Are Free Testers Effective for Learning about a New Technology?

Experimental Evidence from Seed Trail Packs in Uganda and Ethiopia

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Abstract

Temporary price reductions are a widely used strategy to encourage the initial uptake of new products or technologies, offering users the opportunity to gain firsthand experience and potentially facilitate diffusion through social networks. However, concerns remain that subsidizing or giving away products may reduce their perceived value, increasing the risk that recipients will underutilize, repurpose, or resell the product rather than use it as intended. We examine three behavioral and economic mechanisms through which charging a price may increase uptake, intended use and subsequent adoption of a new technologies: (1) a screening effect, whereby payment deters users who do not value the product and targets those more likely to use it; (2) a sunk cost effect, where paying a positive price induces psychological commitment to use; and (3) a quality signaling effect, where a positive price conveys higher product quality. We test the relevance of these mechanisms in the context of newly released seed varieties for staple food crops, drawing on field experiments with smallholder farmers in Uganda and Ethiopia. Our design allows us to isolate each mechanism's contribution to adoption and use. The findings offer insights into optimal pricing strategies for promoting the uptake of beneficial technologies in low-income settings.

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1 Introduction

Prices are ubiquitous in economic transactions. They are central to the efficient allocation of scare resources within a society and provide an important incentive to producers. But charging the (full) price may not always be optimal. For instance, if a product or technology is new, providing it for free or at a discount for a short period of time may be necessary to encourage potential consumers to try it and learn from it (Bawa and Shoemaker, 2004). From a social welfare point of view, subsidies may be justified to ensure access to essential goods and services for poor or disadvantaged communities that may benefit most (Duflo and Banerjee, 2011). Additionally, providing an initial "starter pack" of subsidized inputs can help overcome barriers to adoption by giving households a temporary boost that enables reinvestment and sustained use over time, potentially setting off a path to long-term welfare gains, in a process that is reminiscent to those described in the poverty trap literature (Balboni et al., 2021). The presence of positive externalities provides another strong rationale against charging the full price for socially beneficial goods (Miguel and Kremer, 2004).

At the same time, there are concerns that free or subsidized provision of goods and services may diminish their perceived value among recipients. As a result, these free or subsidized goods are sometimes left unused, repurposed, or even resold. Prominent examples include the use of free bed nets for fishing and the diversion of subsidized chlorine from water treatment to household cleaning (Cohen and Dupas, 2010; Ashraf, Berry, and Shapiro, 2010).

There are at least three mechanisms through which charging a positive price for a good or service may increase use of the food or service for its intended purpose. First, a *screening effect* may arise: individuals who place higher intrinsic value on the product or service will be more likely to purchase it. Second, psychological mechanisms such as the *sunk cost effect* suggest that individuals may value and use a product or service more simply because they have paid for it, irrespective of their initial interest. Third, prices can serve as signals of quality, particularly when there is uncertainty about the intrinsic value of the product or service (Milgrom and Roberts, 1986).

A key challenge is that these mechanisms are typically conflated in observational data, as each predicts a positive correlation between price and usage. Building on Ashraf, Berry, and Shapiro (2010), this paper employs a field experiment specifically designed to disentangle the three effects. We extend the two-stage randomized pricing design introduced by Arkes and Blumer (1985) to empirically disentangle screening, sunk cost, and signaling effects.

We apply our experimental design in the context of seed trial packs aimed at promoting a newly introduced improved seed varieties among smallholder farmers in a developing country context. Adoption of improved seed varieties presents a policy-relevant case for several reasons. First, given the novelty and limited familiarity of a variety, free samples may be necessary to encourage experimentation among risk-averse farmers.Second, social learning, especially through peer networks, plays a critical role in the large-scale adoption of new agricultural technologies, suggesting the existence of significant positive externalities. (Conley and Udry, 2010; Bandiera and Rasul, 2006). Third, seed purchases involve non-trivial upfront costs, making them susceptible to sunk cost effects. Finally, markets for improved seed are characterized by significant information asymmetries. Bulte et al. (2023) show that uncertainty about seed quality reduces labor investment, and argue that the presence of low-quality ('lemon') inputs undermines learning about profitability—highlighting a potential signaling role for prices.

Our study was implemented in Ethiopia and Uganda. In Uganda, we focused on 4 districts in the east where maize is the staple food crop. Here, the provided maize seed trial packs to about 760 smallholder farmers. In Ethiopia, we used two crops: teff and wheat.

We find that...

Our study contributes to a growing literature that examines how pricing affects uptake and use of socially beneficial goods and services, particularly in contexts where such goods and serveries generate positive externalities. A central question in this literature is whether charging a positive price enhances users' valuation and proper use of the good—or whether it instead suppresses demand, especially among the most vulnerable. This tension is especially salient in the design of public health and agricultural interventions, where concerns about cost recovery, wastage, and behavioral responses to subsidies often shape policy.

Seminal studies by Ashraf, Berry, and Shapiro (2010) and Cohen and Dupas (2010) offer contrasting insights. Ashraf, Berry, and Shapiro (2010), in a two-stage pricing experiment of chlorine for water purification in Zambia, find evidence of screening effects—suggesting that willingness to pay reflects private information about future use—but no support for sunk cost effects. Their results imply that pricing may improve targeting efficiency, potentially justifying lower subsidy levels. In contrast, Cohen and Dupas (2010) study demand and usage of insecticide-treated bed nets in Kenya and find that even small prices substantially reduce uptake, with little evidence that pricing improves targeting. They conclude that free distribution may yield greater health benefits by expanding coverage. Other work has explored whether free distribution leads to misuse or resale. Hoffmann, Barrett, and Just (2009), also studying bed nets in Kenya, find little external leakage and no evidence that poor households resell freely distributed nets. Their findings support the viability of targeted free distribution, challenging the notion that zero prices necessarily erode product value or responsible use. More recently, Mahmoud (2024) applies a two-stage pricing design to improved seed adoption in Bangladesh. By offering free seed trial packs in a second stage to those who initially declined to purchase, she tests for both sunk cost and screening effects. Her findings suggest that buyers do not systematically benefit more from the technology than non-buyers, casting doubt on the efficiency of using price to allocate agricultural innovations.

Our study builds on this body of work but adds a critical innovation by explicitly isolating and testing a third mechanism—signaling effects—alongside the more commonly studied screening and sunk cost effects. Existing two-stage pricing designs typically examine whether prices screen for users with higher private valuations or induce sunk cost-driven commitment, typically by estimating one effect while attempting to control for the other. However, if price also serves as a signal of quality—a plausible channel in settings characterized by information asymmetries—then failure to account for this third mechanism risks conflating its influence with the other two. To address this limitation, we introduce a novel three-stage pricing design that separately identifies each effect. In the first stage, a randomized bargaining price provides a potential quality signal; in the second, a bargaining interaction elicits willingness to pay; and in the third, a surprise discount allows us to assess sunk cost effects. We apply this approach to the adoption of newly introduced improved maize seed varieties in both Ethiopia and Uganda, where uncertainty about seed quality, peer learning, and liquidity constraints jointly influence technology uptake.

A second contribution is the multi-country, multi-commodity context, which strengthens both the external validity and practical relevance of our findings. We implement the same experimental design in Uganda and Ethiopia; two countries that differ in agro-ecological conditions, seed market structures, and policy environments. This allows us to assess the generalizability of price effects across institutional and agronomic settings. In Uganda, the study focuses on improved maize seed, while in Ethiopia it includes both teff and wheat seed varieties. By spanning three distinct crops with varying degrees of commercialization, input requirements, and farmer familiarity, we are able to explore how the relative strength of signaling, screening, and sunk cost effects may depend on baseline knowledge, perceived quality uncertainty, and crop-specific value propositions. This cross-context approach provides nuanced insights into how pricing strategies should be tailored to different markets and technologies.

The remainder of this article is organized as follows. We first explain the methods used and the experimental design, followed by the estimation strategy. We then turn to sampling and provide descriptive statistics of our study population. The analysis consists of three parts. We first look at the price elasticity of demand for the seed trial packs using willingness-to-pay data. We then compare groups of farmers that received a seed trial pack under different modalities. Finally, we provide estimates for screening, sunk cost, and signaling effects. The last section concludes and reflects on implications for policy.

2 Methods and experimental design

At the core of the study is an experimental design in which subjects are assigned to one of two groups, reflecting the standard two-stage design used to identify screening and sunk cost effects. A second experimental factor is layered into the design to separately test for signaling effects.

The first group of farmers was provided the opportunity to buy a seed trial pack from us. In particular, farmers were offered the opportunity to buy a bag of seed from a trained enumerator instructed to simulate typical bargaining interactions in a way that is as close as possible to how transactions happen in a real world setting where bargaining is the norm.[1] The enumerator follows a standard script that was implemented in Open Data Kit (ODK) on Android tablet computers. An initial ask price—randomly drawn, see below—is presented to the farmer as the price of the bag of seed. The enumerator explains what kind of seed it is and what the advantages are. The farmer has the option to accept this initial offer price or not.

If the farmer does not accept the initial offer price, the farmer enters into a bargaining stage where he or she is encouraged to name his/her first bid price. A computer algorithm then determines a counter-offer that the enumerator asks in a second round of negotiation. This new ask price is determined as the farmer's bid price plus 80 percent of the difference between the (initial) ask price and the farmer's (last) bid price (appropriately rounded depending on the country-crop case). This updated (lower) ask price is then presented to the farmer and the farmer gets another opportunity to accept or not. If the farmer does not accept, he or she is encouraged to make a second bid and a third ask price is determined as the farmer's last bid price plus 80 percent of the difference between the last ask price and the farmer's last bid price. Bargaining continues until the farmer accepts an ask price, or the price difference between the bid and ask price is smaller than a (country-crop case specific) threshold, in which case the ODK script instructs the enumerator to sell at the last price the farmer bids.[2]

The second group of farmers also plays the bargaining game exactly as outlined above, but is offered a surprise 100 percent discount after the bargain is concluded. In contrast to most two-stage pricing designs that introduce random or tiered discounts (typically to estimate a continuous demand curve or identify optimal subsidy levels), we use a single, full (100%) discount. This choice is motivated by three considerations. First, we expect a discontinuity in behavior between paying any positive amount and receiving the product for free, consistent with findings in behavioral economics that zero prices can disproportionately affect uptake and use (eg. Shampanier, Mazar, and Ariely, 2007). Second, using a single discount point increases statistical power by concentrating observations in two distinct groups (those who pay and those who receive the good for free), rather than spreading the sample across multiple price points. Finally, from a practical standpoint, our design aligns with how agricultural

[1]In two-stage pricing designs, such as those used by Ashraf, Berry, and Shapiro (2010) and Cohen and Dupas (2010), participants are typically offered a good at randomly assigned price points. A common drawback of this approach is that a substantial share of participants opt not to purchase the good, which, absent over-subscription, can significantly reduce the effective sample size. Since willingness to pay (WTP) is central to analyzing such designs, alternative elicitation methods like the Becker-DeGroot-Marschak (BDM) mechanism can be employed. In its basic form, BDM asks participants to state a bid, which is then compared to a randomly drawn price. If the bid is lower, they do not receive the product; if it meets or exceeds the price, they purchase it at the drawn price. A key advantage of this method is that it inherently includes a surprise discount for those whose WTP exceeds the random price—mimicking the second stage in two-stage designs—see appendix E in Berry, Fischer, and Guiteras (2020).

[2]To make the bargaining also incentive compatible for the enumerators, we tell them in advance that the money that is collected from farmers during this first stage will be divided and distributed equally among all the enumerators.

technologies are often introduced in real-world settings, where trial packs are typically distributed at no cost to encourage experimentation and learning.

Instead of simply asking farmers to purchase the seed at a given price, we provide farmers with the opportunity to buy seed through a sequential bargaining game starting from an initial offer price that provides the starting point of the negotiations process. By randomizing the initial offer price, this procedure gives us a price that can be used to estimate (or control for) the signaling effect that is different from the price that farmers agree upon, the latter which can be used to estimate (or control for) the screening effect. For the maize seed packs in Uganda, prices ranged from 9,000 to 12,000 Uganda shillings (UGX) with increments of UGX 1,000; in Ethiopia, prices ranged from 65 to 110 Ethiopian birr (ETB) for the teff seed packs with increments of ETB 5, and from ETB 50 to ETB 80 for the wheat seed packs with increments of EBT 10. We used a uniform distribution across these price points.

Both groups receive a 1 kg trial pack of an improved seed variety. In Uganda, the seed used is a newly introduced hybrid maize variety popularly known as Bazooka, produced by Naseco Seed Ltd. This variety is high-yielding, with expected returns of 3.5 to 4 metric tons per acre. It was selected in part due to its broad availability in local markets. For the Ethiopian case, we use

Assignment into the groups was at the village level, as we wanted to avoid that a farmer that gets a bag of seed for free lives right next to a farmer that has to pay a positive price for it. However, we did vary the initial offer price in the bargaining experiment at the individual level. We will work with 10 farmers per village, a number that was informed by weighing logistical against statistical power consideration.

3 Estimation

To separate signaling effects from screening effects, we estimate models that are similar to the original two-stage design used in for instance Ashraf, Berry, and Shapiro (2010). In these designs, study participants are given the opportunity to buy a commodity at different price points and in a second stage are given a surprise discount.In such designs, evidence of a screening effect is provided when the coefficient on the price paid is statistically significant in a regression of an outcome variable (such as an indicator for whether the product was used as intended), controlling for the discount. Similarly, a statistically significant coefficient on the discount, in a regression of product use that controls for the price paid, indicates the presence of a sunk cost effect.

In our analysis, we estimate the screening effect by regressing outcome variables on the price agreed upon during the bargaining interaction, while controlling for both an indicator for receiving a discount and the initial randomized offer price. Evidence of a screening effect is provided by a statistically significant coefficient on the agreed price (see β_P in equation 1). Similarly, to estimate the sunk cost effect, we regress outcome variables on an indicator variable that equals one if the farmer paid the agreed-upon price and zero if the farmer received the surprise discount, while controlling for both the price agreed upon during the bargaining interaction and the initial randomized offer price. A statistically significant coefficient on this variable provides evidence of a sunk cost effect (which corresponds to β_D in equation 1).[3] Finally, to test for screening effects, we regress outcome variables on the initial offer price while controlling for the price that resulted from the bargaining and an indicator for having paid the full price; a statistically significant β_I- coefficient in equation 1 provides evidence of a screening effect:[4]

$$Y_i = \alpha + \beta_P P_i + \beta_D D_i + \beta_I I_i + \varepsilon_i \tag{1}$$

where Y_i is the outcome of interest (eg. use of seed trial pack as seed, adoption of promoted seed in subsequent season), P_i is the price for the seed pack that was agreed upon through bargaining, D_i is an indicator variable that is one if the discount was not received, and I_i is the initial offer price at the start of the bargaining.

In the analysis, we look at different (potentially correlated) outcomes, leading to the problem of multiple hypothesis testing. To deal with this problem, we follow a method proposed by Anderson (2008) and aggregate different outcome measures within broadly defined families (eg seed pack use, subsequent adoption of technology, use of complementary inputs and practices,...) into single summary indices. Each index is computed as a weighted mean of the standardized values of the outcome variables, with the weights derived from the inverse variance covariance matrix of the components of the index.

4 Sample and Descriptive Statistics

For the Uganda case study, the total sample consists of a representative sample of about 760 maize farming households, drawn from 4 districts in Eastern Uganda (Mayuge, Kamuli, Iganga, and Bugiri). These districts were chosen because maize is an important crop for both food and cash. In these 4 districts, 76 villages were randomly selected from a list of all villages with the likelihood of a village being selected proportional to the number of households that live in the village. Within each village, 10 households were randomly selected.

In February and March 2023, well before the first agricultural season, we visited all sampled households and collected baseline data. At that time, farmers were also provided with the trial seed pack. The groups were equally split across

[3] In two-stage pricing designs where there is also variation in the discount offered, the price paid after the discount is used in the regressions to measure sunk-cost effects. We focus on the hypothesis that paying something results in more use than paying nothing, since we expect non-linearities around zero price. This hypothesis was also suggested by a practitioner in Ashraf, Berry, and Shapiro (2010) and tested in Panel B of their Table 4.

[4] Note that these three tests can be derived from estimating a single equation. However, we estimate 3 separate equations depending on the effect we are interested in and controls are included demeaned and fully interacted, which is considered the safest option to include controls (Lin, 2013). Standard errors are not adjusted as initial offer prices are randomized at the individual level.

the sample, with about 380 farmers (in 38 villages) that were enrolled in the bargaining and paid the price agreed upon, and 380 farmers (in 38 villages) that were enrolled in the bargaining and received a 100% discount. A few days before enumerators would visit the villages to collect baseline data and implement the bargaining exercise, farmers were notified that we would visit them, and they were told that there may be an opportunity to buy something so they should make sure they had a little bit of money by the time we visited them.

Baseline survey and treatment administration was done by trained enumerators. After a short introduction and obtaining consent, enumerators started with the bargaining as explained in detail in Section 2. After the experiment ended and seed and money changed hands, the baseline survey was implemented asking questions about general household characteristics and more specific questions about maize farming and the use of seed of an improved variety. We also collected some data on consumption expenditure and more subjective questions on food security and welfare. After the survey, farmers that were in the 100 percent discount groups were told that they were lucky winners and got a 100 percent cash-back.

We see that the average household head in the sample that paid a positive price for the seed is 48 years (column 1).

About 53 percent of farmers finished primary education. In 82 percent of households, the head is a man. However, in the group that received a discount, this is only about 75 percent. The average household in our sample comprises of 8.5 individuals. Also on this characteristic we find a slight imbalance for the group that received a discount.

Of relevance to the current study is that the average household in our sample lives about 3.7 kilometers from the nearest agro-input shop. About 43 percent of farmers report that they used maize of an improved variety (as opposed to local seed) on at least one plot in the season preceding the baseline (which was the second season of 2022). For a more precise measure of technology adoption, we asked farmers to list all plots on which maize was grown. The data capturing program (ODK) then randomly selected a plot for which a series of detailed questions are asked.[5] About 7 percent of farmers indicated that they adopted the seed variety that we promoted (Bazooka) in the season preceding the baseline. This low adoption rate confirms that the new technology was not yet widely adopted before our study.

About 35 percent of farmers in the group that paid a positive price used seed from a formal seed source in the season preceding the baseline (for instance from an agro-input dealer or from the government extension system). This is somewhat lower in the group that received the seed for free without bargaining.

[5]The decision to only ask detailed questions on one (randomly selected) plot was guided by the fact that outcomes at plot level (such as adoption of improved inputs and technologies, management practices and production) are likely to be correlated such that gains in statistical power from surveying all plots likely do not outweigh costs of longer and more tedious questionnaires. As the plot to be surveyed was selected randomly, outcomes should be unbiased and consistent. The validity of this approach was confirmed during the endline questionnaire where we asked detailed questions on seed use on all plots: average use of the promoted variety calculated using all maize plots was the same as only using the randomly selected plot.

While this difference is not significant when compared to the group that paid a positive price, it is significantly lower than in the group that got the 100 percent discount. To maintain sufficient vigor, seed should not be reused too much. Only about 22 percent of households used seed that was recycled less than 4 times (which is considered the limit for open pollinating varieties). Finally, maize yields on the randomly selected plot in the second season of 2022 was about 400 kilograms per acre. This was slightly higher in the group that got the 100 percent discount after negotiation than in the group that got the seed for free without participating in the bargaining.

5 Analysis

5.1 Price elasticity of demand

A first step in the analysis is to determine if the seed trial pack is a normal good, in a sense that demand reduces with price. This a prerequisite for screening and sunk cost effects to exist. However, demand elasticity also determines how increasing the price dampens demand and reduces the share of farmers that gets access to the seed, preventing them from using it even in the absence of screening and sunk cost effects. In the context of cash or credit constrained farmers, this may sideline the farmers that could potentially benefit most.

To get a sense of how demand responds to prices, we can look at the prices at which the bargaining was concluded. Figure 1 shows that of all farmers that participated in the bargaining, more than 35 percent was willing to pay only 5000 UGX for the bag. At the other end, less than 5 percent of farmers valued the seed at 9000 UGX.

5.2 Three-stage pricing analysis

We now run regressions to isolate screening, sunk cost, and signaling effects of prices following Equation 1. We do this for four categories of outcomes measured at different points along the causal impact chain. We run models that pool across countries and crops, which are presented in the body of the text, and present separate regressions for the crops (maize, teff and wheat) in the Appendix.

5.2.1 Trial pack use

We start again by testing if, and how, farmers used the seed trial pack. Indeed, the primary outcome in studies that look the relative importance of screening and sunk cost effects is whether the product that was subsidized or provided for free was used for its intended purpose and not wasted or sold. Our first outcome variable is thus whether the seed trial pack was planted in the season that followed. Appendix Table A1 shows that on average, between 97 and 68 percent of farmers used the seed trial pack depending on the crop. Table 1provides evidence of a significant screening effect: farmers with higher valuations of the

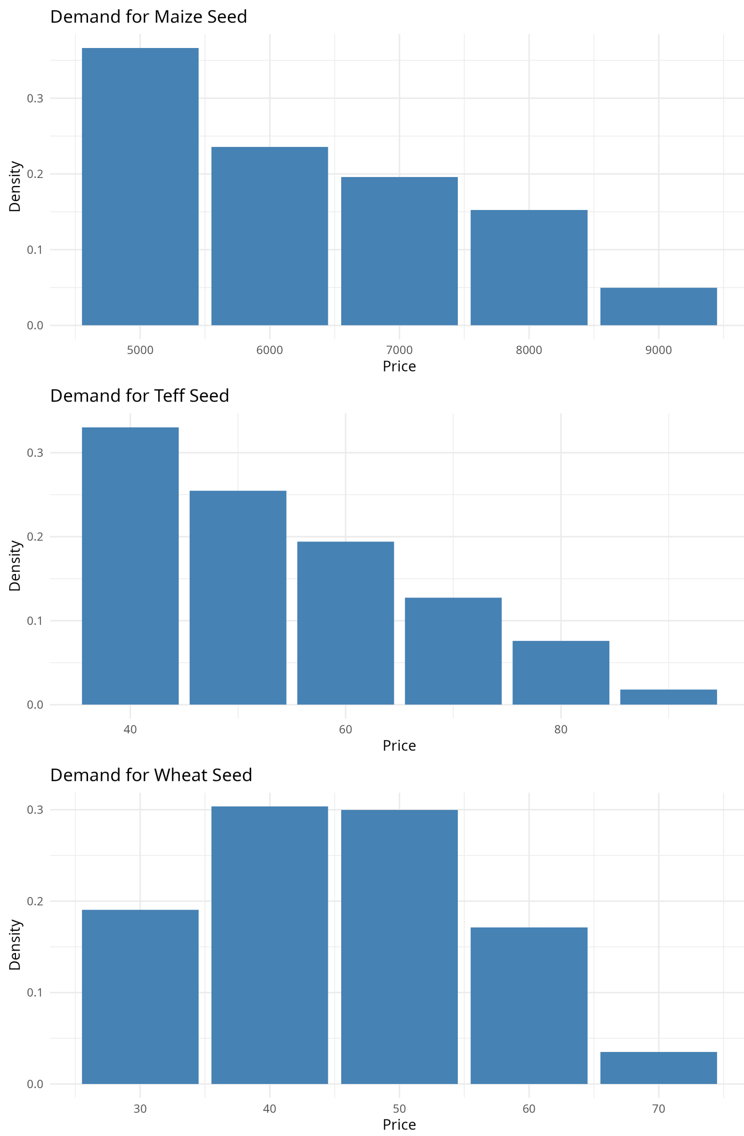

Figure 1: Distribution of prices agreed upon

seed—as proxied by the final price agreed upon during the bargaining game—are also more likely to have planted it. The second column shows that no evidence of a sunk cost effect on seed trial pack use: farmers who paid a positive price were no more likely to plant the seed than those who received it for free, suggesting that paying does not increase psychological commitment to use. Finally, the third column shows that a higher starting price at which the seed was initially offered reduces the likelihood that the seed is used for its intended purpose, suggesting a negative signaling effect. A possible explanation is that farmers who were initially offered a high price perceived the seed as more valuable and may have opted to resell it rather than plant it themselves. If resale opportunities exist, a higher initial price could increase the perceived market value, shifting behavior away from on-farm use. This would imply that price signals may distort intended use, particularly when products are both subsidized and tradable.

Appendix Table A1 shows significant heterogeneity related to the crop and/or country. In particular, the effect that we find in the pooled regression seems to be driven by teff in Ethiopia. In addition to the significant screening effect and the negative coefficient for signaling, we now also have a significant and negatives sunk cost effect. The negative coefficient implies that paying reduces use conditional on interest, possibly due to liquidity constraints, social comparisons, or perceived unfairness. Rather than reinforcing commitment, payment appears to create friction—a finding that challenges conventional wisdom on pricing as a behavioral tool. Interestingly, results also show that for the case of wheat in Ethiopia a sunk cost effect may be at play.

The table similarly does not find screening, sunk cost, nor signaling effects for the likelihood that farmers did not mix the seed from the seed trial pack with other seed. For the proportion of farmers that use a plot layout that enables for direct comparison between seed performance of the trial seed and local seed, we find that as prices rise, the proportion reduces, suggesting a negative screening effect.

In about 92 percent of the cases, the seed trial pack was used by the person who generally takes decisions with respect to what seed to use. We find among farmers that paid the full price, this proportion is significantly lower. We also find that farmers who paid and did not get the discount were less likely to keep grain obtained from the trial plot separate during and after harvest. This suggests negative sunk cost effect.

Overall, we do not find convincing effects that screening, sunk cost or signaling are important early in the causal impact chain. In fact, the summary index shows a negatives sunk cost effect.

5.2.2 Adoption and outcomes in subsequent season

Turning to adoption in the season following the one where farmers could use the trial pack, we see that about 22 percent of farmers used improved seed on the randomly selected plot. Restricting to the seed that was the focus of the study, we find that about 11 percent of farmers used bazooka on the randomly selected plot. We do not find that seed use in the subsequent season is susceptible to

Table 1: Effects on Use of Trial Seed - pooled

	screening	sunk cost	signaling	nobs
Used trail pack as seed (1=yes)	0.038**	-0.004	-0.043*	1673
	(0.014)	(0.007)	(0.017)	
did not mix seed with other seed	0.003	0.006	-0.033+	1651
	(0.014)	(0.007)	(0.017)	
decision maker used seed	0.04**	-0.011	-0.045*	1652
	(0.015)	(0.008)	(0.018)	
kept harvest separate	0.043**	-0.014+	-0.005	1607
	(0.015)	(0.008)	(0.018)	
Index	0.058**	-0.023**	-0.031+	1607
	(0.015)	(0.008)	(0.017)	

Note:

Table 2: Effects in Subsequent Season - pooled

	screening	sunk cost	signaling	nobs
used improved seed on random plot	0.013	0.017	0.002	1458
	(0.015)	(0.011)	(0.019)	
used bazooka seed on random plot	0.044**	0.007	-0.026	1458
	(0.015)	(0.011)	(0.019)	
quantity of seed	0.009	-0.029*	0.015	831
	(0.024)	(0.013)	(0.025)	
production	0.027+	-0.006	-0.035+	1439
	(0.016)	(0.011)	(0.02)	
Productivity	0.031+	-0.002	-0.026	1238
	(0.016)	(0.012)	(0.021)	
Index	0.056*	-0.019	-0.016	656
	(0.026)	(0.015)	(0.027)	

Note:

screening, sunk cost, nor signaling effects. Looking at the quantities of seed used for farmers that used improved seed varieties and farmers that used Bazooka, we similarly find no price effects.

Finally, we do find evidence of screening effects on production. For each 1000 UGX increase in the valuation of the seed trial pack, production in the subsequent year increased by about 17 kilograms, which corresponds to about 5 % over the mean. The significant screening effect disappears at the intensive margin, suggesting that farmers with a higher valuation also expand plot size. For the sunk cost effect, we find no impact on production, but a negative sunk cost effect appears for productivity (pointing to a reduction in plot size associated to sunk cost effects).

In sum, we only find weak evidence of screening effects on outcomes in the next season, with the summary index being positive only at the 10 percent level.

Table 3: Attention - pooled

	screening	sunk cost	signaling	nobs
Remembers seed	0.055**	0.008	-0.03+	1673
	(0.015)	(0.008)	(0.018)	
Remembers price of trail pack	-0.033*	-0.046**	0.044*	1672
	(0.014)	(0.007)	(0.017)	
difference between actually paid and what farmer remembers	-0.029+	-0.102**	-0.011	1400
	(0.015)	(0.008)	(0.018)	
Index	0.022	-0.085**	-0.012	1171
	(0.018)	(0.009)	(0.02)	

Note: price bought only on subset of farmers that paid positive price - not included in index.

5.2.3 Attention

We now consider if higher prices affects how much attention farmers pay to the seed trial pack and what the relative importance is of the different effects. At the time of the midline questionnaire, about 77 percent of farmers correctly remember the name of the seed that they received. We do not find significant screening or sunk cost effects. We do find weak evidence of a reduction in this likelihood if the initial offer price was higher (indicating a negative signaling effect). Only 5 percent of farmers correctly recalled the name of the seed company and there are no screening, sunk cost, or signaling effects.

A high share of farmers say they remember the price that emerged from the bargaining experiment. As expected, this share reduced somewhat over time. We find a positive sunk cost effect that is significant at the 1 percent level at midline. Farmers that paid the full price (controlling for their valuation of the seed trial pack) are 9 percentage points more likely to say that they remember the price.

We also look at how accurately they remember the price by considering the average absolute deviation from the actual price arrived at during bargaining. Farmers under- or overestimate the price by about 1000 UGX, and, again as expected, this amount increases over time. We find that due to sunk cost effects, the margin reduces significantly: farmers who paid a positive price are better at recalling the agreed upon price.

5.2.4 Complementary input use

Finally, we look at screening, sunk cost and signaling effects with respect to complementary inputs and practices. We find evidence of screening effects for some of the inputs and practices. For example, overall, about 17 percent of farmers follow recommended seed spacing and seed rates on the trial plot and this share is increasing with valuation as proxied by the outcome of the bargaining experiment. For inorganic fertilizer use, there seems to be a positive relationship with price negotiated, but the coefficient is not significant.

Table 4: Effects on Inputs and Agronomic practices - pooled

	screening	sunk cost	signaling	nobs
Used fertilizer	0.04*	-0.019*	-0.006	1483
	(0.016)	(0.008)	(0.019)	
Used chemicals	0.013	-0.014+	-0.022	1483
	(0.015)	(0.008)	(0.019)	
Index	0.048**	-0.027**	-0.026	1453
	(0.016)	(0.008)	(0.019)	

Note:

Looking at sunk cost effects, signs generally turn negative. The share of farmers that used organic fertilizer on the trial plot reduced if farmers had to pay the full price. Farmers also seemed to engage less in timely planting if they had to did not received the discount. There is no evidence of signaling.

Taken together, we find evidence of screening effects for complementary input use and use of recommended agronomic practices on the seed trial plot. We again find evidence of negative sunk cost effects. This is confirmed by significant coefficient estimates for the index.

6 Conclusion

In this paper, we study the importance of prices when introducing a new product or service. We use a recently released hybrid maize seed variety as case study and provide smallholder farmers with seed trial packs. The seed trial packs are provided through three different modalities. A first group is asked to pay a positive price for the seed according to their willingness to pay. This willingness to pay is approximated by the price that is agreed upon after bargaining over the seed (starting from a random initial offer price). A second group also bargained over the price, but was given a 100 percent surprise discount, hence receiving the trial pack for free. A third group simply got the seed trial pack for free without going through the bargaining process.

We find that a farmer's willingness to pay as approximated by the price on which agreement was reached during bargaining does not predict use of the seed trial pack. We find negative sunk cost effects of trial pack usage, with farmers that paid the full price being less likely to use it in ways that would maximize learning. Farmers that paid the full price were also less likely to use recommended agronomic practices such as timely planting and complementary inputs such as fertilizer. At the same time we do find that farmers that value seed higher put more effort and practices into it. This leads them to expand the area under cultivation, significantly increasing production as valuation rises. We do not find evidence that prices signal value or quality.

These findings have clear implications for the pricing of seed trial packs, particularly in efforts to promote the adoption of improved agricultural technologies. First, the presence of a significant screening effect suggests that charging a small, symbolic price may be beneficial. Even modest prices help ensure that seed trial packs are distributed to farmers who are genuinely interested and likely to use them, rather than being wasted or diverted. In resource-constrained programs, such targeting can improve cost-effectiveness. For example, charging a nominal fee for seed packs—as opposed to giving them away for free—could help extension agents or NGOs identify early adopters more efficiently, especially in remote or underserved regions where follow-up is costly.

Second, the absence of a sunk cost effect implies that paying a positive price does not, on its own, increase the likelihood that farmers use the seed. This challenges the commonly held assumption that paying for a product creates a psychological commitment to use it. In this case, farmers who received the seed for free were just as likely to plant it as those who paid for it, conditional on their underlying interest. This means that prices should not be used as a behavioral nudge to enforce usage. Instead, complementary strategies such as follow-up visits, reminders, or support with input use may be more effective in encouraging proper use of the seed packs.

Third, the finding that a higher initial offer price reduces the likelihood of seed use points to an unintended negative signaling effect. Rather than interpreting a high price as a signal of quality, farmers may see it as a warning sign indicating that the seed requires costly complementary inputs or is being sold opportunistically. In contexts where farmers are used to receiving agricultural inputs through government programs or NGOs at low or no cost, anchoring them on a high initial price can backfire. Moreover, if resale markets exist, high initial prices may make it more attractive to sell the seed rather than plant it. This underscores the importance of avoiding inflated or misleading reference prices and instead designing pricing strategies that are clear, credible, and well-aligned with farmers' expectations and realities.

Taken together, these results suggest that the optimal pricing of seed trial packs involves setting a low but positive price that enables effective targeting without triggering mistrust or misinterpretation. Pricing strategies should be simple and transparent, and if price is intended to serve as a signal of quality, it should be accompanied by trusted endorsements or demonstrations. In low-trust, information-scarce environments, price alone is unlikely to fulfill all these roles. Instead, combining modest pricing with well-designed communication and support may be the most effective approach to promoting the uptake and use of improved seeds.

7 Ethical clearance

This research received clearance form Makerere's School of Social Sciences Research Ethics Committee (MAKSSREC 01.23.627/PR1) as well as from IFPRI IRB (DSGD-23-0108). The research was also registered at the Ugandan National Commission for Science and Technology (SS1657ES).

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9 Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used ChatGPT in order to refine phrasing, improve clarity and structure, and prepare materials for publication and dissemination. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

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10 Appendix

Table A1: Effects on Use of Trial Seed

	mean	screening	sunk cost	signaling	nobs
		Uganda - maize			
Used trail pack as seed (1=yes)	0.972	0.006^{+}	-0.002	-0.003	749
	(0.165)	(0.003)	(0.002)	(0.005)	
did not mix seed with other seed	0.94	-0.002	0.001	-0.005	727
	(0.238)	(0.005)	(0.003)	(0.008)	
decision maker used seed	0.918	0.005	-0.006^{+}	-0.01	728
	(0.275)	(0.005)	(0.003)	(0.009)	
kept produce from improved separate from local during and post harvest	0.713	0.013	-0.018**	0.007	683
	(0.452)	(0.009)	(0.006)	(0.015)	
Index	0.12	0.014*	-0.017**	0	683
	(0.341)	(0.007)	(0.004)	(0.011)	
		Ethiopia - teff			
Used trail pack as seed (1=yes)	0.8	0.038**	-0.018**	-0.039**	554
	(0.401)	(0.013)	(0.007)	(0.012)	
did not mix seed with other seed	0.779	0.032*	-0.017*	-0.041**	554
	(0.416)	(0.014)	(0.007)	(0.012)	
decision maker used seed	0.572	0.064**	-0.019*	-0.056**	554
	(0.495)	(0.018)	(0.009)	(0.016)	
kept produce from improved separate from local during and post harvest	0.699	0.046**	-0.017*	-0.034*	554
	(0.459)	(0.017)	(0.008)	(0.015)	
Index	0	0.109**	-0.038**	-0.097**	554
	(0.851)	(0.03)	(0.015)	(0.026)	
		Ethiopia - wheat			
Used trail pack as seed (1=yes)	0.684	-0.04^{+}	0.05**	-0.019	370
	(0.465)	(0.021)	(0.01)	(0.02)	
did not mix seed with other seed	0.67	-0.04^{+}	0.049**	-0.007	370
	(0.471)	(0.022)	(0.01)	(0.02)	
decision maker used seed	0.523	-0.019	0.032**	-0.005	370
	(0.5)	(0.025)	(0.011)	(0.024)	
kept produce from improved separate from local during and post harvest	0.606	-0.013	0.042**	0.002	370
	(0.489)	(0.023)	(0.011)	(0.022)	
Index	0	-0.036	0.075**	-0.002	370
	(0.885)	(0.042)	(0.019)	(0.04)	

Note:

Table A2: Effects in subsequent season - separate

	mean	screening	sunk cost	signaling	nobs
			Uganda - maize		
used improved seed on random plot	0.219	0.006	0.029	0.012	703
	(0.414)	(0.008)	(0.032)	(0.013)	
used bazooka seed on random plot	0.114	0.005	0.014	0.003	703
	(0.318)	(0.006)	(0.024)	(0.01)	
quantity of seed	5.337	0.314	-0.512	-0.41	147
	(4.458)	(0.2)	(0.754)	(0.305)	
production	381.248	19.135**	6.31	-13.55	684
	(389.54)	(7.143)	(29.987)	(12.593)	
Productivity	489.523	10.022	-55.862$^+$	-14.303	671
	(374.231)	(6.954)	(29.122)	(12.224)	
Index	0.587	0.04	-0.19	-0.057	143
	(0.747)	(0.033)	(0.125)	(0.051)	
			Ethiopia - teff		
used improved seed on random plot	0.689	0.011	0.003	-0.002	497
	(0.464)	(0.019)	(0.009)	(0.016)	
used bazooka seed on random plot	0.339	0.072**	-0.013	-0.03$^+$	497
	(0.474)	(0.019)	(0.009)	(0.017)	
quantity of seed	8.605	-0.527	-0.041	0.678$^+$	446
	(9.277)	(0.398)	(0.196)	(0.351)	
production	455.191	-55.351	24.553	4.319	497
	(945.29)	(40.283)	(19.828)	(35.229)	
Productivity	1338.957	66.143	11.308	42.903	384
	(2112.819)	(97.979)	(49.563)	(91.41)	
Index	0.017	0.021	-0.005	0.021	343
	(0.435)	(0.02)	(0.01)	(0.019)	
			Ethiopia - wheat		
used improved seed on random plot	0.607	0.024	0.022$^+$	-0.047$^+$	258
	(0.489)	(0.028)	(0.013)	(0.027)	
used bazooka seed on random plot	0.312	0.027	0.019	-0.023	258
	(0.464)	(0.028)	(0.013)	(0.027)	
quantity of seed	43.169	2.966	-0.318	-0.391	238
	(28.755)	(1.814)	(0.836)	(1.755)	
production	714.094	-102.262	33.259	-82.52	258
	(1836.82)	(115.754)	(52.824)	(112.886)	
Productivity	2566.752	139.758	76.49	-869.189$^+$	183
	(6948.588)	(550.243)	(246.896)	(522.082)	
Index	-0.022	0.052	0.021	-0.064*	170
	(0.438)	(0.033)	(0.015)	(0.031)	

Note:

Table A3: Attention

	mean	screening	sunk cost	signaling	nobs
			Uganda - maize		
Remembers seed at endline	0.772	0.008	0	-0.022^{+}	749
	(0.42)	(0.008)	(0.004)	(0.013)	
Remembers price of trail pack at endline	0.939	-0.004	0.004	0.004	748
	(0.24)	(0.004)	(0.002)	(0.007)	
difference between actually paid and what farmer remembers at endline	1018.519	28.479	-70.411**	-25.651	702
	(1577.191)	(29.265)	(16.058)	(49.671)	
Index	0.282	0.009	-0.002	-0.043*	473
	(0.54)	(0.013)	(0.007)	(0.02)	
			Ethiopia - teff		
Remembers seed at endline	0.298	0.049**	-0.003	-0.021^{+}	554
	(0.458)	(0.014)	(0.007)	(0.012)	
Remembers price of trail pack at endline	0.182	-0.001	-0.044**	0.025**	554
	(0.386)	(0.011)	(0.005)	(0.009)	
difference between actually paid and what farmer remembers at endline	-18.435	-0.143	-7.791**	0.395	372
	(48.586)	(1.937)	(0.917)	(1.267)	
Index	0.091	0.158**	-0.14**	-0.031^{+}	372
	(0.6)	(0.026)	(0.012)	(0.017)	
			Ethiopia - wheat		
Remembers seed at endline	0.409	0.052*	0.015	-0.017	370
	(0.492)	(0.025)	(0.012)	(0.024)	
Remembers price of trail pack at endline	0.1	0.019	-0.044**	0.01	370
	(0.3)	(0.014)	(0.007)	(0.013)	
difference between actually paid and what farmer remembers at endline	-26.773	-4.01**	-9.725**	1.418	326
	(40.629)	(1.489)	(0.69)	(1.333)	
Index	0.097	0.069*	-0.142**	-0.003	326
	(0.613)	(0.03)	(0.014)	(0.027)	

Note: price bought only on subset of farmers that paid positive price - not included in index.

Table A4: Effects on Inputs and Agronomic practices

	mean	screening	sunk cost	signaling	nobs
			Uganda - maize		
Followed recommended seed spacing and seed rate	0.169	0.016*	-0.002	-0.012	714
	(0.375)	(0.007)	(0.004)	(0.012)	
Used fertilizer	0.546	0.029**	-0.015**	0.001	728
	(0.498)	(0.009)	(0.005)	(0.015)	
Used chemicals	0.285	0.011	-0.005	-0.009	728
	(0.452)	(0.008)	(0.005)	(0.014)	
Gap filling	0.16	0.013+	-0.004	0	728
	(0.367)	(0.007)	(0.004)	(0.011)	
nr of times weeding	2.492	0.003	-0.014+	-0.034	727
	(0.702)	(0.013)	(0.007)	(0.022)	
timely planting	0.646	0.009	-0.01*	0.011	713
	(0.479)	(0.009)	(0.005)	(0.015)	
Index	0.002	0.033**	-0.015**	-0.012	698
	(0.447)	(0.008)	(0.005)	(0.014)	
			Ethiopia - teff		
Used fertilizer	0.982	-0.003	0.002	0.002	497
	(0.134)	(0.005)	(0.002)	(0.004)	
Used chemicals	0.765	-0.023	0.004	0.008	497
	(0.424)	(0.014)	(0.007)	(0.012)	
Index	0	-0.038	0.014	0.016	497
	(0.726)	(0.024)	(0.012)	(0.021)	
			Ethiopia - wheat		
Used fertilizer	0.997	0	-0.001	-0.001	258
	(0.058)	(0.004)	(0.002)	(0.004)	
Used chemicals	0.718	0.058*	-0.03*	-0.056*	258
	(0.451)	(0.025)	(0.012)	(0.025)	
Index	0	0.061	-0.044*	-0.067	258
	(0.739)	(0.044)	(0.02)	(0.043)	

Note: