

(Ineffective) Messages to Encourage Recycling: Evidence from a Randomized Evaluation in Peru

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Abstract: There is growing interest in using messaging to drive pro-social behaviors, which contribute to investment in public goods. We worked with a leading NGO in Peru to randomize nine different pro-recycling messages that were crafted based on best practice, prior evidence, and theories of behavioral change. Different variants emphasized information on environmental or social benefits, social comparisons, social sanctions, authority, and/or reminders. None of the messages had significant effects on recycling behavior. However, reducing the cost of ongoing participation—by providing a recycling bin—significantly increased recycling among enrolled households.

Keywords: Behavioral Economics, Recycling, Peru, Field Experiment, Social Messaging

JEL Codes: D03, Q53, N56, C93

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Evidence from psychology and behavioral economics has spurred interest in using low-cost messaging, in place of lowering economic barriers, to drive pro-social and other investment behaviors. There is mounting evidence that in certain contexts simple, timely bits of information, reminders, cues/“primes”, or even pure “framing” can drive behavior.¹ One domain of focus has been the environment, and specifically whether messaging can help solve collective action problems by increasing conservation behaviors.

We focus on whether and how messaging can increase recycling. Our work builds on several prior field experiments on recycling behavior—most of which were done in the United States or another developed country—and applies lessons from their results to a developing country context.² Prior work has used a variety of types of messages; some have stressed providing information on the environmental benefits of recycling while others have used descriptive information about social norms surrounding recycling. A multifaceted message, delivered in-person by Boy Scouts, increased recycling in a field experiment in Claremont, California both when solely informative messages were given and when public commitment was added (Burn and Oskamp 1986). In a separate field experiment in LaVerne, California, door-hangers providing feedback on individual or neighborhood recycling norms increased recycling, while informative hangers on how to sort trash and the environmental benefits of recycling did not (Schultz 1999).³ There is also evidence that, when asking people to recycle more, the source of information—e.g.,

¹ See e.g., *Nudge* by Thaler and Sunstein (2008); Bertrand et al on advertising (2009); Choi et al on savings cues (2012); Karlan et al on reminders (2011); Stango and Zinman on overdrafts (2011); and Zwane et al on survey measurement (2010).

² For broader reviews of evidence on drivers of recycling behavior see e.g., Carlson (2001) and Chu and Chu (2006).

³ The Burn and Oskamp message included information on sorting, information on benefits to the environment, the local average participation rate, and an endorsement from the municipality.

whether from a neighbor or anonymous written communication—matters (Burn 1991; Lord 1994). Prior research has shown that providing peer comparisons, such as the frequency with which one's peers engage in some behavior or the percentage of them who approve of a behavior, has been proven to be an effective catalyst for behavioral change (Cialdini and Goldstein 2004; Elster 1989).

While there is evidence that messaging using social norms can be effective, there is also evidence that these effects depend on the specific context of the experiment and the presentation of the message, and according to some researchers, have been overemphasized in recent years. Schultz et al (2008), studying energy conservation in California residents, found that while “normative social influence” was rated very low by survey respondents as a motivation for conservation, experimental findings suggested it actually had more effect on actions than many other influences. In contrast, however, Carlson (2001) writes that in cases like recycling which is a “large number, small payoff” problem of collective action, researchers have overestimated the effects of social norm messaging in changing behaviors, and that governments should focus on financial incentives or reducing necessary effort in order to change behaviors.

In addition, these studies leave important questions about the characteristics of treated groups unanswered. Carlson suggests that significant effects seen in social norm oriented messaging might be positively related to, and dependent on, the long term pro-recycling views prevalent in the American population, and that in a setting without these views, treatment effects might be different. In Peru, although concern about general environmental issues are as strong as in the United States, average views of recycling are far less reliably positive, and recycling itself is far less understood. Until recently, the separation of reusable refuse from garbage was performed by around 100,000 unofficial

workers who reported being viewed and referred to as “scavengers” (Chauvin 2009). These baseline differences in the experimental population could potentially cause different treatment effects than on a population in the United States or other developed country. Very little academic work has been done on recycling in developing countries, despite the fact that these are the very places where insufficient waste management is leading to huge environmental issues. This is one of the first studies focusing on interventions to increase recycling behaviors among the populations of these areas.

We attempted to address these gaps by working with a leading Peruvian NGO, PRISMA, to randomize 9 different recycling enrollment messages that were crafted based on best practice, prior evidence, and theories of behavioral change. The control group received PRISMA’s standard marketing: door-to-door canvassing. The treatment groups, randomized at the household level, received this in addition to a flier introducing the recycling program and a “treatment message” (described directly below). Treatment groups also received text messages.

Each enrollment treatment message was designed, based on prior research, either to highlight a piece of general information on the benefits of recycling, or to introduce a social comparison/influence. Following several prior studies, some messages provided general information by highlighting the benefits of recycling for the environment or the recycling workers.⁴ Following Cialdini and Goldstein (2004) and the oPower experiments (Alcott 2009), some messages emphasized *conformity* by highlighting a high rate of participation in nearby areas. Following Cialdini and Goldstein (2004), some messages provided *social pressure* by highlighting the fact that the participation rate for someone’s

⁴ See Gerber et al (2008) on voting.

neighborhood would be revealed to people in another neighborhood.⁵ Following Burn and Oskamp (1986) and Cialdini and Goldstein (2004), some messages emphasized *authority* by providing an explicit or implicit endorsement from the municipal government or the Catholic Church.

The relative effectiveness of these 9 treatments was then compared with a separate evaluation of 3 randomly assigned treatments meant to ease economic barriers to increase participation intensity in a sample of participants in the recycling program. One provided a free recycling bin,⁶ and a second a bin with a sticker containing instructions on how to sort recyclables from non-recyclables (i.e., information on the logistics of recycling). These were compared to a control group which received nothing. A separate treatment, randomized within the same group, sent weekly SMS reminders the day before recyclables would be picked up from the curb.

None of the enrollment messages had significant effects on recycling behavior. This null result is precisely estimated; we can rule out effects larger than 5 percentage points (or about 10 percent of the mean level of participation). Similarly, SMS reminders had no impact on recycling behavior. In contrast, providing a bin does significantly increase frequency and amount of recycling. In all, the results suggest that reducing the time/hassle costs of ongoing usage is more effective than messaging.

I. SETTING AND EXPERIMENTAL DESIGN

⁵ See Lerner and Tetlock (1999) on accountability; Gerber et al (2008) on voter turnout; Frey and Meier (2004) and Alpizar et al (2008) on social signaling in charitable giving.

⁶ See Bryce et al (1997) for some results on paid vs. free bins.

Global polling data shows that a majority of Latin Americans express concern about the environment, on par with other parts of the world. In the most recent round of the World Values Survey, 65 percent of Latin Americans agreed that they would “give part of [their] income if [they] were certain that the money would be used to prevent environmental pollution.” In contrast, 52 percent of respondents in the U.S., 37 percent of respondents in Germany, and 74 percent of respondents in Canada agreed with that statement (World Values Survey Association 2009). In another poll by the Pew Research Center, 73 percent of Latin Americans said they would give priority to protecting the environment, even at the cost of slower economic growth or fewer jobs; 66 percent of U.S. citizens, 77 percent of Canadians, and 75 percent of Germans said the same (Pew Global Attitudes Project 2007).

Over 20,000 tons of solid waste is produced every day in Peru, much of which is dumped in waterways or left in informal dumps, making solid waste management an area of increasing concern in the country (Chauvin 2009). Various programs have been implemented across Peru to confront environmental issues posed by solid waste disposal. In 2002, PRISMA, a nongovernmental organization in Peru, started a program called the “Improvement and Expansion of the Scope of Micro and Small Enterprise Solid Waste Management in the Districts of Piura, Castilla and Catacaos.” This program provides technical assistance and training to help informal recyclers develop and launch small formal recycling businesses that engage in door-to-door recycling collection. The project has facilitated the creation of three recycling micro-enterprises, and continues to expand with the dual goals of creating formal jobs for the informal trash collectors, and increasing recycling.

To enroll new families into the recycling program, PRISMA conducts five-week-long marketing campaigns in areas where the three micro-enterprises do not currently work. In the first week, marketers visit households in the new area, present the program to them, and invite them to join. From the second to fourth week, PRISMA's marketers accompany the recycler on his route across the new area to introduce him to the participating families. On the last visit, households that have given recyclables at least one time are given a sticker, fixed near their door, indicating that they participate in the program. During this period households are provided with disposable recycling bags free of charge.

Once the initial marketing process ends, the recyclers are responsible for keeping families active in the program. Administrative data from PRISMA pertaining to the period before this study suggests that around 50 percent of households contacted by PRISMA's marketers join the program. However, due to the inability to contact all families, the program enrolls only about 34 percent of households residing in the intervention areas.

Working with PRISMA, we designed a two-part study to help expand their recycling program. The first part of the experiment tested different messaging treatments designed to increase enrollment in the door-to-door recycling program (the "participation" study), and the second tested different methods of increasing recycling compliance for those who participated in the program (the "participation intensity" study).

For the participation study, the experiment was built into PRISMA's expansion into new neighborhoods.⁷ In areas which had never before received the program, we randomly provided 6,718 households with messages encouraging individuals to recycle their waste. We tested four main information campaigns: i) a focus on social norms, encouraging recipients to “conform” to the pro-environmental behavior of their peers; ii) a focus on social sanctions, informing individuals that the participation rates of their street would be shared with others within and outside their community; iii) an injunctive to recycle that was endorsed by religious or government authorities; iv) a purely informational campaign with messages which stressed the social or environmental benefits of recycling and urged individuals to participate.

For the participation intensity study, we worked with a different sample of individuals than the participation study. The participation intensity study used a sample frame of those already enrolled in the recycling program, meaning they had recycled through PRISMA previously. These individuals were randomly assigned to receive either a recycling bin with a sticker with information on recyclables, a recycling bin without a sticker, or no bin (control). The bins component is designed to lower economic barriers, as the bins reduce the cost of recycling by not requiring the purchase of recycling bags, and by requiring less labor. Stickers test whether salient information on recycling increases the frequency and quality of participation.

As a sub-component to the participation intensity study, individuals who provided their cellphone numbers to PRISMA were randomly assigned to receive either a personalized weekly text message reminder, a generic weekly text message reminder, or

⁷ As a result of its past experience, PRISMA does not enter the wealthiest zones—as families are reluctant to talk to the canvassers—nor the poorest zones, as those can be dangerous for the canvassers.

no reminder (control). The text message reminder component aims to test whether limited attention is an important factor in participation in a recycling program.

Although the use of cellphones has grown recently in Peru, phones remain relatively expensive and are not affordable to all households. The full impact of the campaign was only received by those households who both owned a cell phone and were willing to share their phone number, since only they received the reinforcement text messages prior to the marketing agent visit. As shown in Appendix Table 1, cell phone owners in the participation study are slightly richer, more educated and more interested in local affairs (and especially in recycling matters) than non-cellphone-owners. This is important to note when considering the external validity of the impact of the SMS messaging treatments.

II. PARTICIPATION STUDY

2.1 Experimental Design⁸

Prior to the marketing campaign, we conducted a baseline survey of all households in the area where PRISMA was planning to expand. 6,718 families were in the participation study, in three rounds of expansion: the first with 1,804 households in the district of Castilla (March 2010), and the last two rounds in the district of Piura, with 2,173 and 2,744 households respectively (June 2010 and August 2010). Eighty-one percent of the households were present at the time of surveying, or 5,436 families. Households were given one of two surveys: a short survey of questions to provide us with basic information for analysis (such as phone numbers, questions related to their

⁸ Appendix Tables 6a and 6b show the treatments and hypotheses for each section of the study.

economic situation, and opinions and interest in receiving information about recycling), or a long survey intended to provide us with detailed information from a representative sample of households in the area. Of the full sample, 523 families received a long survey. Appendix Table 2 provides summary demographic statistics and also verifies that assignment to treatment was uncorrelated with demographic information collected in the baseline.

After being surveyed, all households were randomly assigned to treatment groups for messages, detailed below, aimed at increasing participation. One week before PRISMA began marketing, a flier with the assigned message was delivered to the household. We received valid phone numbers for about 35 percent of the sample, and sent those people SMS messages which reiterated the flier's message on the night before the marketer's visit and once a week through the end of the study. If people were present when the flier was delivered, a short verbal summary of the message accompanied the flier; if no one was at home, the flier was left on the doorstep. 65 percent of fliers were delivered in person, 32 percent were left on the doorstep, and 3 percent failed to be delivered. An orthogonality check on these two groups didn't raise any important concerns. (See Appendix Table 1b)⁹ The implementation of the text message campaigns was less successful. Due to technical limitations, only 80 percent of the SMSs that were sent reached their destination. The technical difficulties were especially problematic in

⁹ The only difference significant at more than a 10 percent level was number of persons in the household. Those households in which the flyer had to be left at the doorstep were slightly smaller on average. Since a larger household is presumably more likely to have someone present at any point in time, this doesn't seem overly concerning. Significant at the 10 percent level, households with flyers delivered in person were slightly more likely to use "advanced fuel" for cooking, but slightly less likely to have a color TV.

the first wave of the study, when approximately 60 percent of the messages were received by the households.¹⁰

We randomly assigned the households found in the baseline to 10 groups (9 treatment and 1 control), stratifying by street and household presence during the pre-study survey. Treatments groups “Conformity wealthy”, “Conformity poor”, “Signaling wealthy”, “Signaling poor”, “Authority Religious”, “Authority Municipal”, “Environmental emphasis” and “Social emphasis” account for 8.75 percent of the sample each, while the “Signaling proximate” treatment was assigned to 12.5 percent of the sample. We explain each treatment below. As we will conduct the analysis by combining related treatments (“Conformity wealthy” with “Conformity poor”, “Signaling wealthy” with “Signaling poor” and “Environmental emphasis” with “Social emphasis”) we randomized such that the “Signaling proximate” treatment would be overrepresented to maximize power. The remaining 17.5 percent of the sample was assigned to the control group, which did not receive a flier or a text message and was canvassed according to PRISMA’s usual procedure. The division of the sample into treatment groups can be seen in Table 1, Panel A.

All fliers included both a generic message about PRISMA’s program—“Do you know that an association of recyclers is starting a recycling program in your area? By recycling, you help both the environment and the informal collectors to get a formal and decent job”—and a treatment message (except for the control group). The text message only contained the treatment message. The treatment messages printed on the fliers and

¹⁰ The service provider which sent the SMS messages provided reports of whether the message reached the intended phone, from which we estimated the delivery success rate. Network failures, off phones, and incorrect phone numbers were the main factors for failed delivery.

contained in the SMS were formulated as to allow us to provide evidence on the following questions:

Do social norms and peer comparisons affect recycling program enrollment?

If yes, do peer effects operate through:

conformity, defined as seeking to emulate the behavior of peers? (Cialdini and Goldstein, 2004); or

signaling, defined as seeking peers' approval? (Gerber, Green and Larimer, 2008)

Is pro-environmental behavior influenced by *authority*? (Cialdini and Goldstein, 2004)

Is recycling behavior influenced by emphasizing the *benefits* of recycling? Are there differential effects for mentioning *environmental* or *social* (employment) benefits?

Conformity: “*Conformity wealthy*” and “*Conformity poor*” groups. Messages encouraging individuals to behave *as well as* others by describing the majority’s behavior as an existing norm have been shown to influence the adoption of environment-friendly behaviors (Cialdini and Goldstein 2004). Goldstein et al. (2008) show that the power of descriptive norms varies according to the reference group to which the participant is compared. We designed two “conformity messages” which described high participation rates for the program in other neighborhoods.¹¹ We varied whether the reference neighborhood was of high or low socioeconomic status, which may affect the degree to which people identified with the reference group and responded to the message. The exact wording on the flier and sent in the SMS message was: “*In parts of [nearby wealthy / poor area], more than 75 percent of the families participate in the recycling program. Join them!*”

¹¹ These participation rates are accurate albeit based on back-of-the envelope calculations.

Signaling: “*Signaling wealthy*”, “*Signaling poor*” and “*Signaling proximate*” groups. A large body of literature in social psychology shows that individual behaviors are influenced by how public people perceive their actions to be (Cialdini and Goldstein 2004; Lerner and Tetlock 1999). Gerber, Green and Larimer (2008) show that inducing social pressure by telling individuals that their peers will be informed of their actions can increase voting, a pro-social behavior like recycling. They also demonstrate that different levels of proximity to those peers can have a stronger or weaker influence on one’s actions, either by signaling a desirable trait about an individual to those who observe them (e.g. voting indicates one is civic-minded, while recycling indicates a person is a responsible steward of the earth), or by motivating individuals to take certain actions through punishment or the threat of it, whether by criticism or social sanction.

We sought to understand whether this effect would persist when the information pertains to a group with which an individual identifies, rather than a specific individual. Although there may be other factors involved, we chose to reveal the actions of groups of people (those living on the same street) to other groups, which had plausibly different abilities to sanction members of the group whose actions were public. We informed households in certain streets that the participation level of their street would be revealed to others on nearby streets, with whom they were likely to have direct interaction and might face direct criticism for choosing not to participate, and other households that the information would be revealed to individuals in more distant areas. Based on individual survey responses, it appears that the reputation of the household within their local community was important, as was the reputation of their community in the larger urban area. Thus the motivation to signal should be present when information was revealed

locally and to more distant communities, but the threat of potential social sanction is more likely present when information about participation was to be revealed locally.

One message encouraged individuals to set an example for their geographically proximate peers: *“In order for more families on the other side of the street to participate in the recycling program, we will inform them of how many participated on your side of the street. Set a good example for them!”* We refer to this message as “Signaling proximate.” For distant areas, we again chose areas with high or low socioeconomic status. The specific wording of the messages referencing distant communities was: *“In order for more families in [a wealthy /poor area] to participate in the recycling program, we will inform them of how many participated in your area. Set a good example for them!”* We refer to these messages as “Signaling Wealthy” and “Signaling Poor”.

Authority: *“Authority Religious”* and *“Authority Municipal”* groups. One of the most memorable and important contributions to the study of how social forces influence behavior is Milgram’s (1974) famous work on the role of authority in compliance. Milgram’s work, and that which followed, showed that individuals have a strong tendency to conform to norms which are presented to them by authority figures (Cialdini and Goldstein 2004). To test whether authority would be relevant in promoting environment-friendly behaviors, we designed two messages which presented participating in the recycling program as in accordance with the wishes of a higher authority. Because a large proportion of the population is religious, one message cast participation in the recycling program as consistent with religious ethics. The message, which we refer to as “Authority Religious”, reads *“Protect the Earth God created for all. Participate in the recycling program! Recycle!”* The message was limited to mention religious principles rather than authorities because the local religious authorities preferred

not to be mentioned in the campaign. The other treatment, “Authority Municipal”, invoked local government authority in advocating participation in the recycling program. This message read “*The Municipality of [Piura/Castilla] invites you to participate in the recycling program. Recycle!*” encouraging families to participate in their named municipality.

Benefits of Recycling: “*Environmental emphasis*” and “*Social emphasis*” groups. In a review of the literature on possible interventions to solve “large-number small-payoff” issues, Carlson (2001) notes that informational campaigns emphasizing the benefits (social, environmental, etc.) of the “good” way to behave are very commonly used. In studying the effect of social pressure on voter turn-out, Gerber, Green and Larimer (2008) show that generic messages appealing to what people know to be right had a positive influence on individual behaviors, but not as large as the one they observed for messages which induced direct social pressure to behave a certain way. While many information campaigns advocating pro-environmental behaviors emphasize the environmental benefits of certain actions, in this particular context choosing to participate in the recycling program has both environmental and local social benefits, in the form of the formal job created for the collectors.

To understand whether making the local social benefits of participation salient to individuals would have a differential impact than the more traditional route of emphasizing environmental benefits of participation, we added two messages appealing to people’s conscience. One emphasized environmental benefits, while the other emphasized local social benefits for the recyclers. The “Environmental emphasis” treatment reads, “*By recycling, you will take care of the environment, and make our city cleaner. Participate in the recycling program! Recycle!*” while the “Social emphasis”

message reads, “*By recycling, you will help the informal collectors get a formal and more decent job. Participate in the recycling program! Recycle!*”

2.2 Outcome collection and measurement

The outcome measures come from administrative data from PRISMA. These data specify whether the family took-up the program when solicited by a PRISMA marketers and whether the household turned in recyclables in each of the following four weeks.¹²

Based on this data, we consider three outcome variables to represent household’s participation in the recycling program,

“*Participates at any time*” is an indicator equal to 1 if the family participated in the program and gave at least once.

“*Participation ratio*” is the ratio of the number of times a household turned in residuals over the number of opportunities it had to turn in residuals. This variable measures the strength of commitment to the program. In constructing this measure, the denominator, opportunities to turn in residuals, includes instances in which there was nobody at the household when the residual collector visited.

“*Participates during either of last 2 visits*” is an indicator of whether the household turned in residuals during one of the last two canvassing weeks (weeks [n] and [N] of the marketing/enrollment campaign). It measures the initial persistence of households’ commitment to the program.

During the data collection process, we were unable to obtain outcome data for 1468 houses due to coordination problems with PRISMA, household migration, and households choosing to combine their recyclables with other households. The latter households were excluded because we had no way of determining what percent of recycling came from each participant and we are therefore unable to construct accurate

¹² PRISMA considers a household as “participating” if they gave residuals at least once to the collector during the trial period.

outcome values for them. We tested for differential attrition rates between treatment groups and found no significant differences. Our final sample for the participation study comprises 5250 households.¹³

2.3. Results: Effect of Treatments on Participation

Using an intent to treat framework, we find no significant treatment effect from receiving any of the marketing messages on participation or participation intensity compared to the control (no message) group, i.e., the personal visit from the canvassing agent was made no more (or less) effective by the pre-canvassing distribution of marketing material. We show this in a regression framework (Table 2, Panel A and Table 3). Because the marketing message was reinforced by cellphone (in addition to the flier), we also analyze the data for the subsample that provided a cellphone number. We similarly find no effect from the marketing message on this subsample where the treatment also included an SMS (regression results available in Appendix Table 3).

For the regression framework, we use the following specification:

$$(1) \quad Y_i = \beta T_i + \alpha_j + \varepsilon_i$$

where Y indicates our outcome of interest (participates at any time, take-up ratio and participates during last visits), T takes the value of 1 if the household received a flier and/or SMS and i indexes households. In subsequent analysis we replace T with a full set of dummies for each of the treatment messages. In all specifications the control group is the omitted category. The regression equation includes street fixed effects (α) because randomization was stratified by street.

¹³ Attrition in the Treatment and Control groups was 0.130 and 0.138 respectively. With a p-value of 0.449, a t-test fails to reject the null hypothesis that these are equal.

We are able to rule out a modest treatment effect; that is, we estimate a null effect fairly precisely (Table 2, Panel A and Table 3). For any treatment, an effect of anything greater than 5 percentage points lies outside the 95 percent confidence interval. We also analyze subsamples of respondents based on whether they were handed the flyer in person or had it left on their doorstep and find similar results.

2.4. Discussion of Participation Study Results

In this section we discuss possible explanations for the null results: first, we address the possibility that they are simply due to experiment design or implementation, and second, we address possible reasons for the ineffectiveness of messaging campaigns. The first aspects of internal validity that must be explored are issues related to attrition, receipt and understanding of treatment, and spillover effects. Orthogonality checks were performed on attritors and suggest this is not a likely explanation for the results. While we do not have information from the households which allow us to test precisely whether they received and understood the messages, neither of these is likely to have contributed to any internal validity failures. Over half of the flyers were delivered in person, and we have similar data on the receipt of SMS messages. Understanding is not likely to have been an important contributing factor either; all treatments were quite simple, and everyone also received the in person visit and therefore likely had a basic understanding of recycling already. We did not find any outstanding issues related to possible spillover effects that may have affected our findings. In this regard, the data was thoroughly checked and we found no evidence of this issue when testing for possible heterogeneity between treated and control areas even within the same streets.

This leads to an aspect of experiment design that we do believe may have been a contributing factor to the lack of effectiveness of messaging: PRISMA's in person marketing campaign. The personal marketing visit may have swamped the treatment effects of the messaging, such that without the personal marketing visits the messaging would have changed behavior. In other words, those who do not respond to a personalized visit may be more committed non-recyclers and unresponsive to messaging treatments, but those who do respond to a personalized visit would have responded to a messaging treatment even if they had received one without a personalized visit. This issue is not one of internal validity, but it does make the results less widely applicable. Since the messaging treatments were tested in an environment where everyone received a personalized visit to promote recycling, we can only conclude that messaging is ineffective under those specific constraints. Burn and Oskamp (1986) also used a mix of in person visits and written messaging, but their control group received neither. Their results showed a large significant increase in recycling behavior for all treatments relative to their control, but no significant differences between the three treatment arms. While certainly not conclusive, this provides further evidence that in person visits may be the most important part of incentivizing good recycling behavior.

We put forward several other explanations for the failure of the treatment to generate any increase in participation or participation intensity. One possible explanation is that the messages may have been wrong for this context in that they were motivated by studies in the United States where there are different norms, attitudes, and knowledge about recycling. A related explanation is that the strength of opinions may differ. It is difficult to find information on attitudes specific to recycling, but we were able to look more closely at the environmental questions from the World Values Survey (2006) in

Peru and the United States. As noted previously, Peruvians were just as likely as Americans to report that they felt protecting the environment was important, and were more likely to report being willing to give part of their income for the environment (77 percent compared to 51 percent). They were also more likely to be amenable to tax increases if the government would provide environmental protection. In addition, Peruvians interviewed were no less likely than Americans to “agree strongly” with these statements, a potential proxy for level of commitment to environmental action, suggesting strength of norms or additions is unlikely to provide a clear explanation for the null result. Other environment questions in the survey asked respondents about their views on the importance of various local and global environmental problems. Those surveyed in the United States exhibited no more concern about these issues than those in Peru. While these numbers can provide only a rough proxy for specific attitudes about recycling, they do suggest that these are not an obvious rational for the differing results between earlier American trials and ours. Potentially, however, because these number reflect more serious global and local environmental concerns we are not accurately capturing views on recycling with them. Peruvians, faced with more serious problems close to home might feel recycling is so much less serious than other concerns that they are less willing to expend energy on it.

A possible related explanation is that the messages, modeled on those from several different studies in the United States, failed because the subjects of this experiment have norms they want to conform to. For instance, they may feel more or less desire to conform to the expectations of the church or a local authority. Once again the World Values Survey allowed us to look at very rough proxies for several of the messages, church and authority (national instead of local), and there was no evidence

Peruvians felt less strongly than Americans. This argument also seems less valid than other possibilities since none of the messages had any significant effect and none were significantly different than others. If there were differing norms one might expect to see some messages work while others failed.

A third explanation, based on our own surveys, has to do with the fact that individuals in Peru seem to perceive that their active recycling through a formal program is no better for the environment than the existing informal recyclers (who scavenge recyclable items from trash bags and dumps, and perhaps are even more effective at sorting). Thus the formal process requires more effort and work, and does not change the ultimate outcome from an environmental perspective. This explanation has the benefit of explaining why similar messaging was successful in the United States, where such informal recycling exists but it far less prevalent, but not in Peru.

III. PARTICIPATION INTENSITY STUDY

3.1. Experimental Design

In addition to the enrollment study, we conducted a participation intensity study amongst individuals who had previously enrolled in the recycling program, meaning they had recycled through PRISMA at some point in the past. The purpose of this second phase was to assess whether failure to regularly remit recyclables might be attributable to either forgetfulness or the costs of participating, including time costs or the inconvenience of storing recyclables for a week. In the participation intensity study, we randomly assigned program households to receive either a bin with an informative sticker about how to recycle, a bin without an informative sticker, or no bin. The bin tests the

hypothesis that the inconvenience or cost of recycling hinders participation, as households report that bags are often too small and inconvenient for recycling. The sticker treatment tests the hypothesis that lack of knowledge contributes to the high contamination of recyclables, which is a considerable problem for collectors.

Independently of the bin randomization, we also randomly assigned households with a cell phone number to one of two SMS reminder treatment groups or a control group receiving no message. Prior research finds that identity and social context can dramatically change the impact of a message (Cialdini and Goldstein 2004). As such, half of the SMS messages were generic reminders, and half were personalized messages stating the name of the recipient and the name of the collector requesting that their client remembers to recycle. These messages were sent weekly to each phone number on the evening before the collector was scheduled to pick up the recyclables. Approximately 80 percent of messages reached the intended recipient.¹⁴

A total of 1,802 individuals who were already enrolled in the recycling program were identified in different zones of the district of Castilla. We visited the individuals at their homes to administer a short survey which captured basic demographic information and requested cell phone numbers and permission to contact respondents with information about recycling. A longer survey capturing more precise information about socioeconomic situation and recycling behavior was administered to 10 percent of the sample. All households were randomly assigned into treatment groups. During data collection, 17 households could not be located, largely due to the household moving

¹⁴ The service provider, which sent the SMS messages, provided reports of whether the message reached the intended phone, from which we estimated the delivery success rate. Network failures, off phones, and incorrect phone numbers were the main factors for failed delivery.

elsewhere; we dropped these observations from our analysis, leaving a sample of 1,785 households in the participation intensity study.

Out of the 1,785 households in the participation intensity study, approximately 50 percent (829 observations) provided us with a valid cell phone number. Among those, we randomly assigned households to one of three equal-sized groups: “Generic SMS”, “Personalized SMS,” and a control group receiving no text message. This randomization was stratified at the street level.

The 1,785 were then randomly assigned to receive a plastic bin to store their recyclables, a plastic bin with a sticker, or no bin (i.e., single-use plastic bags, which are normally distributed). We stratified this randomization on the SMS treatment assignment. In total, 299 households received a bin with informational stickers attached, 300 received an unadorned bin, and 1,186 received no bin. Table 1, Panel B shows how the sample was divided into randomly assigned treatment groups.

3.2. Outcome collection and measurement

The data collection phase of the participation intensity study went on for eight weeks; the two first weeks were dedicated to baseline measurement, before bins were distributed or SMS messages were sent, and the following six weeks were dedicated to outcome data collection. During data collection, an observer accompanied each recyclables collector on his route to track the participation intensity of each household visited and measure the quantity and quality of recyclables remitted.

Based on the data collected during these visits, we consider the following outcome variables:

“Percent of visits turned in bag”: the proportion of weeks in which the household had an opportunity to turn in a bag or bin of recyclables and in which they actually did so. In calculating this percentage we treat an absence as not turning in recyclables.

“Average number of bins turned in per week”: the average volume of recyclables turned into the collector, as measured by the number of full standard-size bins given to the collector, over the 6 weeks of post-treatment data collection¹⁵.

“Average kg. recyclables turned in per week”: the average weight of recyclables given over the 6 weeks of post-treatment data collection.

“Average market value of recyclables turned in per week”: the average value of the recyclables that were given in terms of prices received by the collector for the items collected, over the 6 weeks of post-treatment data collection.

“Average percent contamination per week”: the average percentage of non-recyclables (by weight) that are mixed in with the recyclable items, over the 6 weeks of post-treatment data collection.

3.3. Results: Effect of Treatments on Participation Intensity

Baseline summary statistics reveal that participation intensity with the PRISMA program is fairly high among the households that had previously indicated their willingness to participate: households turn in a bag in 78 percent of visits. On the intensive margin, in terms of the quantity of recyclables given (measured by volume in terms of the number of bins, of a fixed size, turned in and in terms of weight as measured by kg), however, there may be more scope to increase participation. Moreover, at baseline, over 15 percent of the items turned in, by weight, are non-recyclable items, or “contamination,” which must be separated by the collectors.

¹⁵ Scaling by the number of the people in the household yields no differences in results.

As a first look at the effects of the interventions, we plot the mean of various measures of participation by treatment status. Looking first at the bin treatments, We find that bins have a positive impact on participation: recipients of bins turn in recyclables with higher frequency (i.e., they turn in items on more weekly visits) as well as higher quantities of recyclables, measured both in volume and weight, than households which did not receive a bin. Along these dimensions we do not see a clear difference between the bins with stickers and those without. Recipients of bins also include fewer non-recyclable items in with their recyclables, a phenomenon that appears to be driven from those households that received bins with stickers indicating which items are in fact recyclable.

Turning to SMS treatments, our findings do not indicate a clear impact of SMS reminders. In fact, for some outcomes it appears that recipients of personal SMS messages turn in fewer recyclables than households that received no message. It should be noted however that this figure, as well as the one before it, ignores interaction effects (since some households receive both bins and SMS messages) and omits potentially important control variables, including whether the household has a cell phone, street characteristics and baseline participation levels.

To address the issue of interaction effects, we plot outcomes for every possible combination of bin and SMS treatments and find that individuals who receive a bin, in combination with a SMS message or alone, tend to turn in recyclables more often and in larger quantities. It also appears that individuals who receive a bin with an informational

sticker reduce contamination more than other households, although this is less so among the group of households who do not have a cell phone¹⁶.

In order to assess the statistical significance of these differences and to control for stratification variables and the baseline value of the outcome variable, we turn to regression analysis.

In particular, we estimate:

$$(2) \quad y_{is} = \beta_1 B_g + \beta_2 B_s + P_{is} + \lambda y_{blis} + \alpha_j + \varepsilon_i$$

where y indicates our outcome of interest, i indexes household, B_g is an indicator that the household received a generic bin (without a sticker) and B_s is an indicator that the household received a bin with an informational sticker (not receiving a bin is the omitted category). P is an indicator variable capturing whether the household has a cell phone, which is included as it will be correlated with SMS assignment, and Y_{bl} is a baseline measure of the outcome for that household. The regression equation also included street fixed effects (α), as the randomization was stratified by street.

We estimate this equation separately among households that do not have a cell phone and those that do but did not receive a SMS message, in which case P drops out of the equation and also where interaction effects are not of concern. We also estimate the equation on the full sample.

Table 4 presents the results, demonstrating that the receipt of the bin had positive impacts on participation behaviors. We find that households that received a bin are 4.5 percentage points more likely turn in recyclables (Panel A), which represents a 6 percent increase over the sample mean for this outcome. The point estimates suggest that the

¹⁶ Figures showing these findings are available upon request. In addition, we also performed a simple two-stage Heckman selection equation and found no difference between groups.

magnitude of the effect is stronger for bins with stickers (Panels B and C), but for the most part we fail to reject equality of the coefficients for receiving the bin with and without the sticker.

With respect to other measures of participation intensity: the volume, weight and market value of recyclables given, we detect larger effects (measured as a percentage of the sample mean of the outcome) which are highly statistically significant both among households without a phone and in the full sample. In terms of the effect on contamination, the point estimates indicate that receiving a bin reduces the degree of contamination, but these estimates are generally not statistically different from zero.

We also estimate equation (2) where we replace B_g and B_s with S_g and S_p ; indicator variables that the household received an impersonal or personal text message respectively. We conduct this analysis restricted to the sample with a cell phone, the sample with a cell phone that did not receive a bin (where interaction terms are irrelevant) and in the whole sample. The results of the latter specification are presented in Table 5, and the split sample in Panels A and B respectively of Appendix 5. They fail to indicate any statistically significant effect of SMS reminders to recycle, which is consistent with the graphical presentations discussed above.

We finally examine these effects simultaneously and account for interaction effects. We estimate each of the following equations:

$$(3) \quad Y_i = \beta_1 B + \beta_2 S + \lambda Y b l_i + P_i + \alpha_j + \varepsilon_1$$

$$(4) \quad Y_i = \beta_1 B g + \beta_2 B s + \beta_3 S g + \beta_4 S p + \lambda Y b l_i + P_i + \alpha_j + \varepsilon_1$$

$$(5) \quad Y_i = \sum_j \beta_j T_j + \lambda Y b l_i + P_i + \alpha_j + \varepsilon_i$$

where B and S are indicator variables that the household receives any bin or any SMS treatment. In equation (5) T_j denotes a distinct combination of bin and SMS treatment; the omitted category is having no phone and receiving no bin.

Panels A, B and C of Table 4 show estimates from equations 3-5 which indicate highly significant effects of bin provision on recycling behavior, the magnitudes of which are consistent with those estimated from examining the effect of bins in isolation. The final panel presents results from a full model with indicator variables for every possible combination of treatments (no phone and no bin is the omitted category). We generally find statistically significant and positive effects of treatment on recycling behavior when the treatment includes the provision of a bin.

3.4. Discussion of Participation Intensity Study

The participation intensity results suggest that forgetfulness is not a serious constraint to recycling among households who have already self-selected into the recycling program. Rather it appears that the inconvenience of storing recyclables for the collectors represents a substantive barrier. Indeed households report not liking to keep recyclable refuse around the house because it occupies space and attracts insects. This finding is consistent with the case made in Carlson (2001) that reducing the costs incurred by individuals when engaging in pro-environmental behavior is the most effective way to change behavior.

Doing so, however, requires that some resources be dedicated towards reducing those costs; in this context it is the cost of providing the bin to households. Given that recyclables represent an income stream to the collectors who gather and re-sell them, it is

possible that investing in bin provision represents a profitable prospect, even abstracting from the non-monetary benefits of additional recycling. To answer that question, we estimate the benefits of investing in bins, compared to the provision of one recycling bag per week to each participating family, as is currently done by PRISMA.

Our point estimates suggest that an investment of 14 soles (the cost of a bin without sticker) leads to an increase of 0.09 soles worth of recyclables turned in by each household each week. Additionally, households receiving a bin increase the percentage of weeks in which they turn in recyclables by 3.7 percentage points. Among the group that received no intervention, households turned in recyclables 76 percent of the time, with an average value of 0.418 soles per week. Therefore the value of the increased participation intensity induced by the bin is $(52 \text{ weeks}) * (76\%) * (0.09 \text{ soles}) + (52 \text{ weeks}) * (3.7\%) * (0.09 \text{ soles}) + 4.18 \text{ soles}$, or 4.53 soles. Adding the benefit from not having to buy the recycling bags anymore (0.075 soles per family per participating week), yields an additional benefit of $(52 \text{ weeks}) * (76\%) * (0.075 \text{ soles}) = 2.96 \text{ soles}$, for a total benefit of 7.494 soles per household per year.

On the other hand, an investment of 14.87 soles (the cost of a bin with an informational sticker), increases weekly participation rates by 6 percent and average value of recyclables by 0.107 soles per week. A similar calculation as before yields an additional benefit of 8.827 soles per household per year. As shown in the table below, if PRISMA is able to retain households in the program for two years, investment in bins would both increase the quantity of items recycled through the program and increase the income of collectors beyond the cost of the bins.

Type of bin	Price	Annual benefit/family for collector	Time to break even
Bin without sticker	5.00 USD ¹⁷ (14.00 soles)	2.68 USD (7.49 soles)	21.4 months
Bin with sticker	5.31 USD (14.87 soles)	3.15 USD (8.83 soles)	20.2 months

IV. CONCLUSIONS

As part of a randomized evaluation of a recycling program in Peru, we tested a number of popular messaging approaches to environmental behavioral change, including information, reminders, social norms, appeals to the threat of social sanction, and authority endorsement. We found that none of the informational messages, many of which are similar to messages that have found to be successful in developed country contexts, are effective in increasing participation in this program. This is a fairly precise null result; we are able to rule out effects of relatively small magnitudes. We do find, however, that the provision of bins that make recycling more convenient and cleaner increases participation levels substantially, and would be a cost effective expansion strategy for the PRISMA's program.

These results suggest that the lessons drawn from certain campaigns promoting pro-social behaviors may not generalize across contexts and countries, indicating there are substantial gains to continued theory (to model what specific contextual factors will influence treatment effects) and experimentation and evaluation to test more robust theories which incorporate more contextual factors. Furthermore, we find that the single treatment that changed the relative costs and benefits of the recycling choice (reducing

¹⁷ Currency conversion based on average 2010 exchange rate.

the cost of recycling by providing recycling bins) changed behavior, whereas the treatments that merely changed messaging had no effect.

References

- Alcott, Hunt. 2009. "Social Norms and Energy Conservation." Center for Energy and Environmental Research.
- Alpizar, Francisco., Fredrik Carlsson, and Olof Johansson-Stenman. 2008. "Anonymity, reciprocity, and conformity: Evidence from voluntary contributions to a national park in Costa Rica." *Journal of Public Economics* 92(5-6): 1047-1060.
- Bertrand, Marianne, Dean Karlan, Sendhil Mullainathan, Eldar Shafir, and Jonathan Zinman. 2009. "What's Advertising Content Worth? Evidence from a Consumer Credit Marketing Field Experiment." *Quarterly Journal of Economics* 125(1): 263-305.
- Bryce, Wendy J., Rachel Day, and Thomas J. Olney. 1997. "Commitment Approach to Motivating Community Recycling: New Zealand Curbside Trial." *The Journal of Consumer Affairs* 31(1): 27-52.
- Burn, Shawn M. and Stuart Oskamp. 1986. "Increasing community recycling with persuasive communication and public commitment." *Journal of Applied Social Psychology* 16: 29-41.
- Burn, Shawn M. 1991. "Social Psychology and the Stimulation of Recycling Behaviors: The Block Leader Approach." *Journal of Applied Social Psychology* 21(8): 611-629.
- Carlson, Ann E. 2001. "Recycling Norms", *California Law Review*, 89(5): 1231-1300.

- Chauvin, Lucien. 2009. "Peru's Scavengers Turn Professional." Time Magazine. February 10, 2009. Available at <http://www.time.com/time/world/article/0,8599,1878475,00.html>
- Choi, James J., Emily Haisley, Jennifer Kurkoski, and Cade Massey. 2012. "Small Cues Change Savings Choices." NBER Working Paper.
- Chu, Pin-Yu and Ja-Fun Chiu. 2003. "Factors Influencing Household Waste Recycling Behavior: Test of an Integrated Model." *Journal of Applied Social Psychology*, 33(3): 604-626.
- Cialdini, Robert B. and Noah J. Goldstein. 2004. "Social Influence: Compliance and Conformity", *Annual Review of Psychology*, 55: 591-621.
- Deaton, Angus. 2010. "Instruments, Randomization and Learning about Development", *Journal of Economic Literature*, 48 (June 2010): 424-455.
- Elster, Jon. 1989. "Social Norms and Economic Theory." *Journal of Economic Perspectives*, 3(4): 99-117
- Frey, Bruno S. and Stephan Meier. 2004. "Social Comparisons and Pro-social Behavior: Testing 'Conditional Cooperation' in a Field Experiment." *American Economic Review*, 94(5): 1717-1722.
- Gerber, Alan S., Donald P. Green and Christopher W. Larimer. 2008. "Social Pressure and Voter Turnout: Evidence from a Large-Scale Field Experiment." *American Political Science Review*, 102(1): 33-48.
- Goldstein, Noah J., Robert B. Cialdini and Vidas Griskevicius. 2008. "A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels." *Journal of Consumer Research*, 35(3): 472-482.

- Karlan Dean, Margaret McConnell, Sendhil Mullainathan, and Jonathan Zinman. 2011. "Getting to the Top of Mind: How Reminders Increase Saving." Working Paper.
- Lerner, Jennifer S. and Philip E. Tetlock. 1999. "Accounting for the effects of accountability." *Psychological Bulletin*, 125: 255-275.
- Lord, Kenneth R. 1994. "Motivating Recycling Behavior: A Quasiexperimental Investigation of Message and Source Strategies." *Psychology & Marketing*, 11(4): 341-358.
- Milgram, Stanley. 1974. *Obedience to Authority*. New York: Harper & Row.
- Miller, Norman and Donald T. Campbell. 1959. "Recency and primacy in persuasion as a function of the timing of speeches and measurements." *Journal of Abnormal and Social Psychology*, 59: 1-9.
- Pew Global Attitudes Project, 2007, *Spring 2007 Survey of 47 Publics: Final 2007 Trends Topline*. Retrieved September 20 2011, from <http://pewglobal.org/files/pdf/258topline.pdf>.
- Schultz, P. Wesley. 1999. "Changing Behavior with Normative Feedback Interventions: A Field Experiment on Curbside Recycling." *Basic and Applied Social Psychology* 21(1): 25–36.
- Strango, Victor and Jonathan Zinman. 2011. "Limited and varying consumer attention: evidence from shocks to the salience of bank overdraft fees." NBER Working Papers.
- Thaler, Richard and Cass R. Sunstein. 2008. *Nudge: Improving Decisions About Health, Wealth and Happiness*. New Haven: Yale University Press

UNEP (United Nations Environment Programme Environment for Development), 2010, *Global Environmental Outlook: Latin America and the Caribbean*. Panama City, Panama: United Nations Environmental Programme.

World Values Survey Association, 2009, *World Values Survey 1981-2008 Official Aggregate v. 20090901*. Retrieved September 20 2011, from <http://www.wvsevsdb.com/wvs/WVS Data.jsp?Idioma=I>.

World Values Survey Association, 2005, *World Values Survey 2005 Official Data File v.20090901*. Retrieved April 22, 2013, from <http://www.wvsevsdb.com/wvs/WVSDData.jsp?Idioma=I>.

Zwane, Alix P. et al. 2010. "Being surveyed can change later behavior and related parameter estimates." *Proceedings of the National Academy of Sciences*, 108(5): 1821-1826.

Table 1: Both Participation and Participation Intensity Studies - Treatment Assignment

<i>PANEL A: Participation study</i>					
	Without Cell Phone	With Cell Phone	Total		
Any Message	3129	2432	5561		
Norms, rich	352	242	594		
Norms poor	327	253	580		
Signal, rich	328	252	580		
Signal, poor	328	252	580		
Signal, local	533	399	932		
Religious	310	265	575		
Municipality	310	250	560		
Environmental emphasis	318	263	581		
Social emphasis	323	256	579		
No Message	643	514	1157		
Totals	3772	2946	6718		
TOTAL= 6718					
<i>PANEL B: Participation intensity study</i>					
	Without Cell Phone	With Cell Phone	<i>With Cell Phone Sub-treatments</i>		
			Generic SMS	Personal SMS	No SMS
Bins with Sticker	167	132	42	45	45
Bins without Sticker	160	140	45	50	45
No Bin	629	557	186	183	188
Totals	956	829	273	278	278
TOTAL= 1,785					

Note: Tables show distributions of treatment assignment for both participation and participation intensity studies.

Table 2: Both Participation and Participation Intensity Studies - Overall Treatment Effect from Receiving Any Treatment

	(1)	(2)	(3)
	Participates at anytime	Participation ratio	Participates during either of last 2 visits
<i>PANEL A: Participation study</i>			
Treatment	0.002 (0.016)	-0.007 (0.041)	0.001 (0.016)
Observations	6717	6687	6717
R-Squared	0.055		0.065
Mean of dependent variable	0.506	0.332	0.402
Sd of dependent variable	0.500	0.392	0.490
<i>PANEL B: Participation intensity study</i>			
Treatment	0.005 (0.007)	0.142 (0.167)	0.021 (0.020)
Observations	1782	531	1782
R-Squared	0.121		0.117
Mean of dependent variable	0.978	0.658	0.793
Sd of dependent variable	0.146	0.267	0.405

Notes: The table shows the results of measures of household's participation in the program (whether they ever turned in recyclables, the percentage of times they turned in recyclables or whether they turned in recyclables in one of the last two times they were visited) regressed on a treatment indicator that the household was randomly assigned to in each study. OLS models are used for Columns 1 and 3 and Ordered Probit Model is used for Column 2. One observation from Table 1 is excluded in Panel A because of a missing value for the street variable. Robust standard errors are shown in parentheses. All regressions include street fixed effects. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Table 3: Participation Study - Treatment Effect of Each Different Message on Households' Decisions to Participate

	(1) Participates at any time	(2) Participation ratio	(3) Participates during either of last 2 visits
Norms, rich	-0.007 (0.025)	-0.032 (0.065)	-0.020 (0.024)
Norms, poor	0.022 (0.025)	0.034 (0.065)	0.014 (0.024)
Signal, rich	0.008 (0.025)	0.018 (0.065)	0.015 (0.025)
Signal, poor	-0.008 (0.025)	-0.042 (0.065)	-0.023 (0.025)
Signal, local	-0.018 (0.022)	-0.031 (0.056)	-0.006 (0.021)
Religious	0.005 (0.025)	-0.019 (0.066)	0.002 (0.025)
Municipality	0.022 (0.026)	0.020 (0.066)	0.002 (0.025)
Environmental emphasis	0.004 (0.025)	0.011 (0.065)	0.015 (0.025)
Social emphasis	0.003 (0.025)	-0.006 (0.065)	0.013 (0.024)
Observations	6717	6687	6717
R-Squared	0.056		0.066
Mean of dependent variable	0.506	0.332	0.402
Sd of dependent variable	0.500	0.392	0.490

Notes: The table shows results of measures of households' participation in the program (whether they ever turned in recyclables, the percentage of times they turned in recyclables or whether they turned in recyclables in one of the last two times they were visited) regressed on all specifications of the treatment in the participation study. OLS models are used for Columns 1 and 3 and Ordered Probit Model is used for Column 2. Each specification corresponds to a particular framing of the extra information delivered. One observation from Table 1 is excluded in Panel A because of a missing value for the street variable. Robust standard errors are shown in parentheses. All regressions include street fixed effects. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Table 4: Participation Intensity Study - Treatment Effect of Bins and Text Messages (SMS) on Recycling

	(1)	(2)	(3)	(4)	(5)
	Percent of visits turned in bag	Avg. # bins turned in per week	Avg. kg recyclables turned in per week	Avg. market value of recyclables given per week	Avg. percent contamination per week
<i>PANEL A: Main effects without interactions</i>					
Any bin (1)	0.045*** (0.012)	0.115*** (0.017)	0.187*** (0.032)	0.108*** (0.018)	-0.009 (0.007)
Any SMS (2)	0.002 (0.014)	0.005 (0.021)	-0.024 (0.039)	-0.02 (0.022)	-0.004 (0.009)
Has cell phone	0.022 (0.014)	0.047** (0.02)	0.105*** (0.038)	0.057** (0.022)	0.01 (0.008)
Percent baseline visits turned in bag	0.374*** (0.017)				
Avg. # bins turned in per week, baseline		0.373*** (0.014)			
Avg. kg recyclables turned in per week, baseline			0.281*** (0.011)		
Avg. market value of recyclables given per week, baseline				0.232*** (0.010)	
Avg. percent contamination per week, baseline					0.292*** (0.019)
Street Fixed Effects	Yes	Yes	Yes	Yes	Yes
F-test p-value: (1) = (2)	0.02	0	0	0	0.64
Observations	1781	1781	1781	1781	1588
R-Squared	0.34	0.44	0.38	0.35	0.34
Mean of dependent variable	0.78	0.68	0.76	0.49	0.13

Notes: The table shows household level recycling variables in the participation intensity study regressed on indicators for any SMS or bin treatment (Panel A). “Avg. # bins turned in per week” reflects the volume of recyclables remitted in units of standard size bins. “Avg. market value of recyclables given per week” is the estimated by valuing the quantities of different materials (glass, paper, etc.) at the prices which collectors receive for those items. “Avg. percent contamination per week” is the weight of non-recyclable items included in the bag remitted to collectors divided by the total weight of the bag. Standard errors are shown in parentheses. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Table 4b: Participation Intensity Study - Treatment Effect of Bins and Text Messages (SMS) on Recycling

	(1)	(2)	(3)	(4)	(5)
	Percent of visits turned in bag	Avg. # bins turned in per week	Avg. kg recyclables turned in per week	Avg. market value of recyclables given per week	Avg. percent contamination per week
<i>PANEL B: Sub-treatments without interaction effects</i>					
Bin with sticker (1)	0.055*** (0.015)	0.128*** (0.022)	0.205*** (0.042)	0.125*** (0.024)	-0.012 (0.009)
Bin without sticker (2)	0.035** (0.015)	0.103*** (0.022)	0.17*** (0.041)	0.091*** (0.024)	-0.006 (0.009)
Personal SMS	-0.009 (0.017)	-0.008 (0.025)	-0.046 (0.047)	-0.026 (0.027)	-0.008 (0.010)
Generic SMS	0.015 (0.017)	0.02 (0.025)	0 (0.048)	-0.013 (0.027)	0 (0.010)
Has cell phone	0.022 (0.014)	0.046** (0.020)	0.104*** (0.038)	0.056** (0.022)	0.01 (0.008)
Percent baseline visits turned in bag	0.374*** (0.017)				
Avg. # bins turned in per week, baseline		0.374*** (0.014)			
Avg. kg recyclables turned in per week, baseline			0.281*** (0.011)		
Avg. market value of recyclables given per week, baseline				0.233*** (0.010)	
Avg. percent contamination per week, baseline					0.292*** (0.019)
Street Fixed Effects	Yes	Yes	Yes	Yes	Yes
F-test p-value (1) = (2)	0.31	0.38	0.51	0.27	0.63
Observations	1781	1781	1781	1781	1588
R-Squared	0.34	0.44	0.38	0.35	0.34
Mean of dependent variable	0.78	0.68	0.76	0.49	0.13

Notes: The table shows household level recycling variables in the participation intensity study regressed on indicators for specific SMS or bin treatments (Panel B). “Avg. # bins turned in per week” reflects the volume of recyclables remitted in units of standard size bins. “Avg. market value of recyclables given per week” is the estimated by valuing the quantities of different materials (glass, paper, etc.) at the prices which collectors receive for those items. “Avg. percent contamination per week” is the weight of non-recyclable items included in the bag remitted to collectors divided by the total weight of the bag. Standard errors are shown in parentheses. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Table 4c: Participation Intensity Study - Treatment Effect of Bins and Text Messages (SMS) on Recycling

	(1)	(2)	(3)	(4)	(5)
	Percent of visits turned in bag	Avg. # bins turned in per week	Avg. kg recyclables turned in per week	Avg. market value of recyclables given per week	Avg. percent contamination per week
<i>PANEL C: Fully saturated model</i>					
Generic SMS + Bin with sticker (1)	0.041 (0.041)	0.158*** (0.059)	0.285** (0.112)	0.147** (0.064)	-0.03 (0.024)
Generic SMS + Bin (2)	0.025 (0.039)	0.056 (0.056)	0.154 (0.106)	0.092 (0.060)	-0.029 (0.023)
Generic SMS + No bin	0.019 (0.025)	-0.019 (0.036)	-0.035 (0.068)	-0.033 (0.039)	-0.01 (0.015)
Personal SMS + Bin with sticker (3)	0.036 (0.039)	0.124** (0.057)	0.099 (0.108)	0.053 (0.062)	-0.043* (0.024)
Personal SMS + Bin (4)	0.07* (0.038)	0.059 (0.055)	0.115 (0.103)	0.041 (0.059)	-0.032 (0.022)
Personal SMS + No bin	-0.027 (0.025)	-0.054 (0.036)	-0.051 (0.068)	-0.018 (0.039)	-0.017 (0.015)
No phone + Bin with sticker (5)	0.078*** (0.020)	0.127*** (0.030)	0.232*** (0.056)	0.149*** (0.032)	-0.001 (0.012)
No phone + Bin (6)	0.03 (0.021)	0.1*** (0.030)	0.142** (0.057)	0.096*** (0.032)	0.004 (0.012)
No SMS + Bin with sticker (7)	0.031 (0.040)	0.026 (0.058)	0.109 (0.109)	0.068 (0.062)	-0.049** (0.023)
No SMS + Bin (8)	0.045 (0.039)	0.114** (0.056)	0.299*** (0.107)	0.114* (0.061)	-0.035 (0.023)
No SMS + No Bin	-0.011 (0.025)	-0.061* (0.036)	-0.039 (0.067)	-0.009 (0.039)	-0.018 (0.015)
Has cell phone	0.03 (0.020)	0.082*** (0.028)	0.12** (0.054)	0.068** (0.031)	0.027** (0.012)
Percent baseline visits turned in bag	0.373***				

	(0.017)				
Avg. # bins turned in per week, baseline		0.374***			
		(0.014)			
Avg. kg recyclables turned in per week, baseline			0.282***		
			(0.011)		
Avg. market value of recyclables given per week, baseline				0.233***	
				(0.010)	
Avg. percent contamination per week, baseline					0.292***
					(0.019)
Street Fixed Effects	Yes	Yes	Yes	Yes	Yes
F-test p-value (1) = (2)	0.76	0.16	0.35	0.48	0.96
F-test p-value (3) = (4)	0.49	0.36	0.9	0.87	0.73
F-test p-value (5) = (6)	0.06	0.47	0.21	0.19	0.74
F-test p-value (7) = (8)	0.78	0.22	0.17	0.56	0.61
Observations	1781	1781	1781	1781	1588
R-Squared	0.34	0.44	0.38	0.35	0.34
Mean of dependent variable	0.78	0.68	0.76	0.49	0.13

Notes: The table shows household level recycling variables in the participation intensity study regressed on indicators for a fully saturated model with indicators for each unique combination of treatments (Panel C). “Avg. # bins turned in per week” reflects the volume of recyclables remitted in units of standard size bins. “Avg. market value of recyclables given per week” is the estimated by valuing the quantities of different materials (glass, paper, etc.) at the prices which collectors receive for those items. “Avg. percent contamination per week” is the weight of non-recyclable items included in the bag remitted to collectors divided by the total weight of the bag. Standard errors are shown in parentheses. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Table 5 : Participation Intensity Study - Treatment Effect of Text Messages (SMS) on Recycling

	(1)	(2)	(3)	(4)	(5)
	Percent of visits turned in bag	Avg. # bins turned in per week	Avg. kg recyclables turned in per week	Avg. market value of recyclables given per week	Avg. percent contamination per week
<i>Full sample</i>					
Personal SMS	-0.009 (0.017)	-0.006 (0.025)	-0.043 (0.048)	-0.025 (0.027)	-0.008 (0.01)
Generic SMS	0.014 (0.017)	0.02 (0.026)	0 (0.048)	-0.013 (0.027)	0 (0.01)
Has cell phone	0.021 (0.014)	0.043** (0.021)	0.098** (0.039)	0.053** (0.022)	0.01 (0.008)
Percent baseline visits turned in bag	0.376*** (0.017)				
Avg. # bins turned in per week, baseline		0.375*** (0.025)			
Avg. kg recyclables turned in per week, baseline			0.28*** (0.011)		
Avg. market value of recyclables given per week, baseline				0.231*** (0.010)	
Avg. percent contamination per week, baseline					0.293*** (0.019)
Street Fixed Effects	Yes	Yes	Yes	Yes	Yes
P-value	0.23	0.37	0.42	0.71	0.51
Observations	1781	1781	1781	1781	1588
R-Squared	0.33	0.42	0.36	0.34	0.34
Mean of dependent variable	0.78	0.68	0.76	0.49	0.13

Notes: The table shows household level recycling variables in participation intensity study regressed on the different specifications of the text message treatment. Results for an f-test of an equal effect for each treatment is also shown. Samples are restricted as specified. Standard errors are shown in parentheses. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Appendix Table 1: Participation Study - Comparison of Summary Statistics for Cell Phone Owners and Non Cell Phone Owners

Variable	No cell phone	sd	N	Has cell phone	sd	N	Diff	p-value	
Number of persons in household	4.84	2.78	2481	4.93	2.82	2948	0.09	0.215	
Interested in receiving information about recycling	0.92	0.27	2476	0.95	0.21	2936	0.03	0	***
Indicator for reads flyers when receives it	0.96	0.2	2473	0.98	0.13	2947	0.02	0	***
Conversations with neighbors/day (1=0; 2=<1; 3=1; 4=>1)	2.27	0.93	2474	2.28	0.97	2946	0	0.974	
Indicator for concern about others' opinion	0.41	0.49	2472	0.38	0.48	2944	-0.03	0.03	**
Indicator for family separates trash or not	0.36	0.48	205	0.46	0.5	300	0.1	0.027	**
Personal definition of recycling (accurate or not)	0.22	0.42	204	0.33	0.47	288	0.11	0.006	***
Indicator for interest in local politics	0.25	0.43	204	0.33	0.47	300	0.08	0.04	**
Weekly attendance to church	0.76	0.61	206	0.66	0.64	300	-0.1	0.073	*
Indicator for expensive floor material (parquet, asphalt, vinyl or ceramic)	0.14	0.34	205	0.18	0.39	299	0.05	0.16	
Indicator for expensive wall material (wood, stone or cane, brick, cement)	0.96	0.19	205	0.98	0.15	298	0.02	0.315	
Indicator for advanced fuel used for cooking (gas, electric)	0.85	0.35	205	0.93	0.26	300	0.07	0.008	***
Indicator for advanced source of light (electricity or own generator)	0.98	0.16	204	0.99	0.12	299	0.01	0.356	
# of color TVs	1.46	1.03	203	1.67	1.07	297	0.22	0.026	**
# of cars, trucks, or combis	0.06	0.25	203	0.15	0.4	298	0.09	0.006	***
# of rooms	3.84	1.38	205	4	1.68	300	0.16	0.262	
Number of children in HH	1.4	1.31	184	1.46	1.19	275	0.06	0.615	
Indicator of the woman at head of HH having completed secondary education	0.5	0.5	187	0.8	0.4	276	0.3	0	***
Median level of activity (1=highest level)	2.53	1.16	198	2.3	1.09	288	-0.24	0.023	**
Score on PPI poverty index	54.14	12.12	178	57.52	14.12	265	3.38	0.009	***
Daily expenditure/person in soles	9.03	7.81	191	10.4	7.04	275	1.38	0.048	**
Probability of being under the Nat. Poverty line (by cater)	14.77	15.04	178	12.3	15.22	265	-2.47	0.093	*

Notes: Table shows means and standard deviations of demographic variables separately for households included in the participation study which have a cell phone and those that don't. The final columns present the difference in means and significance level of the difference. Certain variables were gathered from all households in the sample, others were only collected in a more detailed survey administered to a subsample, which explains the differences in the number of observations across variables. Daily expenditures are the results estimated by the calculations of the PAT index. Probabilities of being under the National poverty line are given by calculations of the PPI index applied to Peru. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Appendix Table 1b: Participation Study - Comparison of Summary Statistics for People Who Did and Did Not Receive Fliers in Person

Variable	Left at doorstep	sd	N	Handed in person	sd	N	diff	pvalue	
Number of persons in household	4.550	2.211	1174	5.021	2.864	3261	0.470	0.000	***
Interested in receiving information about recycling	0.942	0.234	1172	0.939	0.240	3247	-0.003	0.688	
Indicator for reads flyers when receives it	0.971	0.168	1172	0.971	0.169	3248	0.000	0.967	
Conversations with neighbors/day (1=0; 2=<1; 3=1; 4=>1)	2.233	0.951	1171	2.280	0.955	3248	0.047	0.151	
Indicator for concern about others' opinion	0.390	0.488	1171	0.384	0.486	3245	-0.006	0.705	
Indicator for family separates trash or not	0.446	0.499	112	0.416	0.494	327	-0.031	0.574	
Personal definition of recycling (accurate or not)	0.327	0.471	110	0.267	0.443	318	-0.060	0.230	
Indicator for interest in local politics	0.330	0.472	112	0.288	0.454	326	-0.042	0.403	
Weekly attendance to church	0.688	0.616	112	0.709	0.625	327	0.022	0.747	
Indicator for expensive floor material (parquet, asphalt, vinyl or ceramic)	0.116	0.322	112	0.172	0.378	326	0.056	0.163	
Indicator for expensive wall material (wood, stone or cane, brick, cement)	0.973	0.162	112	0.972	0.164	325	-0.001	0.960	
Indicator for advanced fuel used for cooking (gas, electric)	0.857	0.351	112	0.914	0.280	327	0.057	0.082	*
Indicator for advanced source of light (electricity or own generator)	0.970	0.160	111	0.990	0.110	327	0.010	0.284	
# of color TVs	1.460	1.080	112	1.650	1.090	323	0.200	0.097	*
# of cars, trucks, or combis	0.134	0.367	112	0.096	0.325	324	-0.038	0.300	
# of rooms	3.821	1.629	112	4.055	1.640	327	0.234	0.193	
Number of children in HH	1.360	1.087	100	1.402	1.215	296	0.042	0.759	
Indicator of the woman at head of HH having completed secondary education	0.686	0.466	102	0.684	0.466	301	-0.002	0.972	
Median level of activity (1=highest level)	2.360	1.050	110	2.380	1.150	313	0.020	0.874	
Score on PPI poverty index	54.838	12.732	99	56.766	13.242	282	1.928	0.209	
Daily expenditure/person in soles	10.510	9.663	103	9.665	6.833	303	-0.845	0.333	
Probability of being under the Nat. Poverty line (by cater)	13.823	15.226	99	12.720	14.351	282	-1.103	0.518	

Notes: Table shows means and standard deviations of demographic variables separately for households that received treatment in the participation study which received fliers in person versus those that didn't. The final columns present the difference in means and significance level of the difference. Certain variables were gathered from all households in the sample, others were only collected in a more detailed survey administered to a subsample, which explains the differences in the number of observations across variables. Daily expenditures are the results estimated by the calculations of the PAT index. Probabilities of being under the National poverty line are given by calculations of the PPI index applied to Peru. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Appendix Table 2: Both Participation and Participation Intensity Studies - Orthogonality Check

Variable	Control (mean)	Control (sd)	Control (N)	Treatment (mean)	Treatment (sd)	Treatment (N)	diff	p-value	
<i>PANEL A: Participation study</i>									
Number of persons in household	4.91	3.19	938	4.9	2.71	4435	-0.01	0.928	
Interested in receiving information about recycling	0.93	0.25	937	0.94	0.24	4419	0.01	0.506	
Indicator for reads flyers when receives it	0.97	0.17	934	0.97	0.17	4420	0	0.76	
Conversations with neighbors/day (1=0; 2=<1; 3=1; 4=>1)	2.31	0.96	935	2.27	0.95	4419	-0.04	0.264	
Indicator for concern about others' opinion	0.42	0.49	935	0.39	0.49	4416	-0.03	0.073	*
Has cell phone	0.54	0.5	937	0.54	0.5	4426	0.01	0.731	
Score on PPI poverty index	55.55	15.36	62	56.27	13.12	381	0.72	0.697	
Daily expenditure/person in soles	9.76	5.52	61	9.88	7.65	406	0.12	0.907	
Probability of being under the Nat. Poverty line (by categ)	15.02	18.55	62	13.01	14.57	381	-2.02	0.332	
Median educational level of adults in HH	4.2	1.19	64	4.34	1.16	425	0.14	0.365	
Indicator of the woman at head of HH having completed secondary education	0.64	0.48	61	0.68	0.47	403	0.05	0.479	*
Number of children in HH	1.73	1.55	63	1.39	1.18	396	-0.34	0.044	*
Indicator for family separates trash or not	0.39	0.49	67	0.42	0.49	439	0.04	0.583	
Personal definition of recycling (accurate or not)	0.31	0.47	65	0.28	0.45	428	-0.02	0.679	
Indicator for interest in local politics	0.27	0.45	67	0.3	0.46	438	0.03	0.612	
Weekly attendance to church	0.69	0.67	68	0.7	0.62	439	0.01	0.877	
Indicator for expensive floor material (parquet, asphalt, vinyl or ceramic)	0.22	0.42	67	0.16	0.36	438	-0.07	0.175	
Indicator for expensive wall material (wood, stone or cane, brick, cement)	0.96	0.21	67	0.97	0.16	437	0.02	0.438	
Indicator for advanced fuel used for cooking (gas, electric)	0.88	0.33	67	0.9	0.3	439	0.02	0.631	
# of cars, trucks, or combis	0.18	0.43	66	0.11	0.34	436	-0.08	0.099	*
# of rooms	3.72	1.56	67	4	1.64	439	0.28	0.192	
Joint F-test of difference (all variables), p-value	0.6								
<i>PANEL B: Participation intensity study: Bin treatments</i>									
Number of persons in household	5.24	2.09	1181	5	1.85	604	-0.24	0.017	*
Interested in receiving information about recycling	0.97	0.18	1180	0.96	0.2	601	-0.01	0.457	

Conversations with neighbors/day (1=0; 2=<1; 3=1; 4=>1)	2.38	1.05	1180	2.43	1.04	601	0.05	0.297	
Has cell phone	0.6	0.49	1181	0.57	0.5	603	-0.03	0.252	
Score on PPI poverty index	55.24	14.22	83	55.24	15.07	38	0	0.999	
Daily expenditure/person in soles	10.22	5.11	115	9.89	6.33	48	-0.33	0.73	
Probability of being under the Nat. Poverty line (by categ)	14.71	17.48	83	15.87	14.52	38	1.16	0.723	
Median educational level of adults in HH	4.79	1.18	115	4.41	1.28	48	-0.39	0.067	*
Indicator of the woman at head of HH having completed secondary education	0.75	0.43	113	0.63	0.49	46	-0.12	0.124	
Number of children in HH	2.08	1.04	83	1.95	1.06	38	-0.14	0.505	
Indicator for family separates trash or not	0.96	0.2	121	0.92	0.27	52	-0.04	0.337	*
Personal definition of recycling (accurate or not)	0.23	0.42	121	0.08	0.28	49	-0.15	0.024	*
Indicator for expensive floor material (parquet, asphalt, vinyl or ceramic)	0.33	0.47	122	0.42	0.5	53	0.09	0.27	
Indicator for expensive wall material (wood, stone or cane, brick, cement)	0.95	0.22	122	0.96	0.19	53	0.01	0.741	
Indicator for advanced fuel used for cooking (gas, electric)	0.94	0.23	122	0.98	0.14	53	0.04	0.265	
# of cars, trucks, or combis	0.26	0.47	121	0.29	0.54	52	0.03	0.694	
# of rooms	4.38	1.97	120	4.48	1.61	50	0.11	0.739	
Joint F-test of difference (short and long surveys - participation intensity study), p-value	0.04								
Joint F-test of difference (long survey - participation intensity study), p-value	0.06								

PANEL C: Participation intensity study: Cell phone treatments

Number of persons in household	5.31	1.89	277	5.24	2	551	-0.07	0.633	
Interested in receiving information about recycling	0.99	0.1	277	0.99	0.1	549	0	0.812	
Conversations with neighbors/day (1=0; 2=<1; 3=1; 4=>1)	2.46	1.04	277	2.46	1.04	551	0	0.993	
Score on PPI poverty index	54.94	13.98	16	55.71	14.94	52	0.77	0.855	
Daily expenditure/person in soles	9.78	5.53	23	10.26	4.65	67	0.47	0.688	
Probability of being under the Nat. Poverty line (by categ)	15.16	15.33	16	14.18	17.32	52	-0.97	0.841	
Median educational level of adults in HH	4.61	1.16	23	4.77	1.14	67	0.16	0.565	
Indicator of the woman at head of HH having completed secondary education	0.78	0.42	23	0.82	0.39	65	0.03	0.736	

Number of children in HH	2.5	1.03	16	1.87	0.89	52	-0.63	0.019	*
Personal definition of recycling (accurate or not)	0.2	0.41	25	0.19	0.39	69	-0.01	0.901	
Indicator for expensive floor material (parquet, asphalt, vinyl or ceramic)	0.36	0.49	25	0.33	0.47	69	-0.03	0.812	
Indicator for expensive wall material (wood, stone or cane, brick, cement)	0.88	0.33	25	0.97	0.17	69	0.09	0.084	*
# of cars, trucks, or combis	0.32	0.63	25	0.29	0.46	69	-0.03	0.799	
# of rooms	4.67	1.63	24	4.07	1.55	68	-0.59	0.115	
Joint F-test of difference (short and long surveys - participation intensity study), p-value	0.01								
Joint F-test of difference (long survey - participation intensity study), p-value	0.25								

Notes: Table shows means of demographic variables separately for households belonging to the treated or control groups, for both studies, and distinguishing between the bin and cell phone treatments for the participation intensity study, as randomization was conducted separately for these sub treatments. The final columns present the difference in means and significance level of the difference. Certain variables were gathered from all households in the sample, others were only collected in a more detailed survey administered to a subsample, hence the differences in the number of observations across variables. A test of joint-significance of the difference is presented as well at the bottom of each panel; due to limited variation in the small samples, we omit "Indicator for advanced fuel used for cooking (gas, electric)" and "Indicator for family separates trash or not" from the without cell phone sample. Daily expenditures are the results estimated by the calculations of the PAT index. Probabilities of being under the National poverty line are given by calculations of the PPI index applied to Peru. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Appendix Table 3: Participation Study - Treatment Effects of Each Different Message on Cellphone Owners and Non Cellphone Owners

	(1) No cellphone - participates at anytime	(2) Has cellphone - participates at anytime	(3) No cellphone - participation ratio	(4) Has cellphone - participation ratio	(5) No cellphone - participates during either of last 2 visits	(6) Has cellphone - participates during either of last 2 visits
Norms, rich	0.016 (0.335)	0.030 (0.741)	0.032 (0.864)	0.004 (0.107)	0.044 (0.915)	-0.015 (0.379)
Norms, poor	-0.008 (0.193)	0.038 (0.971)	-0.007 (0.239)	0.018 (0.531)	0.003 (0.088)	0.033 (0.894)
Signal, rich	-0.007 (0.158)	0.058 (1.529)	0.032 (0.908)	0.047 (1.620)	0.018 (0.409)	0.043 (1.156)
Signal, poor	-0.008 (0.175)	0.013 (0.312)	-0.003 (0.080)	-0.013 (0.396)	0.017 (0.354)	-0.029 (0.677)
Signal, local	0.007 (0.187)	-0.009 (0.258)	0.039 (1.207)	-0.002 (0.083)	0.018 (0.485)	0.004 (0.136)
Religious	-0.018 (0.427)	0.033 (0.916)	0.008 (0.248)	0.023 (0.752)	-0.014 (0.357)	0.022 (0.606)
Municipality	0.061 (1.388)	0.001 (0.031)	0.053 (1.586)	-0.030 (1.047)	0.072 (1.706)	-0.044 (1.138)
Environmental emphasis	-0.026 (0.606)	0.057 (1.599)	-0.011 (0.300)	0.064* (2.171)	0.005 (0.119)	0.064 (1.728)
Social emphasis	0.010 (0.225)	0.007 (0.204)	0.005 (0.132)	-0.001 (0.042)	0.031 (0.690)	0.007 (0.201)
Observations	2481	2946	2481	2946	2481	2946
R-Squared	0.002	0.002	0.003	0.004	0.002	0.004
Mean of dependent variable	0.557	0.567	0.375	0.375	0.457	0.448
Sd of dependent variable	0.497	0.496	0.402	0.398	0.498	0.497

Notes: The table shows results of measures of households' participation in the program (whether they ever turned in recyclables, the percentage of times they turned in recyclables or whether they turned in recyclables in one of the last two times they were visited) regressed on all specifications of the treatment in participation study. Regressions are run separately for households that have cell phones and for households that don't. Each specification corresponds to a particular framing of the extra information delivered. Robust standard errors are shown in parentheses. All regressions include street fixed effects. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Appendix Table 4: Participation Study - Treatment Effect of Each Different Message on Households' Decisions to Participate

	Restricted to Households That Received Treatments and Whose Flyers Were Left at Doorsteps			Restricted to Households That Received Treatments and Who Received Flyers in Person		
	(1) Participates at any time	(2) Participation ratio	(3) Participates during either of last 2 visits	(4) Participates at any time	(5) Participation ratio	(6) Participates during either of last 2 visits
Norms, rich	-0.040 (0.051)	-0.027 (0.037)	-0.018 (0.048)	-0.014 (0.037)	0.003 (0.030)	-0.021 (0.036)
Norms, poor	0.059 (0.053)	0.042 (0.039)	0.054 (0.051)	-0.041 (0.036)	-0.025 (0.028)	-0.031 (0.036)
Signal, rich	-0.052 (0.051)	-0.036 (0.038)	-0.034 (0.049)	0.006 (0.036)	0.044 (0.029)	0.026 (0.036)
Signal, poor	0.046 (0.050)	0.029 (0.037)	0.015 (0.047)	-0.050 (0.038)	-0.032 (0.030)	-0.037 (0.038)
Signal, local	-0.047 (0.046)	-0.034 (0.034)	-0.025 (0.044)	-0.028 (0.033)	0.011 (0.027)	-0.002 (0.033)
Religious	-0.022 (0.053)	0.011 (0.040)	-0.009 (0.050)	-0.018 (0.036)	-0.000 (0.029)	-0.004 (0.036)
Municipality	-0.009 (0.053)	-0.023 (0.037)	-0.019 (0.049)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Environmental emphasis	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.044 (0.036)	-0.001 (0.028)	-0.006 (0.035)
Social emphasis	-0.052 (0.055)	-0.032 (0.041)	-0.044 (0.051)	-0.030 (0.035)	-0.011 (0.028)	0.002 (0.035)
Observations	1868	1868	1868	3692	3692	3692
R-Squared	0.140	0.134	0.142	0.077	0.081	0.090
Mean of dependent variable	0.369	0.228	0.281	0.575	0.386	0.464
Sd of dependent variable	0.483	0.347	0.450	0.494	0.403	0.499

Notes: The table shows results of measures of households' participation in the program (whether they ever turned in recyclables, the percentage of times they turned in recyclables or whether they turned in recyclables in one of the last two times they were visited) regressed on all specifications of the treatment in the participation study. OLS model is used for all columns. Each specification corresponds to a particular framing of the extra information delivered. One observation from Table 1 is excluded in Panel A because of a missing value for the street variable. Robust standard errors are shown in parentheses. All regressions include street fixed effects. Stars denote significance level of the difference: * Significant at the 10% confidence level, ** Significant at the 5% confidence level, *** Significant at the 1% confidence level.

Appendix Table 5 : Participation Intensity Study - Treatment Effect of Text Messages (SMS) on Recycling with Split Sample

	(1)	(2)	(3)	(4)	(5)
	Percent of visits turned in bag	Avg. # bins turned in per week	Avg. kg recyclables turned in per week	Avg. market value of recyclables given per week	Avg. percent contamination per week
<i>PANEL A: Restricted to sample with cell phone</i>					
Personal SMS	-0.013 (0.018)	-0.016 (0.027)	-0.046 (0.054)	-0.027 (0.03)	-0.011 (0.011)
Generic SMS	0.015 (0.018)	0.017 (0.027)	0.011 (0.054)	-0.009 (0.03)	0.005 (0.011)
Percent baseline visits turned in bag	0.371*** (0.022)				
Avg. # bins turned in per week, baseline		0.363*** (0.019)			
Avg. kg recyclables turned in per week, baseline			0.284*** (0.015)		
Avg. market value of recyclables given per week, baseline				0.226*** (0.013)	
Avg. percent contamination per week, baseline					0.267*** (0.025)
Street Fixed Effects	Yes	Yes	Yes	Yes	Yes
P-value	0.16	0.27	0.34	0.6	0.18
Observations	1052	1052	1052	1052	920
R-Squared	0.4	0.44	0.41	0.39	0.39
Mean of dependent variable	0.78	0.7	0.81	0.51	0.14
<i>PANEL B: Restricted to sample with cell phone and did not receive a bin</i>					
Personal SMS	-0.024 (0.023)	-0.029 (0.034)	-0.034 (0.066)	-0.018 (0.038)	-0.01 (0.015)
Generic SMS	0.031 (0.023)	0.013 (0.033)	-0.013 (0.065)	-0.021 (0.038)	0.005 (0.015)
Percent baseline visits turned in bag	0.403*** (0.027)				

Avg. # bins turned in per week, baseline		0.37***				
		(0.024)				
Avg. kg recyclables turned in per week, baseline			0.301***			
			(0.016)			
Avg. market value of recyclables given per week, baseline				0.243***		
				(0.014)		
Avg. percent contamination per week, baseline						0.304***
						(0.035)
Street Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
P-value	0.03	0.26	0.78	0.93		0.34
Observations	705	705	705	705		605
R-Squared	0.5	0.51	0.52	0.5		0.43
Mean of dependent variable	0.76	0.66	0.74	0.48		0.15

Appendix Table 6a: Participation Study Treatments and Hypotheses

Treatment	Sub-Treatment	Hypothesis Tested
Conformity	wealthy	Do respondents seek to emulate the behavior of their wealthy peers?
	poor	Do respondents seek to emulate the behavior of their poor peers?
Signaling	wealthy	Do respondents seek the approval of their wealthy peers?
	poor	Do respondents seek the approval of their poor peers?
	proximate	Do respondents seek the approval of peers who live very close to them?
Authority	religious	Do religious social forces influence respondents' recycling behavior?
	municipal	Do government social forces influence respondents' recycling behavior?
Emphasis	environmental	Does emphasizing the benefits of the "good" way to behave affect respondents' recycling behavior?
	social	Does emphasizing the local benefits of recycling affect respondents' recycling behavior?

Appendix Table 6b: Participation Intensity Study Treatments and Hypotheses

	SMS Control	Does personalizing a reminder increase recycling behavior?	Does a reminder increase recycling behavior?
Bin Control	No bin or SMS reminder	No bin with personalized SMS reminder	No bin with generic SMS reminder
Does decreasing the cost and inconvenience of recycling increase recycling behavior?	Bin w/o sticker with no SMS reminder	Bin w/o sticker with personalized SMS reminder	Bin w/o sticker with generic SMS reminder
Does increasing knowledge increase recycling behavior?	Bin with sticker with no SMS reminder	Bin with sticker with personalized SMS reminder	Bin with sticker with generic SMS reminder

Supplemental Material

S.1 Flier – front side (all treatments)

La próxima semana las sensibilizadoras de PRISMA llegarán a tu casa para invitarte a participar en el programa de reciclaje, explicarte cómo separar los residuos, y entregarte tu primera bolsa verde.

¡Entérate y empieza a separar tus residuos!

Papel, Cartón, Revistas y Cuadernos

Metal

Plásticos

¿Sabes que una asociación de recicladores está comenzando un programa de recolección en tu zona?

Este es un volante informativo de la organización sin fines de lucro PRISMA.

Municipalidad de Cuzco

S.2.1 Conformity Wealthy

Si reciclas, cuidas el medio ambiente y ayudas a los recicladores informales a tener un trabajo más digno y formal.

En partes de la **Urbanización Miraflores,** **más del 75%** de las familias **participan** en el programa formal de reciclaje

75% PARTICIPAN

25% NO PARTICIPAN

En Miraflores reciclan, ¡hazlo tú también!

S.2.2 Conformity Poor

Si reciclas, cuidas el medio ambiente y ayudas a los recicladores informales a tener un trabajo más digno y formal.


En partes del **AA.HH. San Valentín,** **más del 75%** de las familias **participan** en el programa formal de reciclaje

75% PARTICIPAN

25% NO PARTICIPAN

En San Valentín reciclan, ¡hazlo tú también!

S.2.3 Signaling Wealthy


 Si reciclas, cuidas el medio ambiente y ayudas a los recicladores informales a tener un trabajo más digno y formal.



Para que más personas en la **Urbanización Miraflores,** **participen** en el programa formal de reciclaje **les informaremos** de cuántos participan en tu zona. 

Dales un buen ejemplo: ¡Recicla!

S.2.4 Signaling Poor


 Si reciclas, cuidas el medio ambiente y ayudas a los recicladores informales a tener un trabajo más digno y formal.



Para que más personas en el **AA.HH. San Valentín** **participen** en el programa formal de reciclaje **les informaremos** de cuántos participan en tu zona. 

Dales un buen ejemplo: ¡Recicla!

S.2.5 Signaling Proximate

 Si reciclas, cuidas el medio ambiente y ayudas a los recicladores informales a tener un trabajo más digno y formal.



Para que más personas **al frente de tu casa** **participen** en el programa formal de reciclaje **les informaremos** de cuántos participan **del lado de tu casa.** 

Dales un buen ejemplo: ¡Recicla!

S.2.6 Authority Religion

Si reciclas, cuidas el medio ambiente y ayudas a los recicladores informales a tener un trabajo más digno y formal.





Cuida la Naturaleza que Dios ha creado para todos.

¡Recicla!



S.2.7 Authority Municipality

Si reciclas, cuidas el medio ambiente y ayudas a los recicladores informales a tener un trabajo más digno y formal.




La Municipalidad de Castilla te invita a participar en el programa de reciclaje.



Municipalidad de Castilla



¡Recicla!



S.2.8 Environmental Emphasis

Si reciclas, cuidas el medio ambiente y haces tu ciudad más limpia.





Antes del Programa de Reciclaje **Con el Programa de Reciclaje**

¡Recicla!



S.2.9 Social Emphasis

Si reciclas, ayudas a los recicladores informales a tener un trabajo más digno y formal.





Antes del Programa de Reciclaje **Con el Programa de Reciclaje**

¡Recicla!

