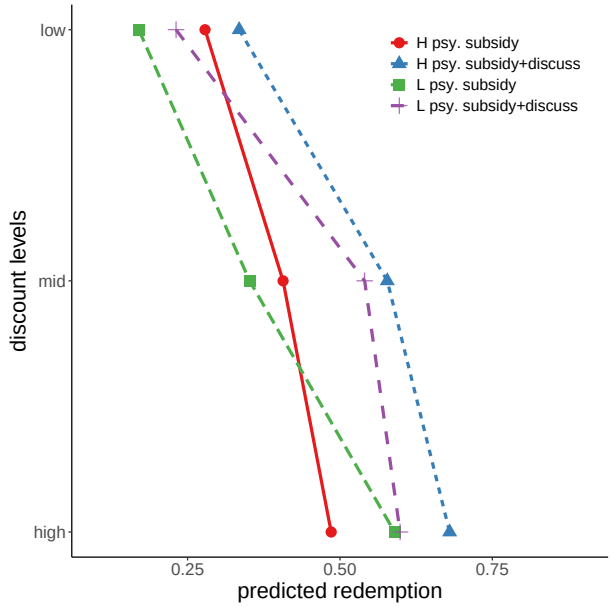
(A) Subsidy+Discussion and Subsidy-Only

FIGURE C2: CDF of Compliance Probabilities for Subsidy+Discussion and Subsidy-Only Group

Source: Authors' calculations.

Note: Panel (A) shows the cumulative distribution of predicted compliance probabilities for the subsidy-only and subsidy-plus-treatment groups. The predicted compliance probability is estimated by running a probit regression of compliance on the baseline variables described in Section A.2.1.

(Return to Section 3.2)



(A) High psy. cost: Did not self-purchase

FIGURE C3: Predicted Redemption Levels by Baseline Stigma

Source: Authors' calculations.

Note: The sample is restricted to women who reported having known about sanitary pads in the baseline. The figure shows predicted redemption across subgroups when high psychological cost is defined as individuals who did not self-purchase sanitary pads during the last menstrual cycle, using the baseline information. The coefficients from the specification similar to Table 9 Column (8), are used for prediction. The average values of predicted probability for each subgroup is taken to depict the predicted redemption proportion. The discount levels of 90% and 75% represent a high discount; 50% is a mid-level discount; 10% and 25% pertain to the low discount category.

(Return to Section 4)

Table C1: Correlates of Sanitary Pad Use in Baseline

	(1)	(2)	(3)	(4)
Received health awareness after earthquake=1	0.139***	0.145***	0.162***	0.172***
	(0.0371)	(0.0367)	(0.0370)	(0.0371)
Educ Low secondary		0.153**	0.131*	0.129*
		(0.0666)	(0.0671)	(0.0664)
Educ Secondary		0.150**	0.129**	0.120**
		(0.0498)	(0.0500)	(0.0525)
Educ Tertiary		0.234***	0.195***	0.193***
		(0.0525)	(0.0532)	(0.0582)
Income Rs. 25000-39,999			0.126**	0.115**
			(0.0433)	(0.0434)
Income Above Rs. 40,000			0.195**	0.175**
			(0.0642)	(0.0648)
Chhetri				0.0957*
				(0.0539)
Brahmin				0.0286
				(0.0528)
Janjati				0.0671
				(0.0497)
Observations	710	705	700	700

Standard errors in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: Authors' calculation.
Note: The dependent variable is whether an individual ever used a sanitary pad in the baseline. The regression also controls for age, age squared, and marital status. Robust standard errors adjusted for heteroskedasticity are presented in parentheses.
(Return to Section 2.3)

TABLE C2: Balance Exercise Across Treatment Arms - Demographic Characteristics (Excluding Non-compliers)

	Dependent variable:							
	brahmin	chhetri	age	educ.	father educ,	family income	hindu	married
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
25 percent discount	0.037	−0.065	0.056	0.012	0.370	0.013	−0.067	−0.012
	(0.071)	(0.073)	(1.551)	(0.882)	(0.822)	(0.078)	(0.069)	(0.066)
50 percent discount	0.013	−0.058	0.780	−0.760	0.121	0.006	0.013	−0.053
	(0.070)	(0.073)	(1.538)	(0.878)	(0.819)	(0.078)	(0.069)	(0.066)
75 percent discount	0.049	0.019	1.239	0.959	−0.535	0.033	0.042	0.025
	(0.072)	(0.074)	(1.568)	(0.895)	(0.832)	(0.079)	(0.070)	(0.067)
90 percent discount	−0.074	0.075	2.483	−0.186	−1.064	−0.002	−0.016	−0.005
	(0.071)	(0.074)	(1.564)	(0.889)	(0.829)	(0.079)	(0.070)	(0.067)
10 percent discount×discussion	0.015	−0.157*	−0.429	−0.416	−0.309	−0.141	−0.007	−0.057
	(0.081)	(0.084)	(1.783)	(1.021)	(0.945)	(0.090)	(0.080)	(0.076)
25 percent discount×discussion	−0.056	0.017	−0.244	−0.339	0.315	−0.050	0.070	−0.011
	(0.080)	(0.082)	(1.744)	(0.999)	(0.921)	(0.088)	(0.078)	(0.075)
50 percent discount×discussion	−0.118	0.162*	2.188	0.501	−0.920	0.023	0.053	0.004
	(0.080)	(0.083)	(1.758)	(1.011)	(0.939)	(0.089)	(0.079)	(0.075)
75 percent discount×discussion	−0.057	−0.037	−0.255	−0.208	0.918	−0.119	0.009	−0.103
	(0.077)	(0.080)	(1.687)	(0.962)	(0.891)	(0.085)	(0.076)	(0.072)
90 percent discount×discussion	0.050	−0.049	−0.800	0.101	1.659*	−0.289***	0.005	0.029
	(0.077)	(0.080)	(1.691)	(0.962)	(0.893)	(0.085)	(0.076)	(0.072)
F-statistics	0.837	1.741	0.314	0.119	1.201	3.024	0.261	0.536
Pr($> F$)	0.524	0.123	0.905	0.988	0.307	0.011	0.934	0.749
Observations	570	570	570	565	567	570	570	569

Source: Authors' calculation.
Note: The sample excludes the non-compliers in the subsidy-plus-discussion intervention group. The table shows the balance across demographic variables including whether an individual is from a Brahmin household, Chettri household, age, education, father's education, family income (between $0-24,999 per month), whether a Hindu, and marital status (married vs. unmarried). The F-statistics are from the joint hypothesis testing under the null, that the coefficients on the subsidy-plus-discussion intervention treatment group are jointly equal to zero. Standard errors are presented in parentheses. All regressions account for the stratification variable.
(Return to Section 2.3)

TABLE C3: Balance Exercise Across Treatment Arms - Menstruation-related Variables (Excluding Non-compliers)

	Dependent variable:					
	kept in shed	disallowed in kitchen	untouchable	source uterus	use last pad	frequent use
	(1)	(2)	(3)	(4)	(5)	(6)
25 percent discount	−0.046	−0.061	−0.043	0.043	0.094	−0.007
	(0.085)	(0.084)	(0.082)	(0.085)	(0.083)	(0.085)
50 percent discount	−0.041	−0.028	−0.022	0.049	0.237***	0.112
	(0.084)	(0.083)	(0.081)	(0.085)	(0.083)	(0.084)
75 percent discount	0.115	−0.019	−0.045	0.069	0.092	0.012
	(0.086)	(0.085)	(0.083)	(0.086)	(0.084)	(0.086)
90 percent discount	−0.030	−0.027	−0.009	0.046	0.062	0.041
	(0.085)	(0.085)	(0.083)	(0.086)	(0.084)	(0.085)
10 percent discount×discussion	−0.144	−0.233**	−0.062	0.099	0.033	0.010
	(0.097)	(0.096)	(0.094)	(0.098)	(0.096)	(0.097)
25 percent discount×discussion	0.131	0.081	−0.006	−0.133	0.180*	0.084
	(0.095)	(0.094)	(0.092)	(0.096)	(0.094)	(0.095)
50 percent discount×discussion	0.039	0.100	0.022	−0.143	−0.255***	−0.096
	(0.096)	(0.095)	(0.093)	(0.097)	(0.094)	(0.096)
75 percent discount×discussion	−0.202**	−0.011	0.047	0.057	0.008	0.027
	(0.092)	(0.091)	(0.089)	(0.093)	(0.090)	(0.092)
90 percent discount×discussion	−0.068	−0.035	0.060	−0.029	0.045	0.031
	(0.094)	(0.091)	(0.090)	(0.093)	(0.091)	(0.092)
F-statistics	1.962	1.577	0.242	1.11	2.446	0.396
$\Pr(> F)$	0.083	0.165	0.944	0.354	0.033	0.852
Observations	568	570	569	570	570	570

Note: *p<0.1; **p<0.05; ***p<0.01

Source: Authors' calculation.
Note: The sample excludes the non-compliers in the subsidy-plus-discussion intervention group. The table shows the balance across the stigma and knowledge-related variables including whether the respondent: i) Was kept in shed during menstruation; ii) not allowed in the kitchen; iii) Regarded as untouchable; iv) Identified the menstruation source as the uterus; v) Used sanitary pad during the last menstrual cycle; and vi) Use sanitary pads frequently. The F-statistics are from the joint hypothesis testing under the null, that the coefficients on the subsidy-plus-discussion intervention treatment are jointly equal to zero. Standard errors are presented in parentheses. All regressions account for the stratification variable.
(Return to Section 2.3)

TABLE C4: Comparison between Subsidy-only vs. Subsidy-plus-discussion Intervention Groups (income 0-24,999 Rs.)

	Variable	mean (Discuss)	sd.	mean (Subsidy-only)	sd	p. val	N
1	Hindu	0.757	0.43	0.752	0.433	0.959	398
2	Chhetri	0.201	0.402	0.252	0.435	0.183	398
3	Brahmin	0.194	0.397	0.173	0.379	0.666	398
4	Age	30.042	9.829	29.606	9.345	0.902	398
5	Married	0.792	0.408	0.81	0.393	0.472	397
6	Highest Education	6.545	4.836	6.389	5.235	0.73	395
7	Father's Education	2.604	4.781	2.012	4.101	0.189	396
8	Mother's Education	1.146	3.71	1.175	3.849	0.843	396
9	Has toilet	0.87	0.338	0.881	0.325	0.788	316
10	Own land	0.875	0.332	0.925	0.769	0.472	398
11	Stigma: Not permitted kitchen	0.583	0.495	0.61	0.489	0.521	398
12	Stigma: not permitted holy place	0.951	0.216	0.933	0.251	0.479	397
13	Stigma: kept in shed	0.528	0.501	0.61	0.489	0.142	396
14	Stigma: untouchable	0.354	0.48	0.335	0.473	0.766	398
15	Knowledge: source uterus	0.479	0.501	0.508	0.501	0.506	398
16	Knowledge: source vagina	0.153	0.361	0.15	0.357	0.883	398
17	Knowledge: source unaware	0.264	0.442	0.268	0.444	0.994	398
18	Knowledge: Cause pathological	0.069	0.255	0.043	0.204	0.227	398
19	Knowledge: Cause physiological	0.722	0.449	0.748	0.435	0.557	398
20	Knowledge: Cause do not know	0.181	0.386	0.201	0.401	0.584	398
21	Usage: Use sanitary pad	0.771	0.422	0.728	0.446	0.357	398
22	Usage: Frequently use pad	0.389	0.489	0.366	0.483	0.519	398
23	Usage: Used in last menstrual cycle	0.528	0.501	0.539	0.499	0.99	398
24	Discount 10%	0.174	0.38	0.197	0.398	0.555	398
25	Discount 25%	0.208	0.408	0.205	0.404	0.808	398
26	Discount 50%	0.236	0.426	0.205	0.404	0.639	398
27	Discount 75%	0.222	0.417	0.205	0.404	0.519	398
28	Discount 90%	0.16	0.368	0.189	0.392	0.398	398

Source: Authors' calculation.
Note: The sample is restricted to women in a family income bracket of Rs. 0-24,999 across both groups. Also, non-compliers are excluded from the subsidy-plus-discussion sample. *(Return to Section 4)*

TABLE C6: The Effect of Price Subsidies and the Discussion Intervention Program (income Rs. 0-24,999)

	Dependent Variable: Redemption			
	(1)	(2)	(3)	(4)
25% discount	0.309***	0.290***	0.305***	0.306***
	(0.091)[0.002]	(0.093)[0.006]	(0.092)[0.003]	(0.091)[0.003]
50% discount	0.292***	0.277***	0.272***	0.269***
	(0.092)[0.004]	(0.093)[0.007]	(0.093)[0.008]	(0.092)[0.009]
75% discount	0.433***	0.440***	0.433***	0.416***
	(0.092)[0]	(0.094)[0]	(0.093)[0]	(0.093)[0]
90% discount	0.449***	0.416***	0.453***	0.435***
	(0.093)[0]	(0.094)[0]	(0.092)[0]	(0.092)[0]
10% discount×discuss	0.249*	0.270**	0.321***	0.297***
	(0.114)[0.053]	(0.114)[0.033]	(0.112)[0.008]	(0.112)[0.015]
25% discount×discuss	0.119	0.126	0.135	0.127
	(0.105)[0.258]	(0.108)[0.275]	(0.107)[0.218]	(0.106)[0.232]
50% discount×discuss	0.126	0.107	0.127	0.135
	(0.103)[0.251]	(0.104)[0.305]	(0.103)[0.218]	(0.102)[0.21]
75% discount×discuss	0.179	0.128	0.163	0.163
	(0.104)[0.11]	(0.106)[0.275]	(0.103)[0.147]	(0.102)[0.145]
90% discount×discuss	0.210	0.190	0.237*	0.228*
	(0.118)[0.11]	(0.121)[0.174]	(0.122)[0.079]	(0.122)[0.093]
HH Controls		X	X	X
Knowledge+Stigma		X	X	X
Distance Controls			X	X
Area FE				X
Prop 10% redeem	0.02			
F-statistics	3.022	2.7	3.843	3.599
$Pr(> F)$	0.011	0.021	0.002	0.003
Observations	389	386	378	378
R^2	0.169	0.225	0.274	0.282

Source: Authors' calculations.

Note: The sample includes women in the lowest family income bracket (0–24,999 Rs.) and excludes non-compliers. All specifications account for the stratification variable, caste indicators, and a baseline indicator depicting whether an individual has used sanitary pads in the past. Column (2) adds household and personal controls such as father's education, mother's education, family income, relationship dummies, age, and age squared, as well as variables from the baseline survey pertaining to the household's attitude and one's knowledge regarding menstruation. Column (3) adds indicators representing whether the household's distance to the nearest college and market is less than 30 minutes by walking (respectively) and Column (4) includes area fixed effects. White standard errors robust to heteroskedasticity are presented in parentheses. Q-values adjusted for the False Discovery Rate based on Storey (2002) and Storey et al. (2004) are presented in brackets. The F-statistics and $Pr(> F)$ shown are from the joint hypothesis testing under the null, that the coefficients on the interaction terms are jointly equal to zero. The proportion of the redemption for 10% discount in subsidy-only group (omitted category) is 2%. *p<0.1; **p<0.05; ***p<0.01.
(Return to Section 4)

TABLE C7: Determinants of Exposure to Stigma in the Baseline

	Dependent variable:		
	kept in shed	temp. untouch	did not purchase
	(1)	(2)	(3)
secondary education	0.038	−0.003	−0.164***
	(0.052)	(0.056)	(0.056)
tertiary education	0.060	0.002	−0.223***
	(0.046)	(0.050)	(0.050)
brahmin	0.019	−0.045	−0.054
	(0.049)	(0.054)	(0.053)
dalit	−0.051	−0.062	−0.059
	(0.079)	(0.086)	(0.086)
newar	−0.522***	−0.319***	−0.045
	(0.071)	(0.077)	(0.077)
janjati	−0.431***	−0.283***	−0.016
	(0.046)	(0.050)	(0.050)
family income (Rs. 25,000-40,000)	−0.068*	−0.034	−0.170***
	(0.041)	(0.044)	(0.044)
family income (Rs. 40,000 or more)	−0.181***	−0.039	−0.224***
	(0.065)	(0.071)	(0.071)
age	0.037***	0.012	0.005
	(0.012)	(0.013)	(0.013)
age squared	−0.001***	−0.0002	0.00003
	(0.0002)	(0.0002)	(0.0002)
constant	0.243	0.337*	0.525***
	(0.188)	(0.204)	(0.203)
Observations	689	691	692
R^2	0.234	0.076	0.119
Note:	*p<0.1; **p<0.05; ***p<0.01		

Source: Authors' calculations.

Note: All specifications control for the stratification variable. *(Return to Section 4.2)*

TABLE C8: Testing Equality of Coefficients – Heterogeneous Analysis

	kept in shed (1)	kept in shed (2)	temp. untouch (3)	temp. untouch (4)	did not purchase (5)	did not purchase (6)	stigma index (7)	stigma index (8)
low discount, high stigma, treated	0.04	0.06	0.14	0.26	0.10	0.22	0.14	0.29
mid discount, high stigma, treated	0.05	0.12	0.04	0.03	0.04	0.13	0.04	0.09
high discount, high stigma, treated	0.02	0.10	0.01	0.05	0.00	0.04	0.03	0.10

Source: Authors' calculations.

Note: The table shows the p-values from the hypothesis testing of whether the estimated effects from Table 9 among the high stigma group who received discussion intervention treatment are equal to the high stigma group without discussion intervention at respective discount levels. In most cases, p-values are less than 0.10, indicating support to reject the null.

D Survey Instruments

D.1 Questionnaire

Person Number .....
Tol/Area Name (Basti Name).....
Household Number.....
Note: All personal information collected in this survey will be kept confidential and will be used only for statistical purposes.

Part A. Basic Demographic Questions

1. What is your relationship to the head of the household?

   a. Head of the household b. Wife c. Mother d. Daughter e. Sister f. Daughter-in-law g. Sister-in-law h. Mother-in-law i. Niece j. Other

2. Religion of the household.

   a. Hindu b. Buddhist c. Christian d. Other

3. Caste

   (please fill) (.....)

4. Age

   (please fill) (.....)

5. Marital Status

   a. Married b. Divorced c. Separated d. Never Married

6. If married, number of children

   a. Girls (please write down the number of girls) (...)

   b. Girls living with you (...)

   c. Boys (please write down the number of boys) (...)

   d. Boys living with you (...)

7. Location of birth

   a. District b. VDC c. Municipality

8. Location of birth

   a. Urban b. Rural

9. During the past 12 months, how many months did you live here?

   (.....)

10. Do you plan on migrating from this location in the coming year?

    (.....)

11. What is the highest level of father's education?

    (.....)

12. What is highest level of mother's education?

    (.....)

13. Did you ever go to school?

    a. Yes b. No

14. What is the highest level of education you completed?

    (.....)

15. Are you currently employed?

    a. Yes b. No

16. If yes, your occupation

    Please write 999 if housewife (.....)

    Ask questions 17 and 18 only for married individuals.

17. Is your husband currently employed?

    a. Yes b. No

18. Your husband's occupation

    (.....)

19. Monthly family income: (Note: Family income includes both husband's and wife's income if respondent is married, family income includes both mother's and father's income if respondent is a daughter)

    a. Rs. 0 to 24,999 b. Rs. 25,000 to 39,999 c. Rs. 40,000 to 60,000 d. Rs. 60,000 to 80,000 e. Rs. >80,000

20. Do you own a piece of land?

    a. Yes b. No

21. If yes (for question 20), how many acres?

    (.....)

22. Do you own the following:

    a. Motorbike b. Car c. Cycle d. TV e. Fridge f. Internet

23. How many rooms does your household occupy?

    a. Total b. Kitchen c. Toilet d. BedRoom e. Living Room

24. Were you affected by the earthquake?

    a. Yes b. No

Part B. Location (Basti) Specific Questions

25. How long does it take to get to the following facilities?

    a. Primary School b. College c. Health Post d. Local Bazaar

26. What is population of the Basti?

    (.....)

27. When was the last time you visited the following (in days): a. Health Post b. Local Bazaar

Health and Sanitation

28. When did you last speak to a health professional (doctor, nurse, or a healthcare worker)?

    a. (.....) days b. (.....) months c. (.....) years

29. How do you categorize your health?

    a. Excellent b. Good c. Poor

30. Do you have difficulty doing the following:

    a. Walking b. Climbing stairs c. Doing daily chores

31. Did you receive any aid after the earthquake?

    a. Yes b. No

32. Did you receive any health-related awareness after the earthquake? a. Yes b. No

33. If yes, what sector was it in:

    a. Faeces-related b. Home Sanitation-related c. Hygiene
    d. Menstrual Health and Sanitary pad-related ***Stratification Variable***

34. When was the last time you had menstruation?

    a. A week ago b. 2 weeks ago c. More than 2 weeks

Stigma Against Menstruation

35. Were you allowed in the kitchen during your last menstruation? a. Yes b. No

36. Were you allowed in holy places during menstruation? a. Yes b. No

37. Were you secluded to a shed or a room during menstruation? a. Yes b. No

38. Were you considered an untouchable, specifically to the male household members, during menstruation? a. Yes b. No

Knowledge Regarding Menstruation

39. How do you best describe menstruation?

    a. Pathological process b. Curse from god c. Physiological process d. Do not know

40. Cause of menstruation?

    a. Hormones b. Caused by disease c. Curse of god d. Do not know

41. Source of menstrual blood flow.

    a. Vagina b. Bladder c. Uterus d. Abdomen e. Do not know

42. Had you heard about menstruation before attaining menarche?

    a. Yes b. No

43. Know about menstrual hygiene?

    a. Yes b. No

44. Do you think that menstrual blood is unhygienic?

    a. Yes b. No

Usage of Sanitary Items

45. Have you ever used a sanitary pad during menstruation?

    a. Yes b. No

46. What did you use during your last menstruation?

    a. Sanitary pad b. Moon cup (menstrual cup) c. Cloth or rag d. Other (please state)

47. If answer is sanitary pad for 46, which brand did you use?

    a. Stayfree b. Whisper c. Safety d. Others

48. If answer is sanitary pad for 46, where or how did you obtain a sanitary pad?

    a. Health worker b. Clinic c. Earthquake relief groups (NGOs) d. Purchased it oneself

49. If answer is sanitary pad for question 46, how long have you been using a sanitary pad?

    a. Months b. Years

50. How did you know about sanitary pads?

    a. School b. Health worker c. Husband d. Daughter e. Other family members f. Awareness programs g. Other (Please explain) (.....) h. Do not know about sanitary pads

51. If answer is cloth or rag for 46, did you clean the cloth with soap and water?

    a. Yes b. No

52. If answer is cloth or rag for 46, did you dry cloth out in the sunlight? a. Yes b. No

53. Did you change pads or cloths more than three times a day during menstruation?

    a. Yes b. No

54. Do you bathe daily with soap during menstruation?

    a. Yes b. No

55. How often do you use a sanitary pad?

    a. Every time when having period b. Frequently c. Only when going outside (once in a while) d. Never

56. If answer is c or d for 55, why not?

    a. Uncomfortable during purchase b. Parents disapprove of pads c. Cannot afford d. Lack of access (health post too far away) e. Prefer using cloth to sanitary pad

57. Do you know about moon cups?

    a. Yes b. No

58. If Yes to 57, how did you know about moon cups?

    a. School b. Health worker c. Husband d. Daughter e. Other family members f. Awareness programs g. Other (Please explain) h. Do not know about moon cups

D.2 Sanitation pad information packet/script

This section summarizes information dispensed on the group discussion intervention sessions. The sessions were discussion-based and experiences of participants were highlighted and questions were answered by the health workers.

Cultural and Religious Beliefs on Menstruation

- Menstruation – usually regarded as a sign of impurity, when bodily excretions are considered to be pollutants
- Societal Restrictions:
  - Not allowed in kitchen and holy places; discouraged to participate in social gatherings
  - Secluded to a shed, to avoid contact with others
  - Considered untouchable
- *CHAUPADI*
  - An ancient ritual based in Hinduism, where women are banished from their homes during menstruation
  - Harsh superstitions attached with menstruation; e.g., if a menstruating women fetches water, wells will dry up
  - Seclusion to a shed has caused deaths due to suffocation [37]
  - Practice of *CHAUPADI* is banned by Nepal's supreme court (in 2005)

What is Menstruation?

- Menstruation is a physiological phenomenon
- Shed the lining of the uterus (womb)
- Blood flows from the uterus through small openings in the cervix
- Passes from vagina
- Length: 3-5 days (and can vary)
- Menstrual Cycle
  - Period happens regularly; regularity signals that organs are functioning well
  - Provides hormones and prepares for pregnancy
  - Average period cycle is 28 days but can vary (range: 21 to 45 days)
  - Helpful to track period

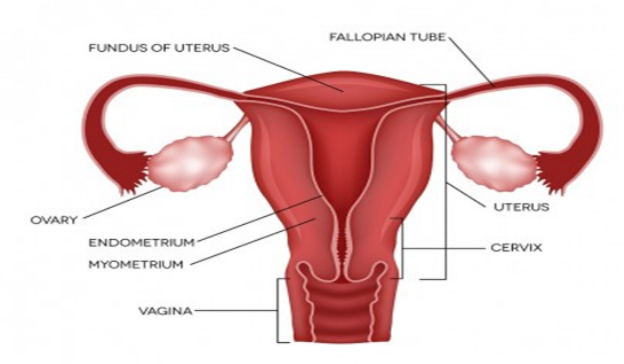
What Happens During Menstruation?

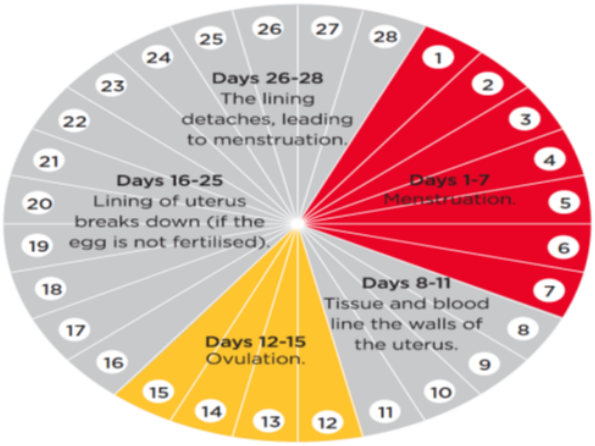
- Rise in estrogen (female hormone), which plays a key role in health
- Ovum in ovaries start to mature; ovulation: In about 14 days (of 28 day cycle), the egg leaves the ovary
- Egg travels through fallopian tube to ovaries
- Women are most likely to get pregnant in the 3 days before or on the day of ovulation

Menstrual Hygiene and Health

- Risk associated with infection may be higher than normal during menstruation
- Mainly because blood passing through vagina creates a pathway for bacteria to travel to uterus
- Insertion of unclean material into vagina can facilitate bacteria to have easier access to cervix and the uterine cavity
- If using cloths or rags, they should be washed with clean water and soap and completely dried
- Several relatively new technologies:
  - Sanitary pads (commonly found in pharmacy stores); Tampons; Menstrual cups (difficult to find in the market)
- How does the sanitary pad work and how to use a pad?
- Should be changed once every 3-4 hours

[37] https://www.cnn.com/2017/07/10/asia/nepal-menstruation-hut-deaths-outrage/index.html





a. Uterus: *Patheghar*; b. Ovary: *Dimbasya*; c. Vagina: *Yonimarg*; d. Ovule: *Anda*; e. Infection: *Sankraman*; f. Microorganism: *Jibjantu*; g. Urethral Opening: *Mutradwar*; h. Urinary Bladder: *Mutrasawa*

Proper Disposable of Sanitary Material

- Should not be disposed of among domestic household waste
- Should be wrapped around a newspaper before disposal to lessen risk from pathogens
- Use clay incinerator for disposal if available
- Better to use biodegradable products if available in the market

(Return to Section 2.2)