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What Impedes Efficient Adoption of Products? Evidence from Randomized Sales Offers for Fuel-Efficient Cookstoves in Uganda

By DAVID I. LEVINE, THERESA BELTRAMO, GARRICK BLALOCK, CAROLYN COTTERMAN, AND ANDREW M. SIMONS*

Consumers' failure to adopt products with health and wellbeing benefits apparently far greater than their costs has consistently challenged the widespread use of health-improving technologies. A sales offer combining free trial, time payments, and the option of returning the product can overcome barriers such as liquidity constraints and poor information about benefits and usability. We tested this sales offer (and alternatives) in an experiment with a fuel-efficient charcoal stove in urban Uganda and a fuel-efficient wood stove in rural Uganda. This offer dramatically increased uptake—in urban Kampala, from 4 to 46%, and in rural Mbarara, from 5 to 57%.

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Despite the potential of new products and technologies to improve health and wellbeing, adoption levels often remain surprisingly low. Examples include latrines (Gertler et al. 2015; Guiteras, Levinsohn, and Mobarak 2015), point-of-use water treatment technologies (Albert, Luoto, and Levine 2010; Ashraf, Berry, and Shapiro 2010; Kremer et al. 2009), insecticide-treated bed nets (Cohen and Dupas 2010; Dupas 2009; Tarozzi et al. 2014), hand washing with soap (Halder et al. 2010; Luby et al. 2011; Meredith et al. 2013), vaccines (Clemens and Jodar 2005; Cropper et al. 2004), deworming (Kremer and Miguel 2007; Meredith et al. 2013), and micronutrient fortification (Dewey and Adu-Afarwuah 2008; Meredith et al. 2013).

Existing studies have examined the uptake of beneficial health products using price discounts (Cohen and Dupas 2010; Dupas 2009; Kremer et al. 2009; Meredith et al. 2013; Mobarak et al. 2012) or providing microfinance for purchases (Devoto et al. 2012; Fink and Masiye 2012; Tarozzi et al. 2014). In this paper, we provide evidence of another lever with the potential to induce purchase. We sold fuel-efficient cookstoves at local market prices but altered the sales offers' terms to examine the roles of liquidity constraints and imperfect information in the adoption of these products.

In urban Kampala, we found a low (4%) uptake of fuel-efficient charcoal-burning stoves with traditional cash-and-carry offers (we gave households a week to raise funds, if needed) and a high (46%) uptake with contracts that combined a free trial and time payments. In this urban setting, we also tested free trial (29% uptake) and time payments (26% uptake) offers separately. We repeated two of these sales offers in a rural district (i.e., Mbarara) in southwestern Uganda, with fuel-efficient wood-burning stoves, and found a similarly large uptake with free

trial and time payments (57%) as compared with cash-and-carry (5%) offers. Our confidence in the results' external validity increased with similar findings in different settings.

I. Background on Cookstoves

Approximately half the world cooks on inefficient traditional biomass cookstoves that burn solid fuels such as wood, dung, or charcoal. Traditional stoves burn inefficiently and produce a large amount of smoke. This leads to heart, respiratory, and other disorders that kill approximately four million people a year (Lim et al. 2012). Much of the health burden falls on women and children, as does the time burden of collecting biomass fuel (Burke and Dundas 2015; Kammen, Bailis, and Herzog 2002). Environmental damage includes deforestation (Arnold, Köhlin, and Persson 2006; Hosonuma et al. 2012) and large releases of greenhouse gasses (Bailis, Ezzati, and Kammen 2005). Furthermore, the incomplete combustion of biomass fuels leads to the release of black carbon (i.e., soot), which contributes to global climate change (Bond, Venkataraman, and Masera 2004; Kar et al. 2012; Ramanathan and Carmichael 2008).

Fuel-efficient cookstoves, depending on their quality and construction, have the potential to reduce household air pollution substantially and improve the health of cooks and children (Ezzati and Kammen 2001; Ezzati and Kammen 2002; Mueller et al. 2013; Smith et al. 2011). Further, these cookstoves can significantly reduce consumption of biomass fuels, which diminishes deforestation and environmental degradation (Bensch and Peters 2013). Fuel savings can decrease household expenditure on fuel and/or reduce time spent collecting fuel (García-Frapolli et al. 2010).

Because of these benefits, fuel-efficient cookstoves projects have had a long history within the development community. While some successes have occurred (Smith et al. 1993), most regions continue to adopt efficient stoves at “puzzlingly low” rates (Mobarak et al. 2012; see also World Bank 2011 and Lewis and Pattanayak 2012).

Previous studies assessing the demand for cookstoves in developing countries have generally found low demand. For example, Mobarak et al. (2012), in an experiment in Bangladesh, found low adoption levels for two different types of fuel-efficient cookstoves at full price (2% and 5%, respectively), and continued low uptake (5% and 12%, respectively) even with a large (50%) price discount. However, they did not randomize the terms of their sales offers. In a related study in the same region, Miller and Mobarak (2013) compared men and women’s demand for cookstoves when these were given for free versus a small positive price. They found that women exhibit a stronger preference for free stoves—most likely because health benefits accrue to cooks who are generally women—but that, at a low positive price, women became less likely than men to adopt—probably because women control less of household budgets. Bensch, Grimm, and Peters (2015) surveyed randomly selected households in urban Burkina Faso and used propensity score matching to compare purchase rates for otherwise similar households, of fuel-efficient cookstoves at market prices. They found low uptake: only around 10% purchase of fuel-efficient cookstoves.

Miller and Mobarak (2014) also examined the impact of local social networks and opinion leaders on the probability of purchase of fuel-efficient cookstoves. They found that these influences are stronger when new technologies’ benefits are poorly understood or not easily observed. We also tested the effects of social networks on purchases in rural Uganda. We found evidence that peer effects improved opinions about cookstoves, but this had no detectable influence on purchases (Beltramo et al. 2015a).

We also tested the effect of marketing messages on cookstove purchases in rural Uganda. We found no difference in purchase rates among consumers who received one of four different informational marketing messages (“Good for your health,” “Saves time and money,” and both messages or no message) (Beltramo et al. 2015b).

Understanding stove usage is also important to understand the health and/or environmental benefits attributable to fuel-efficient cookstoves. We will analyze this topic in a subsequent paper. Past studies have had mixed results. For example, Bensch and Peters (2015), Smith and his coauthors (Smith et al. 2006; Smith et al. 2010; Smith-Sivertsen et al. 2009), and Yu (2011) found a fairly high usage of new stoves and improvements in measures of health or exposure to emissions. Other studies (e.g., Beltramo and Levine 2013; Burwen and Levine 2012; Hanna, Duflo, and Greenstone 2012) failed to find consistent usage of new stoves and did not find sustained health improvements.

II. Research Setting and Design

We ran two randomized control trials, one in Kampala, the urban capital of Uganda, and another in the rural district of Mbarara, about 300 km southwest of the capital. The use of solid fuels is almost universal in Uganda: 96% of households use solid fuels for cooking. Wood is normally used in 85% of rural households, while 68% of urban households use charcoal (Uganda Bureau of Statistics and ICF International Inc. 2012). Key differences between these urban and rural studies are presented in Table 1.

A. Urban Study Design

The first experiment took place in Kampala, Uganda's capital and largest city, from October to December 2010. The majority of Kampala's households cook with a traditional charcoal stove. Most cooking is outdoors, unless it is raining.

We marketed the Ugastove charcoal stove, made by a Ugandan-owned company in Kampala (see Figure 1 for images of a traditional charcoal stove and the Ugastove charcoal stove). The main fuel saving innovations of the Ugastove are its cylindrical sheet metal frame and surrounding heat-insulating ceramic insert. These features reduce the amount of charcoal needed as compared to traditional charcoal stoves. The Ugastove was selected based on evidence that this stove reduces fuel use when tested in controlled settings (Wang et al. 2009) and that it met the voluntary carbon market's Gold Standard in kitchen performance tests (Center for Entrepreneurship in International Health and Development 2008). The Ugastove manufacturer receives carbon credits for the stoves and passes these savings on to customers. Because of the carbon credit subsidy, retail prices in our experiment were \$6, \$8, or \$10, depending on the size. These prices matched what Ugastoves sold for in the local Kampala market.

The Centre for Integrated Research and Community Development (CIRCODU), a non-governmental organization based in Kampala that specializes in market research on household energy, served as the in-country sales team and data collection partner. For the urban study, we employed a door-to-door sales strategy with enumerators acting as salespeople. Enumerators' salaries were kept independent from cookstove sales levels to remove incentives for enumerators to target wealthier households.

To select households, we began with a list of all Kampala parishes¹ provided by the Ugandan Bureau of Statistics. CIRCODU's staff categorized about 30% of parishes as "low income," 60% as "middle income," and 10% as "wealthy," based on their personal knowledge. We covered virtually all parishes that were categorized as "low income" or "middle income." We excluded the "wealthy" parishes, as their residents cook mainly with gas stoves and they would not be interested in charcoal cookstoves.

We randomized offers at a sub-parish/neighborhood level to avoid the possibility of upsetting customers who heard that their neighbors received a different sales offer.² Thus, each household enumerators approached within a neighborhood received the same sales offer. To achieve balance between our study arms, we stratified based on CIRDOCU's socioeconomic categorizations of the parishes ("low/middle income"). In addition, to reduce the chance of enumerator bias, we developed a work schedule that ensured each enumerator presented each offer approximately the same number of times, and their schedules had a similar breakdown in times and weekdays.

In each neighborhood, sales teams of two enumerators marketed the stoves to 10 households in which an adult was home. Enumerators gave presentations to approximately every sixth household, identified by a fixed way finding procedure to ensure randomization. Thus, a consumer was unlikely to be approached after having seen or heard enumerators visit their neighbors. To reduce socioeconomic similarity within neighborhoods, after five households, enumerators returned to their vehicle, drove approximately one kilometer, and then made the sales offer at five more households (following the same procedure) in the same neighborhood.

¹ Kampala has 96 urban parishes with an average population of 12,387 each (Uganda Bureau of Statistics 2006).

² We did this to provide sufficient separation so that consumers from different neighborhoods would be unlikely to communicate regularly (i.e., they would probably attend different churches, schools, shops, etc.). We divided parishes into two to three different "neighborhoods," ending up with 226 different neighborhoods in our sample.

At each home, the sales team gave a marketing presentation about the stoves and presented the sales offer randomly assigned to that neighborhood. After gathering some basic information pertaining to the household's cooking and fuel purchasing behaviors, enumerators recorded the homeowners' purchase decisions.

B. Urban Sales Offers

We tested four sales offers in Kampala:

Cash-and-carry offer: Consumers were given the opportunity to purchase a stove at a take-it-or-leave-it price. Consumers were told that, if they needed to gather funds or check with family members, they could take a week to decide and pay. In such cases, enumerators returned one week later to collect payment and deliver the stove.

Free trial offer: If consumers were willing to accept a free trial, enumerators left the stove and returned in one week for the full payment. If consumers did not want to keep the stove, they could return the stove at the end of the week, with no obligation.

Time payments offer: Consumers were given the opportunity to purchase a stove with four equal weekly installments. This offer included the right to return the stove before all scheduled payments were due, in which case, future payments were canceled but no money refunded (similar to the rent-to-own model in the United States). As with the cash-and-carry offer, enumerators offered to return in a week to deliver the stove and collect the first time payment if consumers wanted to discuss their choice with family members or needed one week to gather the first payment.

Free trial and time payments offer: Consumers were offered a one-week free trial followed by the opportunity to purchase a stove through four equal weekly installment payments. They also received the right to return the stoves before all

scheduled payments were due, cancelling future payments, as in the time payments offer.

C. Urban Pricing and Sales Visits

The stove prices for all sales offers were the standard market prices of \$6, \$8, or \$10, depending on the size. The most popular stove was the \$6 version, as it could cook for an average-sized family (i.e., 5–7 people). The most expensive model could cook for 10–12 people.

To those offered the cash-and-carry sales terms, enumerators offered the posted prices (\$6, \$8, or \$10, based on stove sizes desired by consumers) or an incentive-compatible Becker-DeGroot-Marschak (BDM) procedure (Becker, DeGroot, and Marschak 1964). In the BDM procedure, enumerators showed each participant a sealed envelope and explained that the stove price was set randomly by their manager and hidden within the envelope. Enumerators asked participants what was the highest price they would agree to pay, explaining that they could purchase the stove at the envelope price if the price they stated was at least as large as the unknown price inside the envelope. If respondents stated a willingness to pay below the envelope price, they would not be able to purchase the stove.

Because a stated willingness to pay affects whether someone can purchase a product, but *not* how much she pays, this procedure provides incentives for respondents to report their willingness to pay truthfully (if participants understand and believe all the instructions). That is, it is not in the best interests of respondents to name a higher price than what the product is worth to them because they may end up agreeing to pay more than they are actually willing to pay. Similarly, if participants understate their true willingness to pay, they might lose the opportunity to buy a stove at the price they were willing to pay. Enumerators followed the BDM procedure to recover a demand curve rather than

simply the share of households that accepted a cash-and-carry offer at the stoves' market prices.

Enumerators allowed participants to ask questions prior to participating in the BDM procedure, to ensure they understood. Enumerators also explained to participants that they would have up to seven days to gather funds if needed (as with the cash-and-carry offer at market prices).

After consumers made their decisions, enumerators thanked them for their time and offered a small gift (i.e., a bar of soap) in exchange for answering a few more questions. Over a space of weeks, enumerators recorded customers' payments, return rates, and default rates.

D. Rural Study Design

The follow-up experiment took place in 26 rural parishes of the Mbarara district in western Uganda, from March to May 2012. We selected the Mbarara region because it is rural and almost all families cook with wood on traditional three-stone fires. In addition, the district is less than a day from Kampala, families spend considerable time gathering wood, and local leaders were supportive of our project. In contrast to the urban setting, most families cook in a cooking hut. See Harrell et al. (2014) and Simons et al. (2014) for additional background of the rural study area. CIRCODU, the same organization that collected our data in the urban study, carried out the rural study.

We marketed the Envirofit G3300 wood-burning stove, made by Envirofit International Inc. (see Figure 2 for images of a traditional three-stone fire and the Envirofit G3300). This stove achieves relatively efficient fuel combustion by sending airflow into the fire and directing heat upward to the cooking surface. These innovations burn fuel at a controlled rate and enable more complete combustion than a three-stone fire. The manufacturer reports that the Envirofit

G3300 reduces smoke and harmful gasses by 80%, reduces fuel consumption by up to 60%, and reduces cooking time by 50%, as compared to a three-stone fire (Envirofit Inc. 2014).

E. Rural Sales Offers

We randomly selected 12 parishes to receive the traditional cash-and-carry sales offer and 14 parishes to receive the free trial with time payments offer.³ The terms and conditions of both offers were the same as in the urban experiment (see section IIB). Within each parish, we recruited a local point person with the help of local government officials. We asked each point person to gather roughly 60 people together for a public sales meeting on a specified day. We told each point person that we would demonstrate a fuel-efficient cookstove and offer it for sale. We did not tell the point person which sales offer his or her parish would receive.

At the sales meeting, the study team presented the Envirofit G3300, discussed its benefits relative to traditional three-stone fires, did a cooking demonstration, and presented the terms of the randomly selected sales offer. Then participants completed a questionnaire focused on household cooking and basic socioeconomic indicators.

F. Rural Pricing and Sales Visits

We purchased stoves from UpEnergy,⁴ a company that distributed Envirofit stoves in several regions of Uganda but at the time, not in our study area. We offered the stoves for sale at \$12 each in four parishes and then, because of high sales, increased the price to \$16 in the remaining 22 parishes.⁵ These prices were

³ The population of most Ugandan rural parishes ranges from 4,000 to 6,000.

⁴ See <http://upenergygroup.com/projects/uganda/>.

⁵ Because we planned to track usage and health benefits of the stove in a follow-on impact evaluation, we needed to make sure enough stoves sold. We thus started with a lower sales price. Once our results clearly showed that the stoves

similar to what UpEnergy's retail partners sold the same Envirofit stoves for in other regions of Uganda. As with the Ugastove, this retail price was reduced in part due to carbon credits.

Participants given the cash-and-carry offer had the option of purchasing the stove that day for cash, or, if they desired additional time to gather funds and/or discuss their choice with family, they could return to purchase a stove at a second meeting about 10 days later.

Participants offered the free trial with time payments could sign up for a free trial at the end of the group sales meeting. They could then return their stoves with no obligation at the end of the free trial. If they liked the stove, they could purchase it in four equal weekly payments. Due to scheduling and logistical constraints, households that accepted a free trial generally received their stove about three weeks after the sales meeting.

III. Barriers to Adoption

We designed our study to examine market failures that could reduce the purchase of fuel-efficient cookstoves in developing countries, including liquidity or credit constraints, and imperfect information about the quality, usability, and fuel savings of the new appliance.

A. Imperfect Information About Product Effectiveness and Energy Savings

Consumers are subject to numerous marketing messages for many products, some of which are false. This can cause consumers to view information from salespeople with suspicion. A free trial gives these consumers an opportunity to try out a stove and decide if it saves fuel and fits the household's cooking needs. Further, the free trial can be a credible signal that the stove will actually save fuel

were popular, we increased the price to the approximate market price to ensure that we did not run out of stoves. Excluding the four parishes where the stoves sold for \$12 does not materially change our results (see Appendix Table A1).

and perform adequately (Shieh 1996; Sridhar Moorthy and Srinivasan 1995). Our free trial period was similar (prior to the point money was paid) to a money-back guarantee, which is documented to increase consumers' willingness to try unfamiliar products when they are unsure of benefits, especially for experience goods⁶ (Davis, Gerstner, and Hagerty 1995; Grossman 1981; Suwelack, Hogreve, and Hoyer 2011). Another possibility is that a trial period may activate norms of reciprocity, which could increase uptake and repayment (Cialdini 2007). If these barriers existed for consumers in Uganda regarding cookstove purchases, we hypothesized that a free trial would increase sales.

B. Liquidity or Credit Constraints

Liquidity constraints are another plausible reason for the low adoption of beneficial products in developing countries (Bensch, Grimm, and Peters 2015; Devoto et al. 2012; Dupas 2011; Mobarak et al. 2012; Tarozzi et al. 2014). In a related study in different Ugandan rural parishes, we documented willingness to pay—in a within-subject comparison—was on average about 40% higher with time payments (four equal payments over four weeks) than when paying for a new cookstove within a week (Beltramo et al. 2015b).

C. Potential Weaknesses of the Free Trial and Time Payments Offer

The offer of a free trial followed by time payments has several potential weaknesses. Return rates with this offer will be high if stoves break frequently, especially if consumers are careless with them during the free trial. The free trial will not increase demand if new stoves are a poor fit for the region, for example, if they require cooking patterns so far from traditional practices that the difficulty

⁶ An experience good is a product or service whose characteristics, such as quality or price, are difficult to observe in advance but are ascertained upon consumption.

for cooks to adapt to the new technology outweighs its other benefits. If consumers are frequently not at home, collecting payments becomes costly. Furthermore, both the free trial and time payments offers open the stove provider to consumer moral hazards, such as when consumers move frequently or decide to keep stoves and not pay for them. Low payments are particularly likely if adverse selection exists among consumers, in which those consumers least likely to pay for a stove are more likely to accept free trial and time payments offers.

IV. Results

A. Verifying Randomization

Table 2 presents household summary statistics for the urban Kampala study, for each of the four sales offers. Standard errors were adjusted for clustering at the neighborhood level. The households in each group are similar, with none of the differences across a row being statistically different from zero.

In the urban sample, about 87% of respondents were women. Households cooked for about five people at their daily largest meal, of which 95% used charcoal with an average expenditure around \$2.60 per week.

Table 3 presents the household summary statistics for the rural Mbarara study. The groups are similar. Out of the 20 characteristics shown, only one difference is significant at the 5% level, and three differences are significant at the 10% level, about that to be expected by chance.

In the rural sample, about 60% of those attending the village sales meeting were women. The largest daily meal was cooked for an average of 5.6 people. About 87% of households used firewood as the primary fuel source, of which approximately 32% had purchased firewood in the last month and 78% had gathered wood in the last month. Slightly less than 80% of households belonged to a savings group, and few had had previous experience with other new

technologies, such as improved seeds (18%), solar lamps (13%), or fertilizer (6%).

B. Urban Sales Offer Results

Table 4 presents the results of the urban study in term of purchases, returns, and defaults across the four sales offers:

Cash-and-Carry Offer: Only 4% of households given the cash-and-carry offer purchased the stove at prevailing local retail prices (23 of 579). As mentioned earlier, we offered a stated fixed price or followed a Becker-DeGroot-Marschak price elicitation procedure for the cash-and-carry offer in the urban setting. Of the subsample offered the fixed retail price, 6% accepted (7 of 114), while 3% of those in the BDM procedure stated they were willing to pay at least the stove's retail price (16 of 465). The difference in take-up rate across the two procedures is not statistically significant (p -value = 0.21). At the same time, the slightly lower willingness to pay reported with the BDM procedure than for the cash-and-carry offer is consistent with the notion that consumers could have shaved their stated willingness to pay relative to their actual willingness to pay (as in Beltramo et al. 2015b; Berry, Fischer, and Guiteras 2012).

Free Trial Offer: Among households that received a free trial offer, 33% accepted (178 of 539). Among those that accepted, 12% returned the stove after the trial (21 of 178), 11% defaulted (19 of 178), and 78% paid in full (138 of 178). Of those in default, 42% paid at least something (8 of 19).⁷ In total, uptake (minus returns) was 29% (157 of 539), and we collected 90% of the revenue that consumers owed.

⁷ The study protocol did not permit households offered the free trial to pay a portion of the stove price. However, when the sales staff went to the house either to collect the stove or full payment, some households offered to pay a portion of the purchase price. We had not anticipated this possibility when we trained the sales staff. In practice, the sales staff accepted partial payment in these cases. Therefore, some ultimate defaulters may have paid at least some of the purchase price in the free trial offer.

Time Payments Offer: Among households that received the offer of four equal weekly time payments, 26% accepted the offer (102 of 390). Of those that accepted the offer, only 1% (1 of 102) returned the stove after payments began, 6% defaulted (6 of 102) and 93% paid in full (95 of 102). Among those that paid in full, a third paid the stove off early (32 of 95), while 11% paid off late (10 of 95). In addition, 83% (5 of 6) defaults paid at least something. In total, uptake (minus returns) was 26% (101 of 390), and we collected 96% of the revenue that consumers owed.

Free Trial and Time Payments: Of households that received the free trial and four equal weekly time payments offer, even more accepted this offer, with 48% accepting the initial free trial (171 of 355). Among those that accepted the free trial, 5% returned the stove after the trial (9 of 171), 6% defaulted (11 of 171), and 88% paid in full (151 of 171). Of those that paid in full, 31% paid off early (47 of 151), while 10% paid off late (15 of 151). Among those that ended up defaulting, 100% paid at least something (11 of 11). In total, uptake (minus returns) was 46% (162 of 355), with 97% of the revenue that consumers owed being collected.

C. Rural Sales Offer Results

Table 5 presents the results of the rural study:

Cash-and-Carry Offer: Only 5% of households given the cash-and-carry offer purchased the Envirofit at prevailing local retail prices (25 of 538).

Free Trial and Time Payments Offer: Of households that received the free trial and four equal weekly time payments offer, 62% accepted the initial free trial (538 of 866). Among those that accepted the free trial, 8% returned the stove after the trial (44 of 538), 1% defaulted (5 of 538), and 91% paid in full (489 of 538). Of those that paid in full, 22% paid off early (108 of 489), while 6% paid off late

(30 of 489). Among those that ended in default, 40% paid at least something (2 of 5). In total, uptake (minus returns) was 57% (494 of 538), with 99% of the revenue that consumers owed being collected.

As previously noted, in four of the 26 rural parishes (two parishes for each sales offer), the sales price was \$12 rather than \$16. Removing the results of these four parishes does not materially change results (see Appendix Table A1).

D. Market Failures and Demand for Fuel-Efficient Cookstoves

Our arguments are consistent with market failures—rather than poor stove design—as a major reason for the observed low demand for fuel-efficient cookstoves in developing countries (as documented by Bensch, Grimm, and Peters 2015 and Mobarak et al. 2012).

We offered a free trial to combat the potential market failure of consumers having imperfect information. The missing information could concern the stove's general usability, the stove's performance in cooking common meals, the quantity of fuel it saves, and so forth. The quite large increase in uptake, from 4.0% with a cash-and-carry offer to 29.1% with the free trial offer, suggests the free trial overcomes at least some of these informational gaps. Differences between levels of uptake of sales offers discussed in this section are statistically significant at $p < 0.001$.

However, it is possible the free trial may have removed other barriers in addition to imperfect product information. Consumers' perception of the salesperson's trustworthiness may have increased, because free trials are not commonplace. Consumers may have purchased due to a norm of reciprocity after receiving the free trial, or the free trial created an endowment effect. Perhaps the free trial was a credible sign of quality, which was more important to the purchase decision than the information learned during the free trial. Additional research is

needed to understand the exact pathways through which a free trial encourages uptake.

We offered time payments to test the role of liquidity constraints as a potential market failure. Our offer was equivalent to a 0% interest loan, with four equal payments made weekly. The large increase in uptake from 4.0% with cash-and-carry to 25.9% with time payments suggests that this contract overcomes liquidity constraints.

Some of this success is likely due to a reallocation of fuel expenditures. The average household in our sample spent \$2.61 per week on charcoal in Kampala, and the Ugastove's fuel saving estimates range from 35% to 46% (Partnership for Clean Indoor Air 2011; Wang et al. 2009). This corresponds to \$0.91–1.20 per week in charcoal savings for the average household in the urban study. Across the four weeks, a household could have used fuel savings to fund the purchase of \$3.64–4.80 worth of the stove. These fuel savings would fund approximately 61–80% of the \$6 stove (i.e., the model chosen 80% of the time).

Present bias or hyperbolic discounting is also a possibility that could explain the success of time payments in increasing uptake. We hope to differentiate present bias and liquidity constraints in future research.

The free trial and time payments offer increased uptake even further to 45.6%. This rate is over 11 times that of the cash-and-carry offer (4.0%) and substantially above the uptake of the free trial (29.1%) or time payments alone (25.9%). An interesting question is whether, when combining the free trial with time payments, these offers are additive (i.e., they alleviate different constraints for different people). If we assume that the offers are additive and that anyone who accepted the cash-and-carry offer would also accept either the free trial or time payments offers, we calculate the union of the free trial only and time payments only offers would induce about a 51.0% uptake (4.0% cash-and-carry offer + 25.1% free trial offer (29.1% - 4.0%) + 21.9% time payments offer (25.9% - 4.0%)). In our

experiment, the combined offer with a free trial followed by four equal installment payments induced uptake in 45.6% of the sample. We cannot reject equality ($p=0.14$) between 45.6% and 51.0% with a sample size equal to that used in our experiment, which suggests that these offers are additive.

We were surprised that about a third of those who accepted a sales offer with time payments in the urban setting paid it off early (i.e., 33.7% of those offered time payments alone and 31.1% of those offered time payments after a free trial) and about a fifth paid off early in the rural setting (22.1%). This result could suggest that once consumers had used the stoves and learned whether they fit their needs and how much fuel they saved, that financial constraints perhaps became less important. However, this behavior is also consistent with qualitative evidence that suggests many Ugandans consider debt undesirable. Several respondents, for example, said they were prepaying so that the stove salesperson would not come by for collections: they apparently perceived a stigma in owing additional payments. Prepayments may also have been motivated by the irregular nature of many customers' incomes, coupled with the challenges of saving. By prepaying when they had cash on hand, they reduced the risk of losing the stove if they had no cash when the next payment was due. It is possible that one attraction of our time payments offer is this flexibility to prepay, in contrast, for example, to many typical microfinance loans.

E. Costs Borne by the Supplier

The increase in uptake for the free trial and time payments offer comes with additional costs and risks borne by the vendor. The vendor bears the risk of default if a consumer takes a free trial and neither returns the stove nor pays for it. In addition, the vendor needs more working capital to pre-purchase fuel-efficient cookstoves. The important question to answer is whether the additional sales

gained from any of the marketing offers presented in this paper sufficiently compensate the entrepreneurial vendor for the additional default risks and capital costs. While exact costs would vary in different contexts, we present below conservative estimates of the costs of the four offers in the urban study.

Our field staff reported that a salesperson could visit approximately 25 households a day to make a sales pitch and a similar number for collection visits. In Table 6 we normalize effort across the four sales offers so that each salesperson visits 25 households a day. Therefore, in a month with 20 working days, a sales person can sell about 20 stoves a month with the traditional cash-and-carry offer, 113 stoves a month offering a free trial, 73 stoves per month offering time payments, and 81 stoves offering a free trial followed by time payments (see Table 6, first panel).

These higher sales must be weighed against defaults and the cost of capital. To estimate these costs, we used the stove sales per month from the first panel, the default rates we observed in our experiment, and a conservative estimate of 6% per month interest rate (i.e., roughly 100% per year). Even including defaults and an interest charge, the experimental offers are still at least three times as profitable as the traditional cash-and-carry offer (see Table 6, second panel).

Under the stated assumptions, the free trial offer is the vendors' best option. However, this result only holds if collection visits are as time consuming as the initial sales presentation. As the cost of follow-up visits declines, the free trial and time payments offer becomes more favorable. Sales visits may be slower than follow-up visits because the latter will not include a sales pitch highlighting the stove's features. The vendor also can call or text ahead of time to ensure someone is home with the payment, and the use of mobile money could remove the need to meet. The wide and growing availability of mobile money in developing nations, especially sub-Saharan Africa (Aker and Mbiti 2014; Jack and Suri 2014; Luoto and Levine 2014) suggests that mobile payments will eventually reduce, or

perhaps even eliminate, the number of in-person visits required to collect installment payments. However, Luoto and Levine (2014) did not find that collecting time payments with mobile money is profitable in their setting of rural western Kenya. Based on the assumptions underlying Table 6, if the time required for follow-up visits is cut in half, the free trial with time payments becomes the most profitable sales offer.

The logistical set up for rural sales was different from the urban study as households are widely dispersed and we used a local point person who received a commission for collecting payments. While the calculations differ (see Table A2 in the appendix), the free trial with time payments offer is also more profitable than the cash-and-carry offer in rural areas, even when accounting for default risk and increased capital costs.

F. Robustness and External Validity

In the rural study, meeting attendees who heard they would be offered the free trial with time payments may have sent text messages to friends who might be interested. Such texting could have led to non-representative samples at meetings with different sales offers. To test for this possibility, we reran the results removing the final 33%, 25%, and 10% of participants to arrive at each free trial and time payments meeting. The results were similar irrespective of how many late arrivers were removed (see Table A3 in the appendix for results removing the last 25% of arrivers from each meeting).

Further questions arose about our results' level of external validity and the performance of these sales offers with other technologies or products in the developing world. We carried out the field experiment in Kampala, in late 2010, and we were surprised by the large increase in uptake compared to the typical cash-and-carry offer (i.e., over 11 times increase for the free trial with time

payments offer). Because the magnitude of this increase was so large, we solicited funding to run the same trial in a different setting. In the rural setting, with a different stove, fuel type, market, and socio-economic context, the free trial with time payments offer increased uptake by 12 times, about the same as in our first experiment.

However, how well the sales offer of a free trial followed by time payments would work with other products is still unclear. Offering time payments without a free trial raises purchase levels considerably for many products. These include insecticide-treated bed nets (Tarozzi et al. 2014), piped water connections (Devoto et al. 2012), and water filters (Guiteras et al. 2014), as well as for charcoal-burning stoves (in this paper's urban study) and for wood-burning stoves (Beltramo et al. 2015b).

Furthermore, how well the benefits of a free trial generalize is less obvious. A free trial may decrease sales if the product is unpopular, as Luoto et al. (2012) found for chlorine for water treatment, or if the trial anchors consumers' willingness to pay at a lower number (Fischer et al. 2014). A free trial will not raise demand if consumers cannot learn much about a product's effectiveness, which perhaps accounts for the lack of detectable effects of a free trial for water filters in Dhaka (Guiteras et al. 2014). Finally, free trials do not work well for products that cannot be returned, such as built-in products (e.g., latrines and some stoves) or consumable products. With these cautions in mind, quite plausibly, many products—besides the cookstove models studied here—could increase sales if vendors offered free trials.

V. Conclusion

We examined the sale of two different fuel-efficient cookstoves in two different settings in Uganda. In contrast to other studies that have altered cookstove prices

and found low demand, we found extremely high demand for fuel-efficient cookstoves sold at local market prices but with altered sales contract terms (see a summary of uptake statistics in Table 7). In urban Kampala, we offered four contracts for charcoal burning stoves: cash-and-carry (4% uptake), a one week free trial followed by full payment (29% uptake), four equal weekly time payments starting immediately (26% uptake), and a combination of a one week free trial followed by four equal weekly time payments (46% uptake). Default levels were low since the combined offer resulted in recovery of 97% of the purchase price of the stoves sold.

We repeated two sales offers in a rural area with a different market, fuel type, stove model, socioeconomic setting, and a slightly different experimental design. We sold wood-burning fuel-efficient stoves but also found a quite large uptake (57%) with the free trial plus time payments offer, when compared to the cash-and-carry offer (5%). Defaults were also low in the rural setting, as we recovered 99% of the stove sales price. Similarly high uptake in both settings reinforces the idea that low demand does not inherently hamper the sale of beneficial environmental and health-improving technologies such as fuel-efficient cookstoves. Instead, other important barriers, including information and liquidity constraints, must be eliminated before these purchases will occur.

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Figure 1

Comparison of charcoal stoves: traditional versus Ugastove



(a) Traditional Charcoal Stove



(b) Ugastove Charcoal Stove

Figure 2

Comparison of wood burning stoves: three stone fire versus Envirofit G-3300



(a) Three Stone Fire



(b) Envirofit G-3300

Table 1
Differences between urban and rural studies

	Urban (Kampala) study	Rural (Mbarara) study
Fuel used by new stove	Charcoal	Wood or other biomass
Means of acquiring fuel	Majority purchase charcoal	Majority gather wood
Stove brand sold	Ugastove	Envirofit G-3300
Price of stove	\$6, \$8, or \$10 for size 1,2,3	\$12 (\$16) in 4 (22) parishes
Cooks for how many	Size 1, cooks for 5-7 people Size 2, cooks for 10-12 people Size 3, cooks for 10-12 people	Cooks for 4-7 people
Sales method	Door-to-door sales by research staff acting as salespeople	Parish-wide sales meeting with research staff acting as salespeople
Time payment collected by	Research staff acting as salespeople	Focal point person from parish recruited by research team

Table 2
Household characteristics urban (Kampala) study: summary statistics

	Cash and Carry	Free Trial Offer	Time Payments	Free Trial and Time Payments	row equality	
	Mean SD	Mean SD	Mean SD	Mean SD	<i>p</i> -value	N
<i>Household characteristics</i>						
Female respondent (share)	0.86 (0.34)	0.88 (0.33)	0.87 (0.34)	0.88 (0.32)	0.885	1863
Number at largest daily meal	4.98 (2.71)	4.96 (2.56)	5.33 (2.76)	4.86 (2.67)	0.205	1740
Charcoal is primary fuel source (share)	0.94 (0.24)	0.95 (0.21)	0.95 (0.22)	0.94 (0.24)	0.855	1863
Charcoal expenditures (USD per week)	2.52 (1.54)	2.53 (1.82)	2.72 (1.92)	2.76 (1.77)	0.253	1724
<i>Stove usage and knowledge</i>						
Use more than one stove weekly (share)	0.71 (0.46)	0.64 (0.48)	0.68 (0.47)	0.71 (0.45)	0.343	1815
Use clay stove weekly (share)	0.89 (0.32)	0.85 (0.36)	0.86 (0.35)	0.82 (0.38)	0.135	1815
Use basic metal stove weekly (share)	0.33 (0.47)	0.34 (0.48)	0.35 (0.48)	0.37 (0.48)	0.891	1815
Use three stone fire weekly (share)	0.02 (0.12)	0.01 (0.10)	0.00 (0.07)	0.01 (0.09)	0.392	1863
Owns electric, gas or kerosene stove (share)	0.02 (0.14)	0.04 (0.19)	0.04 (0.19)	0.03 (0.16)	0.547	1815
Already owns fuel-efficient stove (share)	0.07 (0.25)	0.09 (0.29)	0.09 (0.29)	0.08 (0.27)	0.393	1796
Have seen a fuel-efficient stove before (share) [among HHs that do not already own one]	0.51 (0.50)	0.57 (0.50)	0.51 (0.50)	0.50 (0.50)	0.495	1639
Aware fuel-efficient stoves use less fuel (share) [among HHs that do not own, but seen one]	0.55 (0.50)	0.48 (0.50)	0.56 (0.50)	0.55 (0.50)	0.569	848

Note: Household data collected at initial household sales pitch. We adjust standard errors for clustering at the neighborhood level. Values presented are rounded to two decimal places.

Table 3
Household characteristics rural (Mbarara) study: summary statistics

	Cash and Carry		Free Trial and Time Payments		Difference	p-value	N
	Mean	SD	Mean	SD			
<i>Household demographics</i>							
Female respondent (share)	0.55	0.50	0.65	0.48	0.10	0.053	1404
Age of respondent	39.12	13.65	39.62	13.65	0.50	0.643	1397
Married (share)	0.76	0.43	0.78	0.41	0.02	0.386	1404
Wife is primary cook (share)	0.85	0.35	0.88	0.32	0.03	0.245	1404
Spouses make decisions jointly (share)	0.52	0.50	0.52	0.50	-0.00	0.976	1404
<i>Socioeconomic status</i>							
Earns income (share)	0.93	0.27	0.89	0.31	-0.04	0.057	1398
Self employed (share)	0.68	0.47	0.66	0.48	-0.02	0.467	1404
Year round employment (share)	0.59	0.49	0.51	0.50	-0.08	0.092	1404
Identify as subsistence farmers (share)	0.85	0.36	0.87	0.33	0.02	0.236	1404
Value of assets (USD)	697.37	1131.58	833.94	1294.64	136.56	0.315	1404
<i>Stove use and fuels</i>							
Three stone fire is primary stove (share)	0.67	0.47	0.70	0.46	0.03	0.610	1404
Number at largest daily meal	5.56	2.46	5.70	2.43	0.14	0.618	1388
Always boils drinking water (share)	0.66	0.47	0.71	0.45	0.06	0.402	1404
Firewood primary fuel source (share)	0.85	0.36	0.90	0.29	0.06	0.203	1404
Purchased firewood last month (share)	0.36	0.48	0.28	0.45	-0.09	0.105	1396
Gathered firewood last month (share)	0.73	0.44	0.84	0.37	0.10	0.048	1397
<i>Openness to new technologies or products</i>							
Household in savings group (share)	0.77	0.42	0.80	0.40	0.03	0.415	1398
Household uses improved seeds (share)	0.18	0.38	0.18	0.38	0.00	0.944	1398
Household uses fertilizer (share)	0.06	0.23	0.05	0.22	-0.01	0.597	1398
Household owns solar lamp (share)	0.12	0.32	0.14	0.34	0.02	0.484	1398

Note: Household data collected at the parish wide sales meeting. We adjust standard errors for clustering at the parish level. To minimize the effect of outliers the value of assets is bottom and top coded at 2% and 98% of the distribution, respectively. Values presented are rounded to two decimal places, the value in the difference column is calculated prior to rounding.

Table 4
Purchase and payment by sales offer in urban (Kampala) study

	Cash and Carry		Free Trial Offer		Time Payments		Free Trial and Time Payments		Test of Equality
	N	%	N	%	N	%	N	%	<i>p</i> -value
Number of offers made	579		539		390		355		
Purchased or accepted free trial	23	4.0%	178	33.0%	102	26.2%	171	48.2%	0.000
<i>Among those that accepted free trial</i>									
Returned after free trial			20	11.2%	—	—	7	4.1%	
Returned after payments began			1	0.6%	1	1.0%	2	1.2%	
Paid in full			138	77.5%	95	93.1%	151	88.3%	
In default			19	10.7%	6	5.9%	11	6.4%	
<i>Among those that paid in full</i>									
Paid off early			10	7.2%	32	33.7%	47	31.1%	
Paid off late			9	6.5%	10	10.5%	15	9.9%	
<i>Among those in default</i>									
Paid more than zero			8	42.1%	5	83.3%	11	100.0%	
Paid at least half price			6	31.6%	3	50.0%	9	81.8%	
Uptake (less returns)	23	4.0%	157	29.1%	101	25.9%	162	45.6%	0.000
Revenue as share of owed		100.0%		90.2%		96.2%		96.9%	
Uptake (less returns and defaults)	23	4.0%	138	25.6%	95	24.4%	151	42.5%	0.000
Revenue as share of owed		100.0%		100.0%		100.0%		100.0%	

Note: Sales offers made at randomly selected urban households. Test of row equality reports the *p*-value for of the chi-squared statistic testing if uptake across the four offers is equal. Revenue as a share of what consumers owed does not count returned stoves as either revenue or what consumers owed. The one case of a free trial recipient returning the stove after payments began was a person who wanted to pay a small portion of the purchase price when the stove was delivered, but then returned the stove after the free trial. Ten recipients of the free trial offer requested to pay at the time the stove was delivered (in essence not utilizing the free trial), these are marked as paid off early in the free trial offer column. Nine recipients of the free trial offer did not pay the full purchase price at the end of the free trial, but did pay in subsequent weeks.

Table 5
Purchase and payment by sales offer in rural (Mbarara) study

	Cash and Carry		Free Trial and Time Payments		Test of Equality <i>p</i> -value
	N	%	N	%	
Number of offers made	538		866		
Purchased or accepted free trial	25	4.6%	538	62.1%	0.000
<i>Among those that accepted free trial</i>					
Returned after free trial			3	0.6%	
Returned after payments began			41	7.6%	
Paid in full			489	90.9%	
In default			5	0.9%	
<i>Among those that paid in full</i>					
Paid off early			108	22.1%	
Paid off late			30	6.1%	
<i>Among those in default</i>					
Paid more than zero			2	40.0%	
Paid at least half price			1	20.0%	
Uptake (less returns)	25	4.6%	494	57.0%	0.000
Revenue as share of owed		100.0%		99.1%	
Uptake (less returns and defaults)	25	4.6%	489	56.5%	0.000
Revenue as share of owed		100.0%		100.0%	

Note: Sales offers made at parish wide sales meeting. Two sample test of proportions used to test equality between sales offers. Revenue as a share of what consumers owed does not count returned stoves as either revenue or what consumers owed.

Table 6
Comparing sales performance and costs in urban setting

<i>Effort to Make 100 Sales</i>	Sales Rate	Initial Sales Visits	Collection Visits	Total Visits	Working Days	Sales per Month	Sales per Working Day
Cash and Carry	4.0%	2,500	0	2,500	100.0	20.0	1.0
Free Trial	29.1%	344	100	444	17.7	112.7	5.6
Time Payments	25.9%	386	300	686	27.4	72.9	3.6
Free Trial and Time Payments	45.6%	219	400	619	24.8	80.7	4.0
<i>Monthly Default and Capital Costs</i>	Default Rate	Sales Price	Gross Revenue	Monthly Interest	Default Losses	Net Revenue	Revenue Ratio
Cash and Carry	0.0%	\$6.00	\$120.00	\$7.20	\$0.00	\$112.80	1.0
Free Trial	9.8%	\$6.00	\$676.22	\$40.57	\$66.27	\$569.38	5.0
Time Payments	3.8%	\$6.00	\$437.25	\$26.24	\$16.62	\$394.40	3.5
Free Trial and Time Payments	3.1%	\$6.00	\$484.42	\$29.07	\$15.02	\$440.34	3.9

Note: The first panel calculates the approximate effort in terms of initial sales visits and followup collection visits required to make 100 sales. We estimate that a salesperson can make 25 household visits per day and has 20 working days per month. We also assume that followup collection visits are equally as time consuming as the initial sales visit. The sales per month column uses this rate of sales and prorates the amount of sales made in a representative month. The second panel uses the sales per month metric from the first panel and calculates additional costs for defaults and the cost of capital. We use the default rates observed in our experiment and conservatively estimate capital costs using a 6% monthly interest rate (higher than what microfinance banks in Kampala generally charge). We calculate the interest rate on the retail value of the entire stock of stoves used in one month (actual capital needs could vary depending on the loan terms and how the salesperson structures sales, but this is likely a fair approximation of the working capital needed, and is comparable across the four offers).

Table 7
Summary of major results: stove uptake

	Urban study	Rural study
Cash and Carry	4.0%	4.6%
Free Trial	29.1%	-
Time Payments	25.9%	-
Free Trial and Time Payments	45.5%	57.0%

Table A1
Robustness check: Purchase and payment by sales offer in rural (Mbarara) study only in parishes where stove was offered for \$16.00 USD

	Cash and Carry		Free Trial and Time Payments		Test of Equality <i>p</i> -value
	N	%	N	%	
Number of offers made	412		720		
Purchased or accepted free trial	21	5.1%	432	60.0%	0.000
<i>Among those that accepted free trial</i>					
Returned after free trial			1	0.2%	
Returned after payments began			35	8.1%	
Paid in full			393	91.0%	
In default			3	0.7%	
<i>Among those that paid in full</i>					
Paid off early			93	23.7%	
Paid off late			4	1.0%	
<i>Among those in default</i>					
Paid more than zero			2	66.7%	
Paid at least half price			1	33.3%	
Uptake (less returns)	21	5.1%	396	55.0%	0.000
Revenue as share of owed		100.0%		99.4%	
Uptake (less returns and defaults)	21	5.1%	393	54.5%	0.000
Revenue as share of owed		100.0%		100.0%	

Note: The four parishes where stoves were sold for \$12.00 USD are excluded to calculate the results in this table. Sales offers made at parish wide sales meeting. Two sample test of proportions used to test equality between sales offers. Revenue as a share of what consumers owed does not count returned stoves as either revenue or what consumers owed.

Table A2
Comparing sales performance and costs in rural setting

<i>Monthly Sales Scenario (1 sales meeting per week)</i>	Cash and Carry	Free Trial and Time Payments
Sales Rate	4.6%	57.0%
Monthly Sales Meetings	4	4
Attendees per Sales Meeting	50	50
Sales	9.2	114
Stove Price	\$16.00	\$16.00
Default Rate	0.0%	0.9%
Total Revenue:	\$147.20	\$1,807.58
Collection costs per installment payment	\$1.60	\$1.60
Installment payments per stove	0	4
Collection costs per stove	\$0.00	\$6.40
Total variable collection costs	\$0.00	\$729.60
Fixed cost to village focal person (\$16 per person)	\$64.00	\$64.00
Capital Cost (6% per month)	\$8.83	\$109.44
Total Expenses:	\$72.83	\$903.04
Net Revenue:	\$74.37	\$904.54
Revenue ratio	1.0	12.2

Note: Sales offers made at village wide sales meeting with approximately 50 attendees each meeting. We simulate one sales meeting per week, and four different villages visited in a month. A village focal point person was recruited to gather the community for the initial sales meeting and then to followup with collecting the installment payments. One village focal point person in each village was paid with a free stove (\$16.00 value) and \$1.60 per installment payment collected (or \$6.40 per stove sold once the full payment amount was collected). We use the default rates observed in our experiment and conservatively estimate capital costs using a 6% monthly interest rate. We calculate the interest rate on the retail value of the entire stock of stoves used in one month (actual capital needs would vary depending on the loan terms and actual sales, but this figure is at least comparable across the offers).

Table A3

Robustness Check: Purchase and payment rates after removing late arrivers in rural (Mbarara) study

	Cash and Carry		Free Trial and Time Payments		Test of Equality
	N	%	N	%	<i>p</i> -value
Number of offers made	396		640		
Purchased or accepted free trial	19	4.8%	397	62.0%	0.000
<i>Among those that accepted free trial</i>					
Returned after free trial			1	0.3%	
Returned after payments began			28	7.1%	
Paid in full			364	91.7%	
In default			4	1.0%	
<i>Among those that paid in full</i>					
Paid off early			83	22.8%	
Paid off late			24	6.6%	
<i>Among those in default</i>					
Paid more than zero			2	50.0%	
Paid at least half price			1	25.0%	
Uptake (less returns)	19	4.8%	368	57.5%	0.000
Revenue as share of owed		100.0%		99.1%	
Uptake (less returns and defaults)	19	4.8%	364	56.9%	0.000
Revenue as share of owed		100.0%		100.0%	

Note: As a robustness check we remove the last 25% of the attendees that arrived at each sales meeting. This is to ensure the representativeness of each sample as it is possible that early arrivers to the meeting texted their friends (whom they knew to already be interested in a fuel-efficient cookstove). If those that arrived the latest to the sales meeting had a higher propensity to purchase a stove, our results would be biased. Comparing these results to the full sample results shows no such bias. Results are largely the same for different cutoff points (removing the final 33%, 25%, or 10% of attendees). Two sample test of proportions used to test equality between sales offers. Revenue as a share of what consumers owed does not count returned stoves as either revenue or what consumers owed.

Table A4
Prices used for construction of aggregate asset values

	Price in USD
Television	134.27
Bicycle	69.70
Radio	13.83
Vehicle	4,509.61
Motorcycle	783.78
Mobile Phone	34.26
Indigenous Cow	252.23
Indigenous Goat	33.18
Indigenous Sheep	26.43
Indigenous Pig	45.27

Note: Price data used to construct value of assets are average prices of durable goods and livestock taken from the 2011-12 round of the Uganda Living Standards Measurement Study (LSMS). This data is publicly available at: econ.worldbank.org