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INSURING THOSE WHO BEAR THE RISK: THE IMPACT OF GENDER-INCLUSIVE INSURANCE IN KENYA

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ABSTRACT

The novel insurance contracts for crop losses and livestock mortality that have been developed in low income countries typically protect against shocks in the traditionally male sphere of economic activity. Often overlooked are women, the particularities of their indirect exposure to this risk, and their socially constructed responsibility to manage family well-being. To fill this lacuna, this paper studies the effect of a low-cost intervention that reformulates a livestock insurance contract so that it directly addresses women's risk and is sold in units that are commensurate with women's expenditure responsibilities. We measure the effect of this contractual reformulation using a randomized trial amongst pastoralist communities in Kenya. Twenty-nine percent of previously subsidized households that received the novel contractual formulation purchased insurance (without subsidy), compared to only nineteen percent of previously subsidized households offered insurance under the standard malerisk formulation. Households that had not received prior insurance subsidies purchased no insurance, irrespective of the inclusivity of the insurance design. Protecting women, their assets, and those who depend on them will require a combination of smart subsidies and gender-inclusive insurance contract design.

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1 Introduction

Index insurance was proposed over a century ago as a practical way to insure small-scale farmers in India who could not be cost-effectively insured using conventional, loss-verified insurance (Chakravarti, 1920). While the proposal lay dormant for some decades, since the 1990s there have been large and continuing efforts to introduce and improve index insurance (see Benami et al. (2021)). Despite these efforts, demand for index insurance has often been tepid at best unless heavily subsidized.[1] While the literature ruminates on multiple reasons for this low demand,[2] this paper focuses on the under-examined hypothesis that demand is low because index insurance typically focusses on men and their activities despite the fact that women bear a substantial burden of the risk in many households. Exploring this hypothesis, we take an existing index insurance product and make it gender-inclusive. Results from a randomized controlled trial in northern Kenya reveal that demand doubles for the gender-inclusive variant of the insurance. We also find that past insurance subsidies are a necessary condition for unsubsidized future demand. This finding that subsidies appear necessary to encourage experimentation and learning mirrors the work by (Carter et al., 2021) on the persistent effects of farm input subsidies. Quantitatively, we find that amongst households that had received randomly distributed insurance subsidies in the past, gender inclusivity boosts insurance demand from 19% to 29%.

The Giné and Yang (2009) study of farmers in Malawi is the work that is perhaps conceptually closest to this paper. These authors find that making insurance purchase a condition for un-collateralized loans actually lowers demand for credit and insurance, precisely because the terms of the loan contract afforded farmers substantial, albeit partial, insurance coverage. Insurance was in other words, being offered to those who did not bear the risk (Carter et al., 2016 further elaborate on this point in their analysis of interlinking credit and insurance).

In our study area–the pastoralist regions of northern Kenya–it is unsurprising that index insurance has been largely focused on men. Livestock-rearing is gender-cast

[1] See the discussion in section 4.

[2] For example, see Carter et al. (2017).

as a male activity that under traditional management requires seasonal migration over long distances. Most households rely primarily on livestock for their livelihoods, and frequent droughts lead to significant livestock losses and cuts to household consumption. Motivated by the centrality of risk in pastoralist regions, a research group collaborating with private insurers introduced index-based livestock insurance (or IBLI) in Northern Kenya in 2010. IBLI relies on a remotely sensed index of vegetative growth in the open rangelands.[3] Since its inception (Chantarat et al., 2013), this insurance was sold on a per-animal basis, thus explicitly targeting assets in the culturally-determined male domain of economic activity. While women sometimes manage small-stock kept close to homesteads, the shocks that directly affect this production and women's other economic activity are not amenable to earth observation as are the shocks that influence transhumance pastoralism. The digital footprints of different economic activities are distinctly gendered.

While women typically do not manage livestock herds that roam the open rangelands covered directly by IBLI, both they and their businesses are exposed to rangeland drought risk. Because livestock are the primary assets and income sources for the majority of households, droughts that destroy livestock also dramatically diminish demand for other goods and services. Droughts can also affect women's businesses indirectly when their partners reduce their contributions to household public goods, defaulting on what (Carter and Katz, 1997) call the conjugal contract that sets transfers from resources under the man's control to women. Conjugal contract default pressures women to reduce their own consumption or sell their own assets to cover household needs that are socially constructed as women's immediate responsibility. The latter becomes increasingly important in the face of anti-poverty graduation programs that rely on building up women's assets (Hobbs, 2022).[4] Timu et al. (2023)

[3]Like other forms of index insurance, IBLI makes payments based on an index that determines payments to everyone in a pre-defined insurance zone (e.g., a county or ward). Because it eliminates the need to measure and verify individual losses, index insurance can in principal be offered to low wealth households in remote location without concerns regarding adverse selection and moral hazard. Jensen et al. (2024) recount the story of IBLI in Kenya, including struggles with low insurance uptake rates.

[4]While graduation programs have been very successful ((Banerjee et al., 2015; Bandiera et al., 2017; Bedoya et al., 2019; Banerjee et al., 2021)), their success is vulnerable to shocks, as illustrate

corroborate this perspective in their study on index insurance in Ethiopia as they show that insurance payouts are associated with increased food consumption for female-, but not male-headed households, providing further evidence that women in many situations are primarily responsible of securing household consumption needs, while men are implicitly insured against this risk by their wives.

A body of research confirms that in many settings, negative shocks disproportionately affect women. For example, in a sample of rural Zimbabwean households, droughts reduced the body mass index of women and daughters but not men and sons (Hoddinott and Kinsey, 2000). Typhoons in the Philippines increased child mortality for female infants, but not males (Anttila-Hughes and Hsiang, 2013). Dercon and Krishnan (2000) find that women who fell ill in rural Ethiopia received a smaller share of household nutrition, but no such effect was seen for men. Finally, Quisumbing et al. (2018) show that droughts in Uganda reduced women's assets, but not men's. Similar to many places, the pastoralist communities in northern Kenya have tightly defined gender roles and responsibilities. This study's maintained hypothesis is that when coupled with women's socially-defined responsibility to deliver household necessities like food, medicine, and school fees, rangeland drought puts women's newly constructed asset base at risk, not to mention their own personal consumption. This pressure is particularly acute because the household responsibilities assigned to women are subject to at least partial irreversibilities. Food shortfalls or even reductions in educational expenditures in one time period cannot be made up for by increased expenditures in future periods. Downside risk thus presents itself as a huge threat to women and the health and well-being of the family for whom they are responsible in the eyes of society.

Against this backdrop, this paper studies the effect of introducing of a low-cost intervention to make index-based insurance fully available for women, as well as for

by the Honduran study discussed in (Banerjee et al., 2015). In our northern Kenya study area, the BOMA Project's Rural Entrepreneur Access Program (REAP) builds up the productive assets of chronically poor women in the pastoralist regions of East Africa, and operates similarly to other graduation programs. Zheng et al. (2023b) show that like these other programs, REAP is effective in supporting pastoralist women in rising out of poverty. Preliminary results from that study also show that rangeland shocks cut deeply into women's assets and erase the impacts of the REAP program.

men, with the hypothesis that this intervention will boost the uptake of insurance and ultimately increase its impacts. To make index insurance available for women, we modified the existing index-based livestock insurance in two ways. First, in marketing and educational materials, we reframed the insurance around women's indirect exposure to rangeland drought by calling out women's risk of reduced intra-household resource transfers from their spouses as well as reduced income in their own businesses. Second, we changed the units in which insurance is sold from the number of livestock that need protecting to number of household members whose basic needs are at risk. We label this two-pronged reformulation of IBLI as a gender-inclusive (GI) insurance intervention.

In a recently published review paper on gender and insurance, Timu and Kramer (2023) find that existing products are often designed and delivered in a way that limits uptake and benefits for women. They argue that gender-inclusive insurance education and extension could be helpful in improving this situation. We study such an intervention in this paper and ultimately find evidence to support their hypothesis: altering the way insurance is framed to emphasize its benefits for women increases demand.

In order to gauge the impact of the novel GI insurance product, we implemented a randomized controlled trial across 87 communities in Samburu county, Kenya. In a randomly selected set of 43 control communities, BOMA Mentors[5] provided marketing and educational information about traditional index-based livestock insurance. In the 44 treatment communities, mentors presented the GI insurance product, emphasizing women's risk exposure, assets and expenditure responsibilities. Conventional IBLT, denominated in animal units, remained available for purchase in treated communities.

As part of a broader impact evaluation of the BOMA REAP program that spanned the 2018-2022 period (see Zheng et al. (2023b)), discount coupons for IBLI were randomly distributed to half the women in the study in all 87 communities. Coupons were valid from 2018 to 2021 insurance purchase periods. Our analysis

[5]As part of the BOMA REAP program discussed in footnote 4, mentors meet regularly with women to teach skills and support their nascent businesses. For this experiment, mentors held meetings open to all members of the community.

Table 1: Insurance Purchases for Post-subsidy 2022 Primary Sales Period

	Full Sample		**Past Subsidy Recipients Only**		
	Past Subsidy	*Never Subsidized*	*Livestock-exclusive*	*Gender-inclusive*	*t-Test (p-Value)*
Bought Insurance, %	23.7	0	19	29	0.001
Premium Paid, $PPP	28.1	0	22.4	34.4	0.007
Premium Paid if purchased, $PPP	118.6	–	116.8	119.9	0.790
Number of Observations	829	881	432	397	–

Kenya shillings converted to $PPP using the December 2021 rate of 43 KSH/$PPP

here focuses on the 2022 sales season, after the expiration of the coupons. We thus have a 2x2 experimental design, with some women previously offered subsidies and others not, and some offered the GI product and others not. Table 1 presents basic descriptive statistics from the study.

While later sections analyze this data using econometric methods, the key insights can be gleaned from the descriptive statistics. As can be seen, in the post-subsidy 2022 insurance sales period, only households that had received past IBLI subsidy support purchased the fully unsubsidized insurance. The right hand side of the table focusses on this sub-population, and 19% of households that received the traditional, livestock-exclusive framing purchased some insurance, while that number rose 10 percentage points to 29% for households offered insurance under the gender-inclusive framing. While there thus appears to be a substantial impact at the extensive margin, conditional on buying insurance, both groups spent just under $PPP120 on insurance.

The remainder of this paper is organized as follows. The next section provides background on index-based livestock insurance and the development of family insurance. Section 3 explains in greater detail the experimental design and balance. Section 4 presents the econometric results while Section 5 concludes.

2 Gender Inclusive Index-based Livestock Insurance

Index insurance is a form of agricultural insurance that uses an index related to production (*e.g.*, satellite vegetation indices, rainfall, or temperature) to identify adverse conditions and compensates policyholders when that index for their geographic area falls below a predetermined threshold. Index insurance has several major advantages compared to traditional indemnity-based insurance. First, there are no individual claims to verify, significantly reducing costs for the insurer. Second, moral hazard is eliminated, since policyholder actions cannot affect their probability of receiving a payout. Third, adverse selection is eliminated since the insurer can observe historical data for the index and price the contract accordingly for each insurance area. The major disadvantage is that the index may fail to reliably capture losses that individuals face (Benami and Carter, 2021) and that uptake is very modest, due in part perhaps to this problem of contract reliability (Carter et al., 2017). This following subsections detail the existing IBLI contract and the modifications made to create the new gender inclusive insurance product that is the subject of this study.

2.1 Index-Based Livestock Insurance

As discussed in the introduction, index-based livestock insurance program was introduced in Northern Kenya in 2010. The index that determines payouts is based on satellite-derived estimates of forage availability, and the contract pricing and payouts are determined at the level of a sub-county administrative unit called a ward.[6] Payouts are calibrated to allow livestock herders to purchase fodder for their animals in times of drought when natural grasses are scarce (Jensen et al., 2019). As originally designed, the product is intended for nomadic pastoralists, who are mobile and spend months each year traveling in search of forage during dry seasons. Livestock ownership and herding is traditionally a male activity — men typically travel with their

[6]In a recent analysis,(Estefania-Salazar et al., 2024) show that forming insurance zones using statistical criteria as opposed to administrative zones can substantially increase the accuracy and quality of index insurance.

herds while women are typically sedentary, staying at a home base, with dependent family members and pursuing activities in the local economy.

In Northern Kenya, there are two rainy seasons each year. The short rainy period spans from October to December, and the long rainy period spans from March to May. There are two insurance sales windows that occur between the rainy seasons, one in January/ February and the other in August/September. Insurance purchased during a sales window covers the next two rainy seasons (or one year), and generally pastoralists who buy insurance during one window will not buy during the subsequent window since their prior insurance purchase is still providing coverage. Because IBLI was initially introduced in the study area during the January-February sales period, most sales and renewals took place during this sales period, with only modest secondary sales taking place during the August-September sales periods. We subsequently refer to the January-February as the primary sales period and the August-September period as the secondary sales window.

Under the conventional framing, pastoralists are encouraged to think of the number of animals they need to protect and to purchase coverage for the appropriate number of goats, sheep, camels, and cows at risk. The total premium and payouts are calibrated to support the number of animals they insure. In the study area for this paper, the product is sold by Takaful Insurance Africa and is structured as a Sharia Law-compliant takaful, and currently sold as Index Based Livestock Takaful, or IBLT.[7]

2.2 Lab-in-the-Field Experimental Pre-test of Gender-inclusive Livestock Insurance

As a prelude to the real world experiment described in Section 3, Hobbs (2022) used a lab-in-the-field experimental game to test the impact of reformulating index-

[7]Takaful insurance contracts contain certain provision for risk- and profit-sharing between the insurance company and the client and share important similarities with mutual insurance companies. To minimize confusion, we will refer to the product by its more common name of IBLI rather than IBLT.

based livestock insurance to make it gender inclusive as described above. The lab experiment relied on a tablet-based game designed to simulate pastoralist life.[8] In the game, participants are asked to allocate a budget between family needs, livestock, insurance, and cash savings for a number of seasons and experience weather shocks each time. In the experiment, participants played several rounds of the game before playing a final incentivized round from which data was collected. Just as in this study, in half of the sessions the insurance used the gender inclusive framing, while in the other half it was framed around livestock. Compared to the conventional framing, the GI treatment increased the share of total spending allocated to insurance by 27% for women and about 17% for men, though the difference from the conventional framing was not statistically significant for men.

The results from Hobbs (2022) indicate that changing the way insurance is formulated may affect purchase decisions, especially for women. The result were also sufficient to encourage our commercial insurance partner, Takaful Insurance Africa, to experiment with GI insurance. But the more important question is whether this reformulation of IBLT demand in the real world, opening the door to protecting women's well-being and the assets they build up independently or through graduation programs.[9]

2.3 Gender-inclusive Insurance Design

To address women's risk exposure, two changes were made to the conventional IBLT product to make it more likely to resonate with women. Appendix Figures A1 and A2 display panels from comic books was used to present the gender-inclusive and standard, or livestock-exclusive framings, respectively. Both comics depict a conversation between two women discussing how a recent drought had impacted them. Under the GI framing, one woman remarks "You know that when rangeland and

[8]See https://vimeo.com/293182472 for a demonstration of the game.

[9]A number of studies have deployed lab in the field experiments to educate people and test demand for index insurance (Lybbert et al., 2010; Elabed and Carter, 2015; Serfilippi et al., 2018). Such experimental games have typically massively overestimated real insurance demand, a fact on which McIntosh et al. (2020) ruefully remark.

forage is bad, we suffer at home ... few meals, no money for school fees, no money for anything." In contrast, under the standard framing the women in the comic emphasize the usefulness of the insurance to protect (men's) livestock.

The second change made to IBLT to increase its salience to women was to shift the unit of purchase from tropical livestock units to family units.[10] This new unit of purchase was offered to allow women to calibrate how much insurance they might need given the number of family members they need to protect given their expenditure responsibilities (as opposed to the number of goats, camels and cows that their husbands need to protect). The payouts for each family unit were set to approximate the per-capita amount of emergency aid that the Government of Kenya offers under its social protection program called the Hunger Safety Net Program (HSNP). Specifically, a single family unit of insurance cost 1,056 Kenyan Shillings (KSH) (24.5 $PPP at the time of this study) and paid a maximum of 5,600 KSH (about $PPP130) in the event of a drought. By comparison, coverage for a single sheep KSH 264 Kenyan Shillings with a maximum payout of KSH 1400. Insurance agents were trained to sell the IBLI insurance in either TLU or family units of coverage.

3 Experimental Design

To study the impact of reformulated gender-inclusive IBLT, we were able to take advantage of a large-scale, ongoing RCT intended to gauge the impact of the BOMA REAP graduation program alone and in combination with livestock insurance. The study spanned the 2018 to 2022 period. As described in Zheng et al. (2023b) women eligible for the graduation program were randomly assigned to treatment waves. Because there were more eligible women than spaces in the graduation program,[11] some eligible women never received the program. The BOMA REAP program provides women with grants, training, and ongoing mentor support to start businesses. It

[10]Tropical livestock units (TLU) converts different species of animals into bovine-equivalent units. A camel is worth 1.4 TLUs, whereas a sheep is 0.1 TLUs.

[11]The implementing NGO did not want to over-saturate the remote communities with too many businesses because of negative pecuniary externalities.

is similar to the poverty graduation programs evaluated in Bandiera et al. (2019), Banerjee et al. (2021), and Banerjee et al. (2022). One of the features of this program is regular visits from mentors who provide coaching and support to women involved in the program.

A separate individual-level randomization in 2018 gave insurance discount coupons to 50% of women in the study, including treated and untreated graduation program-eligible women, as well as a smaller sample of women who were marginally too well-off to be eligible for the BOMA REAP program. The notion behind the coupons was that they would be smart subsidies that would enable low cost experimentation and learning about insurance that would carry over in the form of sustained insurance demand after the coupons expired.[12] Coupons were valid from 2018 to 2021 and allowed families to obtain insurance at zero to low cost. For the first 3.5 years, IBLT was solely marketed using the standard, livestock-exclusive framing. In the second half of 2021, the GI framing was introduced in approximately half of the 87 communities (locally called manyattas), selected at random, from the graduation program study.[13]

In manyattas selected to receive the GI insurance treatment, mentors in August 2021 gave an oral presentation in the local language (Samburu) on the insurance product accompanied by the comic book described earlier and shown in the appendix. The comic and presentation also covered technical aspects of how the insurance worked, pricing, payment modalities, etc. Hard copies of the comics in Swahili were left in each community. Swahili was chosen for the hardcopies as most people who can read are able to read, read Swahili, whereas few people actually read Samburu. An audio file containing a Samburu language reading of the comic was also made available using a popular file sharing platform, although we have no information on the use of that platform. In the January/February 2022 insurance sales season, mentors revisited communities and reinforced the messages delivered on insurance.

[12] In a study of a smart input subsidy program in Mozambique, (Carter et al., 2021) illustrate that once-off subsidy coupons can be very smart by inducing experimentation and learning that creates lasting behavioral change in the future.

[13] Assignement to GI treatment or control was stratified by mentor to insure that all mentors had roughly the same number of treatment and control communities.

Importantly, this 2022 sales period took place after all insurance discount coupons had expired. In treatment villages mentors made clear that insurance could also be purchased in livestock units in the usual way.

In control communities for the GI insurance formulation, mentors held similar community meetings, except that the insurance was described exclusively in the traditional livestock-focused way, with livestock as the only units insured. The livestock comic books were distributed to the community, and all other procedures mimicked those in treatment communities.

Because this study was attached to a large randomized controlled trial, we have detailed survey data on treatment and control households from 2018 when the baseline survey was conducted. Table A1 in the Appendix shows sample means from our treatment and control households for a variety of measures, and for most there is no statistically significant difference between the two groups. We do see a few exceptions to that: the households that received the GI treatment were more likely to have at least two sources of income and had lower average dietary diversity scores. The Wave measures in the appendix table correspond to when households were enrolled in the REAP treatment, with households in Wave 1 enrolled immediately after the 2018 baseline survey and each subsequent wave enrolled at 6-month intervals. A slightly larger share of the households enrolled in waves 2 and 3 received the GI framing, but the majority of households were never enrolled in the REAP program at all. Importantly, the insurance coupons distributed earlier were randomized to test their impact with and without REAP, so many coupon recipients did not participate in REAP and vice versa.

Administrative data from Takaful Insurance Africa allows us to identify which households purchased insurance for the two seasons preceding the experimental introduction of GI treatment and for the two seasons after it. Insurance transactions take place using mobile money transfers and it is not possible to identify which person (man or woman) purchased the insurance. The analysis will primarily focus on the final season of February 2022, which took place after subsidy coupons had expired. We focus on this season in part because the February sales windows consistently had higher sales making it easier to detect effects. As mentioned, insurance cover a full

12 months, and the higher participation in the February sales window undoubtedly reflects the fact that first sales period that occurred was in February of 2018.

To measure the effect of the gender inclusive framing on insurance demand, we would in principal like to estimate the following two equations:

$$D^p_{ijk} = \gamma^p_0 + \gamma^p_1 G_k + \gamma^p_2 S_{ijk} + \gamma^p_3 (G_k \times S_{ijk}) + \boldsymbol{\gamma}^p_B{}' \mathbf{W}_{ijk} + \mu^p_j + \eta^p_{ijk}, \tag{1}$$

$$y^p_{ijk} = \beta^p_0 x + \beta^p_1 G_k + \beta^p_2 S_{ijk} + \beta^p_3 (G_k \times S_{ijk}) + \boldsymbol{\beta}^p_B{}' \mathbf{W}_{ijk} + \mu^p_j + \varepsilon^p_{ijk}, \tag{2}$$

where y^p_{ijk} is the (censored) desired insurance spending by individual i, with mentor j, in manyatta k, on insurance in sales period p and the binary market participation variable D^p_{ijk} takes on the value 1 when the individual actually purchases some insurance. The variable G_k indicates if the family framing was presented in manyatta k, and variable S_{ijjk} indicates if the individual had in the received subsidy coupons in the pre-2022 sales periods. The vector $\mathbf{W}_{ijk}$ represents a set of indicator variables that take the value of 1 if the individual was randomly assigned to one of the five BOMA graduation program waves. Variable γ_j represents mentor fixed effects. Because mentors generally operate in contiguous geographic regions, that fixed effect also controls for regional characteristics. The identifying assumption for both equations 1 is that the treatment variables (G_k, S_{ijk} and W_{ijk}) are uncorrelated with the error terms.

Because of high rates of non-participation in the market (see Table 1), estimation methods that account for censorship are appropriate. Ideally, we would like to estimate equations 1 and 2 using a hurdle model as opposed to, say, a Tobit approach. While a Tobit approach restricts the γ and β coefficient vectors to be the same, it seems quite likely that this is inappropriate for our problem. Specifically, assignment to the BOMA graduation program may increase interest in purchasing some insurance because of the assets built, but it may decrease the amount spent as those assigned to the graduation program are less well-off than those not assigned (a group comprised of those both eligible and ineligible for the graduation program). However, as can be seen in Table 1, not receiving a subsidy coupon is a perfect predictor of not buying insurance in the post-subsidy period of interest. Because of this

characteristic, the likelihood function for the hurdle model (as well as for Tobit and probit models) are ill-behaved and do not converge.[14] For this reason, we will simply estimate equations 1 and 2 using ordinary least squares (OLS).

4 Econometric Results

Figure 1 displays the results from the OLS estimates of equations 1 and 2. In the left panel, the height of each bar is the predicted probability of insurance purchase for each of four sales periods spanning from the 2020 secondary sales season to the primary sales season of 2022. Subsidies coupons, initially introduced in 2018, retained their validity through the secondary sales season of 2021. The GI framing was introduced during that same sales period and covered only that sales window and the unsubsidized primary sales period of 2022. For each sales period, four estimates are presented based on the 2×2 experimental design based on assignment to the subsidy and GI treatments. Letting $\bar{X}(S, G)$ be the estimated mean of the BOMA wave assignment and mentor fixed effects, these estimates are calculated as:

- *Livestock-exclusive, No Subsidy*
  $E(D^p|S, G = 0) = \hat{\gamma}_0^p + \bar{X}(S, G = 0)$, displayed as the light gray bars in the figure

- *Gender-inclusive, No Subsidy*
  $E(D^p|S = 0, G = 1) = \hat{\gamma}_0^p + \hat{\gamma}_1^p + \bar{X}(S = 0, G = 1)$, displayed as the light red bars in the figure

[14] Pushing the coefficient on insurance subsidy higher and higher will improve the likelihood for the non-subsidized households. While ab arbitrary increase in this coefficieent should induce a likelihood penalty for the partially compliant subsidized households. However, this penalty can be avoided by arbitrarily pushing the constant terms down. In other words, the likelihood function is completely flat over a portion of the parameter space, and has not unique maximum.

- *Livestock-exclusive, Subsidy*

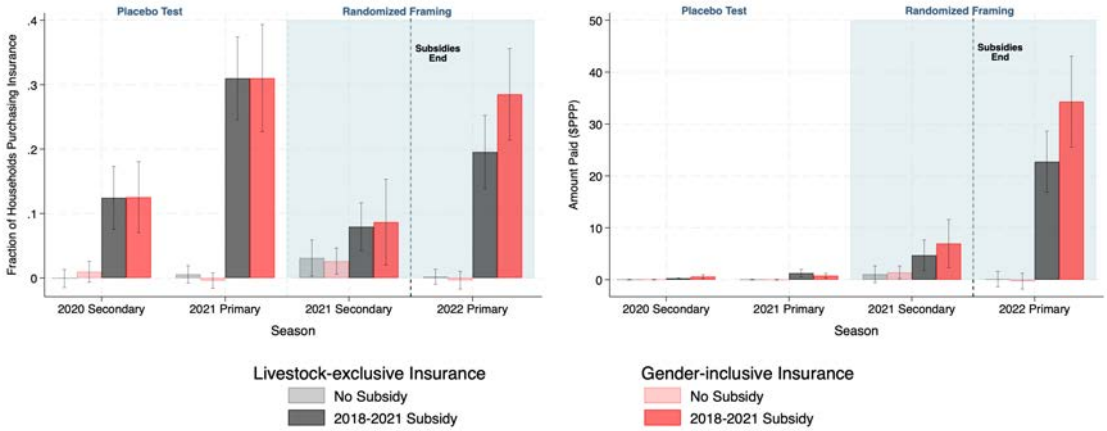
  $E(D^p|S=1,G=0) = \hat{\gamma}_0^p + \hat{\gamma}_2^p + \bar{X}(S=1,G=0)$, displayed as the dark gray bars in the figure

- *Gender-inclusive, Subsidy*

  $E(D^p|S,G=1) = \hat{\gamma}_0^p + \hat{\gamma}_1^p + \hat{\gamma}_2^p + \hat{\gamma}_3^p + \bar{X}(S,G=1)$, displayed as the dark red bars in the figure

Using the analogue definitions, the right panel of Figure 1 displays the estimated spending on insurance, net of subsidy, for these same four groups. Finally, 95% confidence interval estimates are superimposed on each bar. It is impossible to reject the hypothesis that demand is zero when that interval estimate includes zero.

Figure 1: Insurance Demand by Season, Subsidy Status, and Framing Treatment

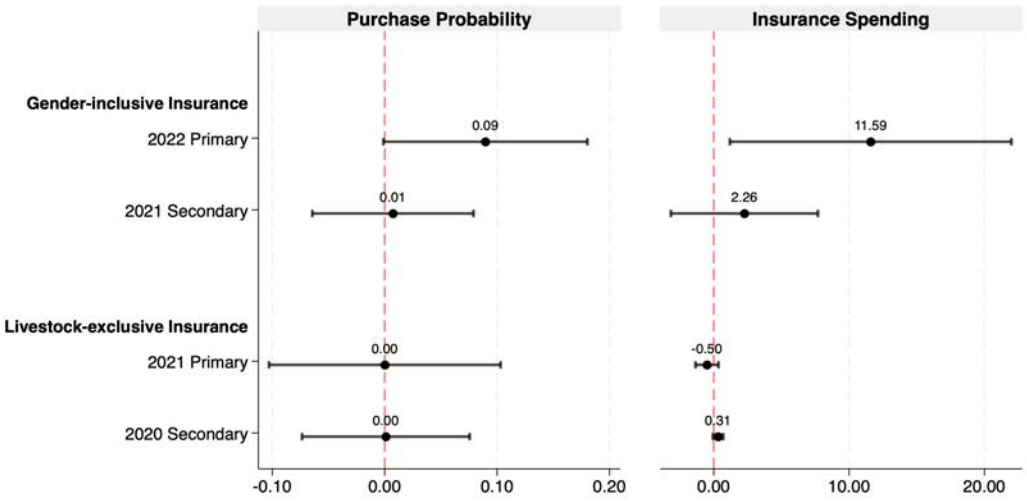


Notes: Left Panel: Fraction of households who purchase insurance each season by subsidy status and framing treatment. Right Panel: Amount paid by each household net of subsidies. Error bars show the 95% confidence interval of a test on the sum of coefficients in each group being statistically different from zero.

The first two sets of bars–for the secondary 2020 season and the primary 2021 season–are a placebo test of GI treatment which was not actually introduced until the secondary 2021 season. As can be visually appreciated, there is no difference

in insurance demand based on assignment to the (future) GI treatment. Figure 2 presents formal tests of the hypothesis concerning the impact of the GI treatment on insurance demand for those households assigned to subsidy. That is, the Figure graphs the interval estimate for $\gamma_1^p + \gamma_3^p$ for the linear probability model and $\beta_1^p + \beta_3^p$ for insurance spending. As can be seen, the total impact of the GI treatment is estimated to be zero during the placebo period, indicating that there was no pre-existing trend in the data that might confound the GI experiment. As can also be gleaned from the graph, even those households who participated in the market spent very little of their own money on insurance purchases.

Figure 2: Differences in Insurance Uptake by Season and Framing Treatment among Subsidized Households.



Notes: For each season the figure plots the result of a t-test with the null $\hat{\beta}_1 + \hat{\beta}_3 = 0$ after estimating equations 1 and 2for each sales period. Error bars show 95% confidence intervals.

Turning to the 2021 secondary sales period when the GI experiment was introduced, we can see that the gender-inclusive treatment has a small, but positive effect on insurance demand for households assigned to the subsidy treatment. Compared to other subsidized households, the GI treatment increases demand by 1 percentage point and spending by about $2. However, these estimates are very imprecisely

estimated and as Figure 2 shows the interval estimates are wide enough that it is impossible to reject the hypothesis that this impact is zero. the very low level of sales during this secondary sales period would of course make it hard to detect any impacts were they to occur.

Finally Figure 1 displays estimated insurance demand for the primary sales period of 2022 during which no subsidies were available as the coupons had expired. As can be seen, almost 30% of the households who had been previously subsidized and were offered the GI treatment purchased insurance during this sales period and on average spending $35 of their own money on insurance purchases. As shown in Table 1 above, those who actually purchased insurance spent $PPP 120 of their own money.

These figures are quite buoyant relative to findings in other studies in the literature. Studies such as McIntosh et al. (2020) and Karlan et al. (2014) find zero demand for unsubsidized insurance products, while other studies such as Hill et al. (2017) only offered subsidized products on the belief that demand would be zero for non-subsidized offerings. While some other studies find positive demand, especially after relaxing liquidity constraints (Belissa et al. (2019) and Casaburi and Willis (2018)),[15] review papers such as Carter et al. (2017) discuss a number of factors that inhibit insurance demand, ranging from basis risk, trust and understanding. However, with the exception of the Giné and Yang (2009) study discussed in the introduction above, there is little attention to the question as to whether many of these products are being tailored and offered to the individuals who do not ultimately bear the risk.

While our results signal the importance of designing insurance for women who ultimately bear the risk of crop failure and livestock mortality, the results also indicate that gender-inclusive insurance is inadequate by itself. The coefficient estimates in

[15] An experiment currently underway across 5 counties in Northern Kenya combines gender inclusivity with a savings group mechanism intended to relax women's liquidity constraints to the purchase of insurance.

appendix tables A2 and A3 show that the the 2022 impact of GI insurance takes place through the interaction effect between past-subsidies and the GI treatment. Indeed, the estimates for the formerly subsidized households offered the livestock-exclusive insurance indicate that almost 20% purchased some insurance post-subsidies and spent an estimated $PPP 23 (Figure 1). Compared to other findings in the literature, these unsubsidized uptake rates are fairly robust and point to the importance of subsidies as an instrument to encourage experimentation and learning (a finding also consistent with Cai et al. (2020)). However, unlike the exploration of smart learning subsidies for fertilizer reported in Carter et al. (2021), in this study there are no spillovers to neighbors who did not receive subsidies.

Figure 2 allows us to test whether or not that the differences between the demand for gender-inclusive versus livestock-exclusive insurance policies are statistically different for formerly subsidized households. As can be seen, the differences are statistically significant at the 5% level and imply that the GI insurance induces a 50% increase in demand relative to the livestock-exclusive insurance. In short, offering insurance to include women who bear substantial risk under traditional gender role casting appears to be necessary but not sufficient for buoyant insurance demand.

5 Conclusion

Index-based insurance is intended to protect low-income rural families from financial hardship when crops or livestock experience negative shocks. Understandably, index insurance generally targets households' the primary income and assets that are directly at risk. In the case of index-based livestock insurance, this approach has meant focusing on livestock, which are generally owned and managed by men. As a result, the benefits of index insurance for women have not been obvious, despite the

fact that women's assets and consumption are indirectly exposed to livestock risk.[16] This observation is magnified when traditional divisions of labor assign women responsibility for securing family consumption and well-being.

Despite evidence that demand unsubsidized index insurance is often minimal or zero, we show that making index insurance gender-inclusive via a simple, low-cost intervention of reformulating index insurance to speak to women's risk exposure and expenditure responsibilities boosts demand for unsubsidized index insurance by 50%. Fully 30% of households offered the gender-inclusive insurance purchased it.[17]

While insuring on those who bear the risk has large impacts, our results indicate that gender-inclusivity is a necessary but not a sufficient for insurance demand. The impact of the gender-inclusive insurance occurs entirely through the interaction with receipt of past insurance subsidies that made it inexpensive for households to experiment with the livestock insurance product. Put more bluntly, families that had not in the past received insurance subsidies did not purchase the insurance even when it was offered to them as a gender-inclusive product. As with any novel technology, subsidies that induce trust and learning in the product can be effective (Carter et al.

[16] Addressing this risk is especially relevant in the context of graduation programs that attempt to address chronic poverty and food insecurity by building up women's productive assets and income-earning capacity. In progress work shows that when purchased, index insurance is a powerful instrument to insulate women's business assets from shocks to the male sphere of economic activity. Specifically, Zheng et al. (2023a) show that women's assets decline substantially and significantly when climate shocks hit the male domain of economic activity and that IBLT in turn largely mitigates those spillover impacts onto women.

[17] Existing research provides some hints as to potential mechanisms for the impacts observed in this paper. One possibility is that associating insurance payouts with household expenditures increases the likelihood they are spent in that category rather than on supporting or replacing livestock. The idea that labeling cash payments affect their final use is explored theoretically by Thaler (1990, 1999), and there is empirical evidence for this idea in a range of cases including the UK Winter Fuel Payment (Beatty et al., 2014), SNAP benefits (Hastings and Shapiro, 2018), and a lab setting (Abeler and Marklein, 2017). There is also evidence that women's decisions in competitive settings are affected by the form taken by the winnings: Cassar et al. (2016) show that women are more likely to compete when the rewards for winning are for the benefit of their children.

(2021)). However, designing a subsidy scheme for technologies like insurance that only infrequently reveal their benefits presents additional challenges, as discussed by Cai et al. (2021). Finding ways to facilitate low cost experiential learning with insurance, while making sure that the insurance speaks to those who bear the risk, would thus seem to be a high priority.

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Appendices

Appendix A Balance Table

Table A1: Experimental Balance - Baseline Survey

	(1)		(2)		T-test	
	Livestock Insurance		Gender Inclusive Insurance		p-value	q-value
Variable	N	Mean/SE	N	Mean/SE	(1)-(2)	(1)-(2)
% HH head is female	909	0.331	801	0.370	0.097	0.367
		(0.016)		(0.017)		
Age of HH head	826	44.442	720	44.008	0.614	0.886
		(0.595)		(0.619)		
HH size	909	5.590	801	5.437	0.142	0.367
		(0.074)		(0.072)		
Reported earnings winsorized at 95%	909	36126.859	801	38540.310	0.134	0.367
		(1079.822)		(1197.746)		
Business income	909	32038.339	801	34525.553	0.238	0.532
		(1480.021)		(1491.714)		
Women Empowerment Index	909	0.754	801	0.772	0.116	0.367
		(0.008)		(0.008)		
Total business assets	909	3731.997	801	3255.206	0.654	0.896
		(667.369)		(843.127)		
Amount of savings	909	974.565	801	689.757	0.275	0.532
		(222.793)		(115.590)		
At least two sources of income	909	0.466	801	0.557	0.000	0.001
		(0.017)		(0.018)		
CES-D score	909	8.205	801	8.357	0.514	0.772
		(0.152)		(0.180)		
Children Went Whole Day Without Food	551	0.194	480	0.177	0.482	0.772
		(0.017)		(0.017)		
Children Skipped Dinner	551	0.381	480	0.400	0.536	0.772
		(0.021)		(0.022)		
Baseline Household Dietary Diversity Score	909	3.237	801	2.983	0.000	0.001
		(0.037)		(0.037)		
Had A coupon	909	0.154	801	0.166	0.498	0.772
		(0.012)		(0.013)		
Had B coupon	909	0.156	801	0.161	0.785	1.000
		(0.012)		(0.013)		
Had C coupon	909	0.165	801	0.169	0.845	1.000
		(0.012)		(0.013)		
ITT BOMA waves 1–5	909	0.359	801	0.404	0.051	0.225
		(0.016)		(0.017)		
ITT Wave 1	909	0.111	801	0.099	0.402	0.772
		(0.010)		(0.011)		
ITT Wave 2	909	0.064	801	0.095	0.017	0.128
		(0.008)		(0.010)		
ITT Wave 3	909	0.052	801	0.079	0.023	0.130
		(0.007)		(0.010)		
ITT Wave 4	909	0.074	801	0.074	0.997	1.000
		(0.009)		(0.009)		
ITT Wave 5	909	0.058	801	0.059	0.974	1.000
		(0.008)		(0.008)		

Notes: Summary statistics for the sample in each treatment arm. Data for this table collected in February and March of 2018 during the first survey round of the REAP impact evaluation.

Appendix B OLS Regression Estimates

Table A2: OLS Regression Estimates of Purchase Probability

	Post-subsidy Period			**Subsidy Period**		
				GI Framing	*Placebo Period*	
	Primary 2022			*Secondary 2021*	*Primary 2021*	*Secondary, 2020*
$\hat{\beta}_1$: *Gender Inclusive Framing, G*	0.046**	0.040*	-0.006	-0.005	-0.010	0.010
	(0.022)	(0.022)	(0.010)	(0.017)	(0.010)	(0.011)
$\hat{\beta}_2$: *Subsidy Coupon, S*		0.238***	0.194***	0.048**	0.304***	0.125***
		(0.024)	(0.030)	(0.019)	(0.035)	(0.026)
$\hat{\beta}_3$: *Interaction, G × S*			0.095*	0.012	0.010	-0.009
			(0.048)	(0.043)	(0.055)	(0.041)
Observations	1710	1710	1710	1710	1710	1710
Mentor FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
$\hat{\beta}_1 + \hat{\beta}_3$			0.09*	0.007	0.000	0.001
			(0.046)	(0.036)	(0.052)	(0.037)

footnote: Standard errors clustered at the manyatta level in parentheses. Regressions with additional controls include dummies for insurance purchases in any of the three previous sales windows and BOMA project participation wave. *** p<0.01, ** p<0.05, * p<0.10.

Table A3: OLS Estimates of Insurance Spending, $US PPP

	Post-subsidy Period			**Subsidy Period**		
				GI Framing	*Placebo Period*	
	Primary 2022			*Secondary 2021*	*Primary 2021*	*Secondary, 2020*
$\hat{\beta}_1$: *Gender Inclusive Framing, G*	6.03**	5.38**	-0.39	0.34	-0.04	0.01
	(2.50)	(2.47)	(1.14)	(1.03)	(0.07)	(0.04)
$\hat{\beta}_2$: *Subsidy Coupon, S*		28.25***	22.63***	3.64**	1.24***	0.26***
		(2.86)	(3.08)	(1.867)	(0.38)	(0.06)
$\hat{\beta}_3$: *Interaction, G × S*			11.98**	1.92	-0.46	0.30
			(5.59)	(3.06)	(0.44)	(0.21)
Observations	1710	1710	1710	1710	1710	1710
Mentor FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
$\hat{\beta}_1 + \hat{\beta}_3$			11.6**	2.3	-0.5	0.3
			(5.2)	(2.7)	(0.4)	(0.2)

footnote: Standard errors clustered at the manyatta level in parentheses. Regressions with additional controls include dummies for insurance purchases in any of the three previous sales windows and BOMA project participation wave. Kenya Shillings converted to \$PPP using the December 2021 rate of 43 KSH/\$PPP*** p<0.01, ** p<0.05, * p<0.10.

Appendix C Gender-inclusive versus Livestock-exclusive Insurance

Figure A1: Frames from Gender Inclusive Comic Strip

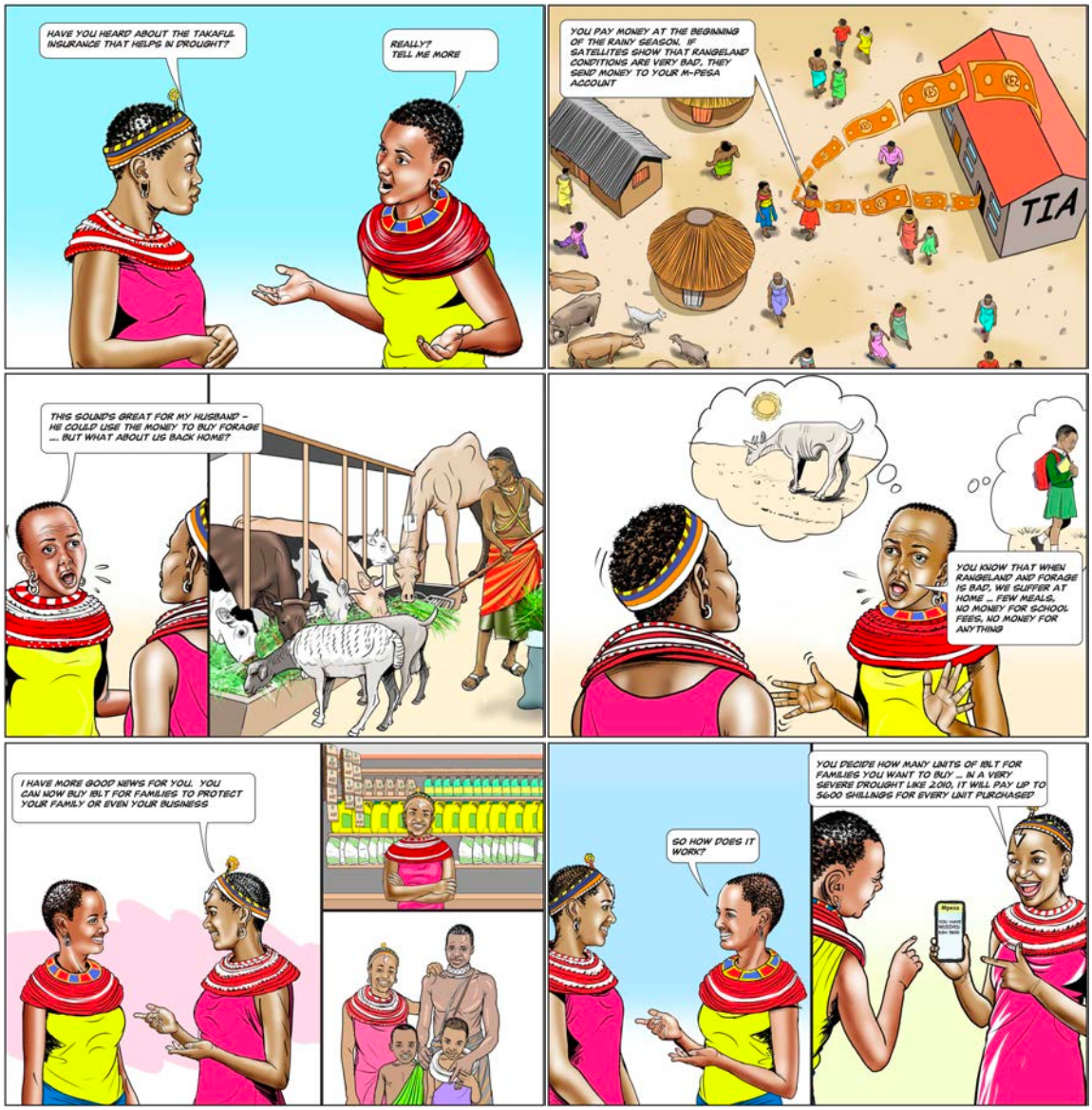

Figure A2: Frames from Conventional Livestock Framing Comic Strip