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# The role of peer imitation in agricultural index insurance adoption: Findings from lab-in-the-field experiments in Kyrgyzstan

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## Abstract

Frequent climate shocks require farmers in developing countries to increase their resilience. Although index insurance is often discussed as a promising climate adaptation strategy, take-up rates are still low. This study primarily explores the role of peer behavior as peer *imitation* in the demand for three marketable and unsubsidized crop index insurance options. Furthermore, the influence of trust and understanding is investigated. We collected data in lab-in-the-field experiments among farmers in Kyrgyzstan, where index insurance is planned for imminent implementation. Applying ordered logit estimations, our results show significant and strong peer imitation effects. Imitation attitudes decrease with own insurance experience and received insurance payouts, but intensify with peer size, insurance trust and practical insurance understanding. While trust robustly increases index insurance adoption, understanding effects only gain significance in the dynamic perspective. These findings underline the importance of community-based extension treatments and trust toward the uptake of innovative agricultural technologies in the first steps of dissemination.

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adoption behavior, agricultural index insurance, experimental economics, peer effects

**JEL CLASSIFICATION**

G22, O12, O16, Q54, O30, Z13

## 1 | INTRODUCTION

Many countries of the developing world are exposed to frequent climate shocks, challenging rural livelihood and wellbeing. To increase resilience against these shocks, risk management strategies such as crop and labor diversification, savings, asset accumulation or agricultural insurance are vital (Binswanger-Mkhize, 2012; Hazell & Hess, 2010). A promising tool is agricultural insurance, which provides the possibility to retain at least part of previous production investments in case of climate-related harvest defaults, and allows for new investments in the subsequent growing season (e.g., Hazell & Hess, 2010).

Since traditional agricultural insurance is characterized by high operational costs, it has not been able to reach wide-scale application in the developing world. Index insurance is an attempt to overcome these issues. In a nutshell, farmers insured by index-based programs receive a payout if a predefined regional or farm-level index (e.g., rainfall index) falls below a previously specified threshold. The relevant index is chosen to achieve the highest possible correlation with farm-level or regional yields. This way, index insurance relies on objective information, avoids problems of information asymmetry, and can lower insurance costs (Barnett et al., 2008; Hellmuth et al., 2009; Miranda & Farrin, 2012). The latter can be particularly beneficial for smallholders, who often have limited access to alternative risk management options due to capital constraints (Barnett et al., 2008; Binswanger-Mkhize, 2012; Hazell & Hess, 2010; Tadesse et al., 2017). Nevertheless, index insurance—just like traditional agricultural insurance—lacks high (voluntary) global adoption (Hill, Hoddinott, et al., 2013; Takahashi et al., 2016). As was pointed out prominently by Binswanger-Mkhize (2012), the feasibility of implementation in low-income countries with lacking government support is still questionable.

Previous studies on index insurance demand have investigated different facets of the adoption puzzle: the role of basis risk, price, income, insurance experience, and climate risk (e.g., Chantarat et al., 2009, Cole et al., 2013, Hill, Hoddinott, et al., 2013). Another uptake barrier is insufficient understanding of the product, or farmers' trust in settlement processes and payouts (Platteau et al., 2017). In environments with a lack of trust, little formal information or low financial literacy, farmers may assess agricultural innovations (like index insurance) not independently via formal information sources, but mostly through peer effects (Luo et al., 2020; Platteau et al., 2017; Wollni & Andersson, 2014). Dessart et al. (2019) review social factors, including “social norms and signaling motives” (p. 433), to determine farmers' adoption decisions. This is in line with former research by Lapinski and Rimal (2005). Moser and Barrett (2006) even find that reasons of conformity can be valued more than profit-maximizing behavior among smallholders, which follows seminal work by Bernheim (1994).

The resulting question is how peer effects operate. According to Manski (2000), individuals can compare peer behavior and its outcome with their own expectations. They subsequently respond themselves (*observational learning*). An alternative peer interaction is *peer imitation*,

which describes the action of simultaneously copying peer behavior. Hence, *observational learning* contains learning from peer experiences and *peer imitation* expresses learning through the transmission of peer information whose consequence is unknown.<sup>1</sup>

It is cumbersome to really understand social interactions in applied research, and researchers use behavioral aspects that serve as proxies instead (Conley & Udry, 2001). In this sense, several studies explore the role of social interactions in agricultural innovation adoption (see Dessart et al., 2019, for a review). There is proof that the exchange of informal information matters in agricultural technology adoption. However, except Matuschke and Qaim (2009), it usually refers to *observational learning* in later stages of dissemination (Bandiera & Rasul, 2006; Conley & Udry, 2010; Foster & Rosenzweig, 1995; Krishnan & Patnam, 2014; Shikuku, 2019). In the field of microinsurance, Platteau et al. (2017) review the relevance of social networks on individual uptake, and research on agricultural index insurance has found evidence for *observational learning* (e.g., J. Cai, de Janvry, et al., 2015; Cole et al., 2014; Karlan et al., 2014). This corroborates the idea of learning from own and/or peer experiences (Luo et al., 2020). To our knowledge, the relevance of simultaneous peer imitation before knowing the peer decision outcome is still undetected in index insurance adoption.

Aiming to better understand adoption decisions, this article primarily analyzes the role of simultaneous peer imitation, and secondarily, trust and understanding toward the adoption of marketable, nonsubsidized index insurance in the first steps of dissemination. As we do not determine early and late adopters, we use the share of adopters in one's peer group to explore peer imitation patterns. The resulting research questions are: (1) How does one's peer insurance decision influence individual simultaneous insurance choice? (2) Which characteristics favor an imitation attitude? (3) What is the role of index insurance trust and understanding in insurance participation?

In order to unveil individual and peer-specific mechanisms, we conducted what Gneezy and Imas (2017) classify as lab-in-the-field experiments. Until now, index insurance has not yet entered the Kyrgyz market, and lab-in-the-field experiments can introduce farmers to this new climate adaptation, elicit their preferences and deliver assumptions on real adoption behavior. Thus, in experimental economic games, participants were asked to allocate a game endowment between different investment strategies, one of them being crop index insurance. Farmers' choices were traced over five rounds (seasons), in which individual endowments depended on previous investment decisions and simulated weather conditions. While farmers were divided into separate game groups, intergroup exchange and observations were allowed and took place. The study design is distinctive in its complexity as well as its focus on replicating real farm and market conditions: The game uses three marketable insurance options that were developed by an insurer to be launched in the region soon, hypothetical rainfall events in the game follow historical local rainfall data, and all remaining game parameters represent the local farm environment. Consequently, game behavior can be seen as a reasonable approximation of farmers' real behavior.

Our study is—to the best of our knowledge—the only one in the index insurance context that combines common socioeconomic characteristics with simultaneous peer imitation, trust and index insurance understanding. Similar to our context, J. Cai, de Janvry, et al. (2015) analyze peer influence in index insurance participation. We expand their work in two major ways: First, as the insurance options in our experimental economic games are marketable, we control for stated general trust in the drought insurance concept and compare it with the impact of the insurer's presence (*observed trust*). Second, we explore peer influences in innovative index insurance participation. However, instead of considering only previously defined friends, we observe

and investigate simultaneous behavior of surrounding village farmers in experimental innovative decision-making. This setting is natural: All farmers can perceive and communicate each other's investment behavior without external interventions that create an artificial atmosphere that real farmers would have difficulty relating to.

The article is structured as follows: After outlining our conceptual framework, Section 3 introduces the experimental design. Section 4 is dedicated to data collection and descriptive results. The empirical approach is described in Section 5. Empirical results are presented and discussed in Section 6, while Section 7 draws conclusions.

## 2 | CONCEPTUAL FRAMEWORK

In Kyrgyzstan, the government aims at disseminating crop insurance; it passed a respective law in 2009 to introduce a voluntary area-based crop insurance against weather risks, subsidizing 50% of the insurance premiums (FAO, 2018). The law has not become operational yet, partly because of lacking government resources to realize the planned subsidization. As 20% of the Kyrgyz labor population is employed in agriculture (World Bank, 2020) and there are predictions of extreme weather events, particularly droughts (IPCC, 2021), the development of suitable climate adaptation measures in the country is crucial. Research on risk-rationed and not only quantity-rationed Kyrgyz households supports this argument—farmers will rather invest in risk-sharing instruments than accept offered bank credits (Kuhn & Bobojonov, 2023). Rooted in the Soviet history of the region, common agricultural practices are to generally increase the inputs of fertilizer and irrigation instead of following a more science-based approach to a changing climate (Fay et al., 2010). Fertilizer is characterized by more costly but higher return properties (e.g., Karlan et al., 2014) and the water source for irrigation in Kyrgyzstan is mostly glacier melting water (Adaptation Fund Board, 2020). Hence, fertilizer input can be flexibly adjusted and potential for irrigation depends on rigid topographical features. Another important climate adaptation is self-insurance or precautionary savings (Le Den et al., 2017). Climate danger paired with currently inadequate mitigation strategies leaves a potential for agricultural index insurance as an efficient climate adaptation. Therefore, the remaining question concerns adoption preferences of Kyrgyz farmers toward agricultural index insurance.<sup>2</sup>

In this context, experimental approaches can overcome prominent issues of low financial literacy and insufficient index insurance understanding (Carter et al., 2008). Insurance games frequently utilize a varying experimental setting to investigate the often-quoted impediments of index insurance purchases: high premium payments and basis risk (Cole et al., 2013; Hill, Hoddinott, et al., 2013; Miranda & Farrin, 2012; Mude et al., 2010; Patt et al., 2010; Patt et al., 2009; Tadesse et al., 2017). Few other studies give attention to various marketing strategies to boost adoption (Cole et al., 2013; Gaurav et al., 2011). As stated by Carter et al. (2017), conceiving the index insurance concept requires an understanding of income probability distributions, which usually develops over time. Index insurance games which mimic farming years may save real time in this process.

Evidence from empirical studies on micro-level index insurance adoption allows for the derivation of the following hypotheses<sup>3</sup>: Demand for index insurance is highest, if the insurance product is characterized by a low basis risk (Cole et al., 2013; Hill, Hoddinott, et al., 2013), a low insurance premium (Hill, Hoddinott, et al., 2013), allows farmers to pay the premium after harvest (Casaburi & Willis, 2018) or with labor (Norton et al., 2014). In addition, personal characteristics like (nonagricultural) insurance experience (Cole et al., 2013), a high subjective

climate risk (Chantararat et al., 2009; Cole et al., 2013; Hill, Hoddinott, et al., 2013), and recent experience with detrimental weather conditions (Chantararat et al., 2009) enhance adoption.

While there is a considerable stock of literature on financial determinants of index insurance participation, related social aspects are increasingly gaining attention. For instance, a few experiments have engaged in the role of trust. Tadesse et al. (2017) descriptively show that only 2% of their Ethiopian sample trust the private agricultural insurance sector, posing a major barrier to real purchases. This is supported by Karlan et al. (2014), who argue that insurer trust is vital. Previous studies have explored the influence of trust in involved institutions indirectly, either through participation in (other) institution programs (e.g., Patt et al., 2009) or received payouts (e.g., Stein, 2018). However, directly stated trust has been ignored in this context so far. Trust can develop through peers, and the emerging literature explores social interactions in the diffusion of index insurance. A rare example is provided by J. Cai, de Janvry, et al. (2015), who find a positive and strong relation of being friends with a treated insurance session participant on insurance purchases. The authors attribute this to experience-based knowledge transfer from peer to peer, instead of simultaneous imitation behavior. Moreover, Giné et al. (2008) find that an increasing number of insurance purchasers in one's primary social group positively affects individual uptake. However, as already stated by the authors, this result may be biased due to unobserved heterogeneity, and it seems driven by peer recommendations that labels it as *observational learning*. Positive observational learning effects in index insurance uptake are also corroborated in research by Karlan et al. (2014) and Cole et al. (2014). The remaining question is whether farmers are peer influenced in the first dissemination step of index insurance, thus before early adopters can gain and share experiences (*peer imitation*).

### 3 | EXPERIMENTAL DESIGN

We designed an experimental economic game in a controlled lab experiment that includes field context efficiently. As opposed to most lab or field experiments, we do not have random treatments, but rather tried to approximate an index insurance implementation process that is realistic under local conditions.<sup>4</sup>

All experiment sessions followed a standardized procedure: Each session involved nine to 24 participants and at least three enumerators. After an introduction, we explained the general concept of agricultural insurance and the specific application of index insurance in a verbal and visual presentation (see Figure S1 in the Supporting Information Material). Hereafter, we described three marketable satellite-based crop index insurance contracts that had been developed by a Kyrgyz insurer and a German reinsurer. These contained premiums, payouts and triggers in the fashion of a commercial product suitable for actual implementation:

- A. a high compensation insurance (3500–14,000 Kyrgyz Som; KGS/ha) and a high premium (1900 KGS/ha);
- B. a medium compensation insurance (2100–8400 KGS/ha) and a medium premium (1200 KGS/ha); and
- C. a low compensation insurance (4200 KGS/ha) that only triggers a payout when encountering very few precipitation levels, and the lowest premium (550 KGS/ha).

In the next step, participants were asked to complete a paper-based survey. The questionnaire included household, individual and farm information, and basic insurance questions to test the

effectiveness of the previously received educational input. To avoid language barriers, farmers could individually choose to receive the questionnaire in Kyrgyz or Russian, the two official languages. All other instructions were given in Kyrgyz and complemented by Russian, if needed.

In the fourth step, we conducted the experimental economic games. To prepare for this, all participants were assigned into game groups according to their seating order (2–10 farmers, on average 6) for organizational feasibility. Participants were instructed to also be farmers in the experiment, and make investment decisions based on their individual preferences. Participants with the highest final balance per hectare per game group would receive a noncash prize at the end of the game.

The game then began (for a summarized game procedure, see Figure S2 in Supporting Information Material): Farmers were equipped with game endowment (43,000 KGS/ha) based on their real land size, and a game sheet (see Figure S3).<sup>5</sup> Next, the individual and dynamic element of the game started:

1. Assuming to be in the beginning of a planting season, farmers allocated their endowment ( $E_t$ ) to a bundle of fixed costs ( $FC$ ) to maintain farming activities.
2. They could choose (binary) investment options, namely (1) fertilizer ( $F_t$ ) that increased yield by 32% (29% or 27%) in the normal (few or very few) rainfall event and/or (2) one of three offered index drought insurance options ( $I_t$ ).
3. The remaining endowment was deposited in a savings account ( $S_t$ ) with an annual interest rate of realistic 5%. Their general budget constraint is:  $E_t = FC + F_t + I_t + S_t$ .
4. Once all farmers made their investment decisions, we presented the exogenous round-specific rainfall: normal, little or very little, whose distribution and sequence were unknown to participants.
5. The resulting end-round endowment was calculated based on the round-specific rainfall and individual investments. While normal rainfall induced high revenues from harvest ( $R_n$ ), these gradually reduced during few ( $R_f$ ) and very few accumulated rainfall events ( $R_{vf}$ ):  $R_n > R_f > R_{vf}$ . Insured farmers received an insurance payout ( $I$ ) when a lack of rainfall had triggered their adopted insurance product. Thus, initial ( $E_{t=1}$ ) and future endowment ( $E_{t>1}$ ) for  $t \in [1;5]$  are formalized as:

$$E_{t=1} = E_{t=1}(\text{ha}) = 43,000 \text{ KGS} \cdot \text{ha} \quad (1)$$

$$E_{t>1}(\text{ha}) = \begin{cases} R_{n,t-1}(\text{ha})(1 + 0.32F_{t-1}) + 1.05S_{t-1} & \text{if rain = normal} \\ R_{f,t-1}(\text{ha})(1 + 0.29F_{t-1}) + 1.05S_{t-1} + I_{A,f,t-1}(\text{ha}) + I_{B,f,t-1}(\text{ha}) & \text{if rain = little} \\ R_{vf,t-1}(\text{ha})(1 + 0.27F_{t-1}) + 1.05S_{t-1} + I_{A,vf,t-1}(\text{ha}) + I_{B,vf,t-1}(\text{ha}) + I_{C,vf,t-1}(\text{ha}) & \text{otherwise.} \end{cases}$$

6. The end-round endowment was used to reinvest into the following round, and participants continued at Step 1 again. The same procedure was repeated for five subsequent rounds.

If heavy liquidity constraints disabled farmers from covering fixed costs, farmers needed to borrow money. The volume of this loan was determined to remain in the interval  $[C_{fix,t}(\text{ha}) - E_t(\text{ha}); E_{t-1}(\text{ha}) - E_t(\text{ha})]$ , which is the amount covering fixed production costs and the change to the previous round endowment. This interval implies that farmers could always

access a loan if suffering financial losses. The main reason for not limiting credit access was to replicate other risk management strategies not considered in the game.<sup>6</sup>

After the last round, participants had to pay off the accumulated loan amount, and the ones with the highest final balance per hectare and game group were rewarded a noncash prize (worth 5–10 USD) for the most economically effective investment behavior. Although prize details were not specified at game start, its existence served as an incentive to reveal one's true investment attitude—take profit-maximizing decisions, if it is the dominant strategy in real life, and vice versa. Every session ended with a short feedback round, and every participant received 350 KGS to compensate for opportunity and travel costs.

Farmers in one game group sat in close proximity and shared enumerators. Just as in reality, they could observe and communicate each other's behavior. Information advantages were impossible, as neither the sequence nor probability of experimental weather was ex ante known by farmers—accumulated rainfall was only announced after everyone decided on their preferred investment strategy. We assume farmers to behave best according to their subjective weather probability.

What makes our games distinctive is that insurance characteristics, input prices, yields, and weather events were adapted to local conditions. Based on local accumulated rainfall during the 2011–2016 growing period, the experimental weather sequence was identical for all participants. Initial endowment per hectare was determined to equal the average agricultural income per hectare after a normal rainfall season. (Weather-depending) fertilizer values, yield and respective revenues originate from a representative database used in a study by Bobojonov and Aw-Hassan (2014). With the help of local experts in agriculture and cultural norms, our game setup was chosen to balance the representation of local farm reality and intuitive experiment choices that are easy to comprehend by all Kyrgyz farmers. The overall experiment structure was chosen to be as lean and efficient as possible.<sup>7</sup> A pretest with agricultural students validated simple operation for participants. Moreover, instead of experimentally manipulating the scope of peer interaction, we intended a natural evolvement. In a setting that approximates a realistic decision-making process for farmers, we can identify their preferences for index insurance that is planned to be implemented soon, and analyze peer influences in there.

## 4 | DATA DESCRIPTION

### 4.1 | Sample

Data collection was conducted in 10 major rainfed grain producing villages in the Chuy province of Kyrgyzstan. Chuy is one of the country's nine provinces and ranks among Kyrgyzstan's main crop production. Of the 10 participating villages, four are located in the Jayil *rayon* (district) and three each in Sokuluk and Panfilov. These *rayons* were identified by local researchers and agronomists as main rainfed grain producing areas in the province. They are also planned for the country's index insurance pilot region, and hence are our area of interest.

From each district we selected, again with support by local agronomists and researchers, three to four representative townships that are situated in a predominately nonirrigated area. In each of the townships, community leaders randomly composed a sample of 15–25 farmers. The sample is regionally representative in terms of permanently or currently unirrigated wheat production. From 144 participants, 129 farmers successfully answered all relevant survey information and attended the experimental economic games. While 101 participants completed all five rounds, the majority of dropouts was a result of exogenous organizational reasons in the first two sessions (harvester service arriving at the village). This accounts for 85.7% of all dropouts.



The remainder of dropouts was due to bankruptcy after the first rain deficit event or fatigue.<sup>8</sup> In order to not lose information, we use all game rounds to generate a panel dataset with time-invariant individual and household characteristics from the survey and time-variant experimental investment behavior. The constructed panel consists of 589 observations.

## 4.2 | Farming and household characteristics

Among our sample, roughly 25% are small-scale farmers ( $\leq 2$  ha). They, on average, sell 41.6% of their production levels, compared to the sample average of 48.1%. For all sample farmers, agriculture is important for self-subsistence and commercial purposes. On average, respondents have about 17 years of farming experience, and 83.7% mainly work in agriculture. Although agricultural insurance has not been introduced in Kyrgyzstan so far, 69.0% indicated to have nonagricultural commercial insurance.<sup>9</sup> The average respondent is roughly 45 years of age, has attained a high school degree or vocational training and lives in a household comprising almost six household members. 31.8% are female. For detailed summary statistics see Table S1 in the Supporting Information Material.

## 4.3 | Climate risk and resilience

Table 1 compares subjective risk exposure with previous stated (objective) yield losses. As stated by 60.0%–85.5% of barley, winter wheat, summer wheat and clover farmers, drought is the major climatic production risk. 22.2%–33.3% of the specific crop growers report the danger of drought-related production loss as *quite threatening*. At the same time, recent crop-specific yield losses are stated to be 22.1%–57.5%. Table 1 reveals the urgency of gaining better understanding of the sample's climate risk impacts and finding accurate risk management tools against drought.

## 4.4 | Insurance behavior

Next, we explore whether agricultural index insurance is perceived as a suitable risk mitigation in Kyrgyzstan's pilot region.

TABLE 1 Subjective and objective climate risk.

Crop	Area cultivated (%)	Perceived climate risk (%)						Average yield losses (%)
		Drought	Excess rain	Frost	Lacking snow cover	Hail	Drought-related production loss quite threatening (%)	
Barley	50.80	85.54	18.07	15.66	10.84	18.07	25.35	22.10
Winter wheat	37.06	69.77	11.63	11.63	18.60	30.23	33.33	36.21
Summer wheat	4.75	75.0	25.0	8.33	25.0	33.33	22.22	57.5
Clover	4.0	60.0	20.0	0	0	0	33.33	23.0

Note: Perceived climate risk was a multiple-choice question and the category "others" is not shown.

Figure 1 displays insurance purchases over the five game rounds. Average game behavior is presented in panel (a). There, 70.3%–89.2% decide on an index insurance uptake. Insurance adoption in the first three rounds is constant at 82.8%–86.0%. The demand incline in Round 4 may result from liquidity gains in the first normal rainfall season after drought, and possibly expecting a rain deficit season to follow. The demand decline in Round 5 may be due to liquidity constraints after severe drought-related yield losses in the previous round. Farmers show a clear interest in innovative index insurance. When comparing the three different insurance options, the contracts that have higher loss coverage (A and B) seem more attractive than the low compensation insurance C. With option A being slightly preferred, sample farmers show ordinal index insurance preferences over all rounds.

Moving to the right, panel (b) displays the descriptive analysis for individuals that have a high insurance affinity peer group per round. In the full sample, the average share of insurance adopters on the peer group level is 82.8% (SD: 23.79). Panel (b) analyses individuals whose peers (excluding oneself) have an above-average share of index insurance purchasers (65.5% of full sample). Compared to panel (a) that includes average peer adopters (82.8% over all rounds), individual adoption rates increase. Being surrounded by above-average adopters relates to higher individual uptake rates. Furthermore, except round one, we observe a clear ordinal insurance option preference:  $A > B > C$ . Among farmers that trust drought index insurance (panel (c)), 70.0%–89.1% demand insurance over all rounds. Their preference relation resembles

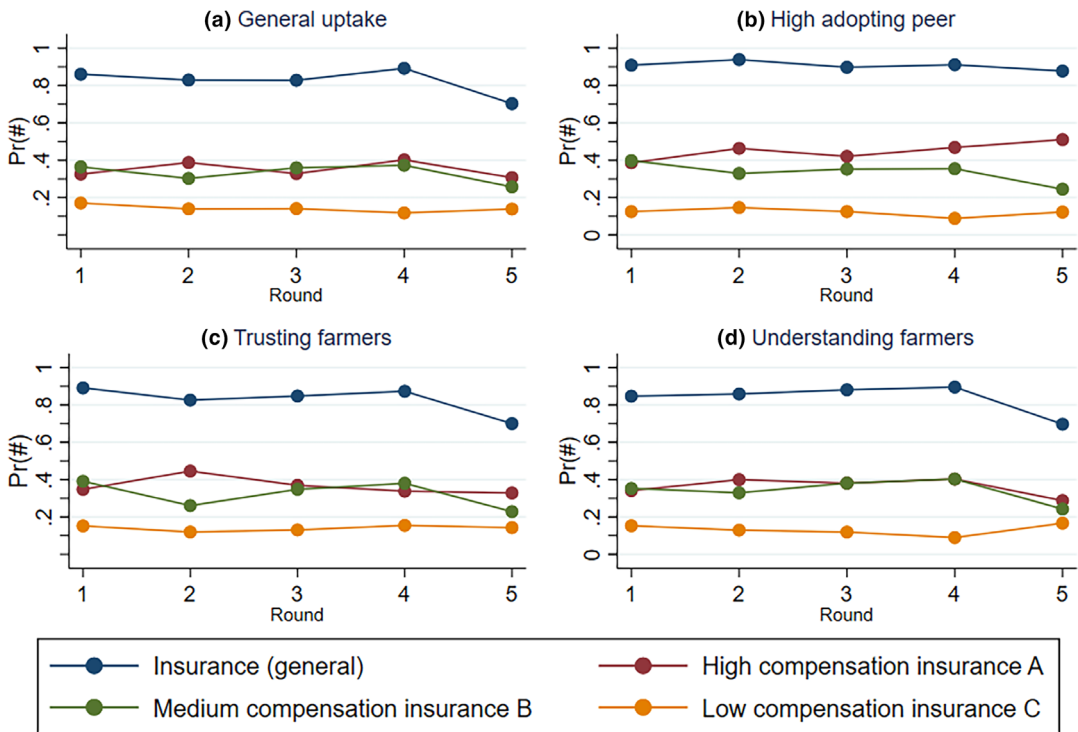


FIGURE 1 Insurance purchase conditional on individual characteristics. The game rainfall sequence is: (1) normal, (2) few, (3) normal, (4) very few, (5) normal. “High adopting peer” captures individuals with peer groups that have an above-average share of index insurance adopters. Trusting farmers believe in the general drought insurance concept, and understanding farmers perfectly answered all index insurance comprehension questions. [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

the one of the unconditional uptakes, where 71.3% trust insurance. While insurance A and B are preferred, the highest compensation option is marginally most adopted. Looking at the ones that perfectly understand index insurance (panel (d)) shows similarities to the general uptake (panel (a)), where perfect understanding reaches 65.9%. Taken altogether, Figure 1 points at a dominant role of peer insurance choices on individual participation, compared to index insurance trust and understanding.

The descriptive analysis shows drought-prone farmers who are curious about index insurance. Their experimental demand follows an ordinal insurance preference:  $A > B > C > \text{no insurance}$ .

## 5 | EMPIRICAL APPROACH

We employ a regression approach to identify farmers' preferences toward index insurance in Kyrgyzstan. In detail, we examine the drivers for round-specific insurance choices: no insurance, insurance C (low compensation), insurance B (medium compensation), or insurance A (high compensation). These follow an ordinal relationship regarding prices and payouts:  $0 < C < B < A$ . Considering these properties, and not to lose relevant information, we apply an ordered logit approach.

To take all experiment rounds into account, we construct a panel with time-invariant information from the survey and time-variant game characteristics. We assume correct model specification, use serial correlation robust standard errors to account for time-(in)variant information on the individual level, and use a pooled panel (Wooldridge, 2010). The structural pooled ordered logit model is written as:

$$y_{it}^* = \beta_1 \text{PeerBehavior} + \beta_2 \text{PeerCharacteristics} + \beta_3 \text{PeerFEs} + \beta_4 \mathbf{X}_{it}, \quad (2)$$

where  $y_{it}^*$  is the latent outcome variable that can be interpreted as an insurance option marginal utility of individual ( $i$ ) at time  $t = 1, \dots, 5$ . Since the latent variable cannot be observed, the response variable is measured in the particular insurance choice  $y_i$  and its respective cutpoints (threshold)  $\alpha_j$ :

$$y_i = j = \begin{cases} 0 = \text{no insurance, if } y_{it}^* \leq \alpha_1 \\ 1 = \text{insurance C, if } \alpha_1 < y_{it}^* \leq \alpha_2 \\ 2 = \text{insurance B, if } \alpha_2 < y_{it}^* \leq \alpha_3 \\ 3 = \text{insurance A, if } y_{it}^* > \alpha_3. \end{cases} \quad (3)$$

Our main variable of interest is the influence of one's peer behavior on individual decision-making. The variable *PeerBehavior* measures the average insurance option  $y_i$  within one's game group (oneself excluded). For a causal exploration we follow Manski (1993, 2000) and include other *peer effects*.<sup>10</sup> These comprise of average peer characteristics (peer's residency duration in village, their production sold and yield losses) as *exogenous effects*,<sup>11</sup> and peer fixed (*correlated*) effects control for unobserved heterogeneity.  $\mathbf{X}_{it}$  is a vector of control variables that are found to be relevant: *other game characteristics* (game endowment, experimental round identifiers including weather), and *individual and farm characteristics* (gender, age, education, household size, risk attitudes, drought index insurance trust, sophisticated insurance understanding, main farmers, rainfed agriculture, land size, self-reported yield losses and danger of crop damages).

*Risk attitudes* is intended to proxy real risk perceptions and is measured as an interaction term between the binary variables risk aversion and high subjective discount rate, which are both constructed from the survey. Risk averse individuals would rather quadruple investments with certainty than have a 50% probability to either octuple it or have input equal output; high subjective discount then indicates the preference to rather receive 3500 KGS today than 4200 KGS next month. *Trust* is a dichotomous variable for believing that drought index insurance covers drought-related yield losses, thus approving of the basic concept. *Sophisticated understanding* is an interaction term between perfectly answering all insurance comprehension questions and having practical nonagricultural insurance experience.<sup>12</sup> Among these, trust and understanding are our focus.

In addition, we compare stated trust with the effect of the insurer's presence during the experiment (*observed trust*). To explore peer imitation attitudes in more detail, we next expand the list of covariates by the lagged individual insurance choice, experienced insurance payout, and peer imitation behavior conditional on peer size, trust and understanding in extension models.

Often stated problems in establishing inference for peer effects are (1) correlated observables and (2) Manski's *reflection problem*, expressing simultaneity in linear-in-means models. By controlling for peer characteristics as well as for peer fixed effects we can circumvent the first problem. The second issue we overcome by excluding the individual from peer behavior, and employing a nonlinear model (Brock & Durlauf, 2001). Other common approaches to eliminate the simultaneity in behavior are the use of lagged peer behavior that is unaffected by current individual behavior. However, this requires the assumption of a "temporal pattern" (Manski, 1993) that is unrealistic in a setting—like ours—with several weather shocks. Alternatively, one can instrument for contemporaneous peer behavior. The chosen instrument(s) needs to be correlated with peer fixed effects and individual insurance uptake (*relevance*), but be uncorrelated with the error term (*exogeneity*). Valid instruments in related studies have often been lagged peer behavior (Wollni & Andersson, 2014) or relevant peer group characteristics (Ammermueller & Pischke, 2009; Boucher et al., 2014; Lundborg, 2006; Trogdon et al., 2008). To test for robustness of our estimates, we apply an instrumental variable (IV) approach; we use exogenous peer characteristics to instrument for contemporaneous peer insurance behavior in Section 6.3. The results are presented and discussed in the next section.

## 6 | RESULTS AND DISCUSSION

Applying a pooled ordered logit model, we identify determinants for four potential insurance decisions: (0) the noninsurance option that is preferred by 17.49%, (1) insurance C with an overall uptake rate of 14.26%, (2) insurance B, which accounts for 33.28%, and (3) insurance A, which attracts 34.97%. Neither the baseline model nor the extension models show any sign of multicollinearity. To account for potential autocorrelation in standard errors, all models apply serial correlation robust standard errors on the individual level (Wooldridge, 2010).

### 6.1 | Baseline model

Table 2 presents the average marginal effects of the baseline model. Our main relation of interest is *peer imitation*, which is expressed in the influence of one's average simultaneous peer behavior on individual decision-making. If more farmers in one's game group (oneself

TABLE 2 Average marginal effects of individual insurance choice (baseline model).

	(0) No insurance	(1) Low compensation insurance C	(2) Medium compensation insurance B	(3) High compensation insurance A
Peer behavior				
Ø Peer insurance choice	−0.1228*** (0.0237)	−0.0510*** (0.0104)	−0.0051 (0.0079)	0.1790*** (0.0333)
Peer characteristics				
Ø Peer residency duration in village	0.0060 (0.0050)	0.0025 (0.0021)	0.0002 (0.0004)	−0.0088 (0.0071)
Ø Peer production sold	0.0001 (0.0012)	4.63e−05 (0.0005)	4.64e−06 (5.18e−05)	−0.0002 (0.0018)
Ø Peer yield losses	0.0001 (0.0041)	0.0001 (0.0017)	0.0000 (0.0002)	−0.0002 (0.0060)
Peer fixed effects YES				
Other game characteristics				
Game endowment/ha (log)	−0.3413** (0.1534)	−0.1418** (0.0649)	−0.0142 (0.0228)	0.4973** (0.2231)
Game round 2 (0/1)	0.0257 (0.0395)	0.0092 (0.0135)	−0.0017 (0.0041)	−0.0332 (0.0494)
Game round 3 (0/1)	−0.0367 (0.0301)	−0.0162 (0.0139)	−0.0034 (0.0043)	0.0563 (0.0467)
Game round 4 (0/1)	−0.0271 (0.0297)	−0.0116 (0.0133)	−0.0017 (0.0032)	0.0404 (0.0451)
Game round 5 (0/1)	−0.0027 (0.0376)	−0.0011 (0.0149)	9.23e−06 (0.0002)	0.0037 (0.0525)
Individual and farm characteristics				
Female (0/1)	−0.0083 (0.0284)	−0.0035 (0.0119)	−0.0004 (0.0016)	0.0121 (0.0417)
Age2	1.91e−05 (01.26e−05)	7.95e−06 (5.38e−06)	7.95e−07 (1.25e−06)	−2.79e−05 (1.83e−05)
Education2	2.36e−05 (0.0012)	9.80e−06 (0.0005)	9.80e−07 (0.0001)	−3.44e−05 (0.0018)
Household size2	−0.0011*** (0.0004)	−0.0005*** (0.0002)	−4.67e−05 (0.0001)	0.0016*** (0.0005)
Risk attitudes				
1. Risk aversion##	−0.0340 (0.0575)	−0.0124 (0.0199)	0.0019 (0.0068)	0.0445 (0.0717)
0. High subjective discount rate				
1. Risk aversion##	0.0156	0.0067	0.0012	−0.0235

TABLE 2 (Continued)

	(0) No insurance	(1) Low compensation insurance C	(2) Medium compensation insurance B	(3) High compensation insurance A
1. High subjective discount rate	(0.0347)	(0.0152)	(0.0032)	(0.0527)
General trust drought insurance concept (0/1)	−0.0734** (0.0341)	−0.0270** (0.0113)	0.0017 (0.0052)	0.0987** (0.0411)
Sophisticated index insurance understanding				
1. Perfect index insurance understanding##	0.0808	0.0302	−0.0006	−0.1105
0. Insurance experience	(0.0559)	(0.0215)	(0.0098)	(0.0775)
1. Perfect index insurance understanding##	−0.0164	−0.0069	−0.0012	0.0245
1. Insurance experience	(0.0327)	(0.0136)	(0.0023)	(0.0483)
Mainly work as farmer (0/1)	−0.0268 (0.0345)	−0.0105 (0.0130)	0.0002 (0.0024)	0.0372 (0.0455)
Only rainfed agriculture (0/1)	−0.0450 (0.0301)	−0.0180 (0.0112)	−0.0009 (0.0027)	0.0639 (0.0411)
Cultivated land in ha (log)	−7.97e−07 (2.25e−06)	−3.31e−07 (9.24e−07)	−3.31e−08 (1.08e−07)	1.16e−06 (3.27e−06)
Ø % Stated yield losses (0–100)	0.0010 (0.0010)	0.0004 (0.0004)	0.0000 (0.0001)	−0.0015 (0.0014)
Ø Danger yield losses (1–4)	−0.0298** (0.0134)	−0.0124** (0.0062)	−0.0012 (0.0019)	0.0433** (0.0197)
Observations	589 (129 farmers)			
Pseudo R <sup>2</sup>	0.1367			

NOTE: Standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ . Elements of the interaction terms are estimated but omitted.

excluded) demand an index insurance contract with a higher compensation, the individual is likely to purchase the high loss coverage insurance A by 17.9 percentage points ( $p < .0001$ ). This finding signals a peer imitation attitude in index insurance participation. Aiming to explore peer imitation causally, we also control for peer characteristics and peer fixed effects (Manski, 1993). Peer characteristics capture the average residency duration in the village (proxying familiarity), their economic farm importance (production sold) and climate danger (yield loss). Findings conclude a dominant role of peer imitation over other peer influences—while peer characteristics have no significant impact, this is different for some game group fixed

effects. Nevertheless, we can verify peer behavior as the only peer influence that stimulates investments in the high loss coverage insurance and (along endowment) is quantitatively the strongest predictor of insurance choices.

A possible explanation for this estimated peer imitation effect builds on a dominantly collective identity and conformity (Bernheim, 1994; Moser & Barrett, 2006). Another factor might be a feeling of overload in adequately assessing the potential of innovative technologies, and hence relying on their peer's perceptive and cognitive skills (Manski, 2000). Our finding contributes to peer learning in index insurance participation from a different perspective. Controlling for the influence of simultaneous peer insurance decisions, we can rule out former evidence of *observational learning* (e.g., J. Cai, de Janvry, et al., 2015; Cole et al., 2014; Giné et al., 2013; Karlan et al., 2014), but rather show pure *peer imitation*.<sup>13</sup> This proposes a marketing strategy for agricultural innovations, which is more focused on the collective (in the developing world). We learn that the collective does not require personal bonds *ex ante*, but only being in the same decision situation. An improved promotion approach that exploits peer behavior as a crucial decision heuristic may boost early index insurance participation in the first dissemination step.

Within innovation adoption, trust aspects are also relevant. During our experiments, farmers who generally trust the drought index insurance concept seem to favor the higher compensation insurance option A by 9.87 percentage points ( $p = .016$ ). However, trying to isolate the effect of the insurer's presence during the experiment (see Table S3 in Supporting Information Material) reveals a higher affinity for the noninsurance option by 5.59 percentage points ( $p = .055$ ) and lower compensation insurance C by 8.52 percentage points ( $p = .049$ ). In this model, stated trust in the general index insurance concept loses in magnitude. We conclude that farmers distrust the local insurer, possibly because they may be skeptical toward institutions in general. Consequently, trust—either stated or observed—makes an important contribution: general trust increases the willingness to adopt, distrust has the opposite effect. This is in line with Karlan et al. (2014), H. Cai, Chen, et al. (2015) and Tadesse et al. (2017). Our findings suggest that insurers should build trust with their prospective customers *ex ante*.

Another aspect that is relevant in demand analysis is product experience and understanding. According to Hill, Robles, et al. (2013), farmers often lack experience in agricultural insurances, challenging their true product understanding. Consequently, we create an interaction term between (nonagricultural) insurance experience and perfect agricultural index insurance comprehension. Assuming that insurance-experienced farmers gain a more fundamental (practical) understanding of index insurance, the interaction serves as a proxy for sophisticated understanding. Although the baseline model does not estimate any significant effects, this is not unexpected. It corresponds with ideas by Luo et al. (2020), who argue that the complex nature of insurance participation induces farmers to not approach the decision from an individual understanding, but follow their peers instead.

In addition, our baseline model predicts that farmers with higher game endowments, more household members and a greater climate danger are more likely to adopt the highest insurance coverage.

## 6.2 | Extension models

To better comprehend how peer imitation operates in our experiment, we extend the baseline model in three different ways. We control for (1) the lagged individual insurance choice,

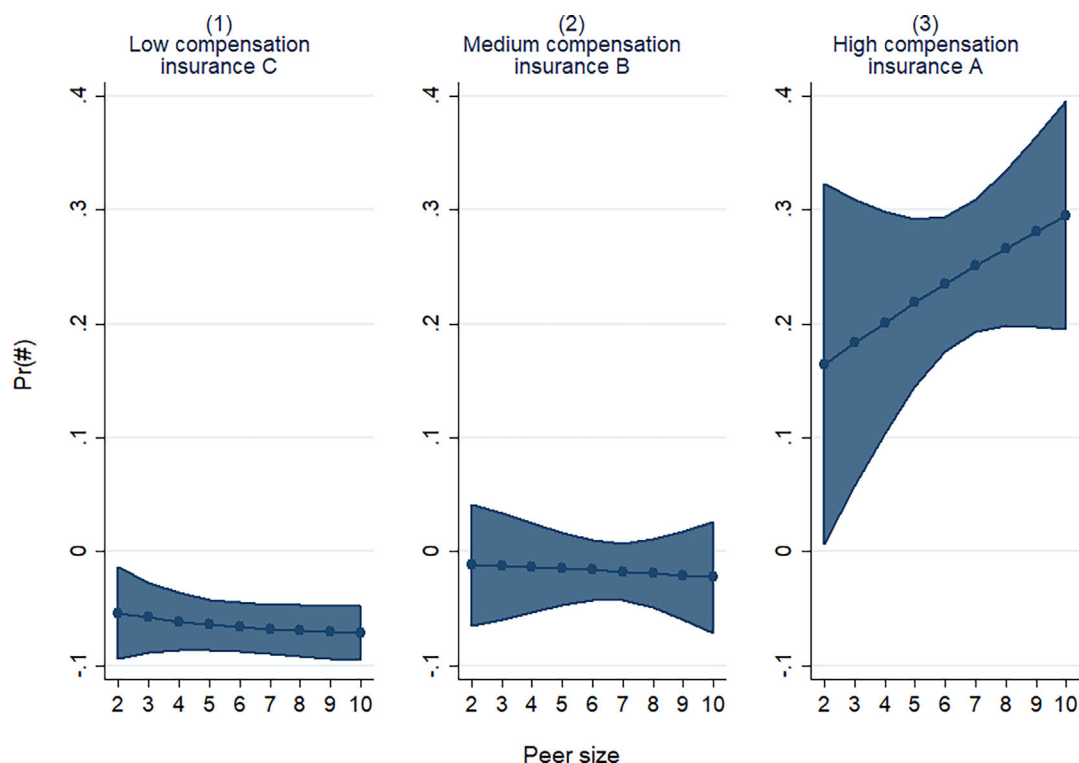


FIGURE 2 Peer imitation conditional on peer size (average marginal effects). [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

(2) experienced payout, and (3) condition imitation behavior on peer size, trust, and practical understanding.

First, we include one's lagged individual insurance choice in Table S4 in Supporting Information Material. While one's lagged individual insurance choice produces insignificant results on any arbitrary significance level, it scales down size effects of peer imitation and trust. This result is not surprising, as farmers are aware of changing game weather. The negative influence on peer imitation and trust may point at a substitution effect between one's own index insurance experience and one's simultaneous peer behavior.

We then explore whether such a substitution effect exists, and extend the baseline model by experienced payouts. As reported by Karlan et al. (2014), receiving insurance payouts can increase trust, and consequently future adoptions. Table S5 in Supporting Information Material shows that experienced insurance payout in the last drought season seems to increase the probability of purchasing the high compensation insurance A by 10.57 percentage points ( $p = .1390$ ), and decreases the probability of no insurance by 7.85 percentage points ( $p = .1350$ ). Although the estimates are not significant on any arbitrary level, the findings are in accordance with J. Cai et al. (2020), who find that insurance experiences trigger repurchasing activities. Furthermore, peer imitation estimates lose their magnitude and high significance level, validating the assumed substitution effect. Ergo, peer behavior becomes more important when lacking personal expertise, and is a crucial heuristic in index insurance decision-making on the first dissemination steps.



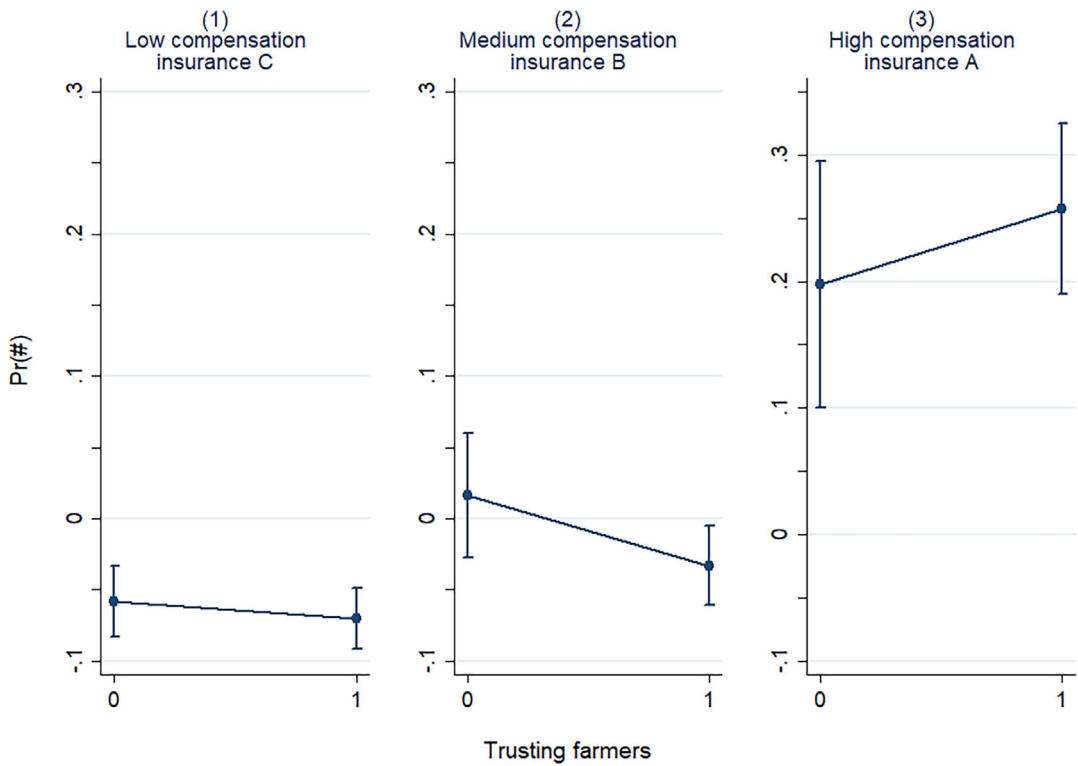


FIGURE 3 Peer imitation conditional on individual insurance trust (average marginal effects). [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

We also investigate whether imitation behavior varies over selected characteristics. Figure 2 shows the marginal effects conditional on one's peer size. We learn from panel (3) that peer imitation almost linearly increases with peer size, and has an average effect of 13.05 percentage points ( $p < .001$ ). Having more peers adopting the innovative insurance option may signal trust and social acceptance, stimulating the individual to follow suit.

We next examine trust effects in an imitation attitude in Figure 3. Farmers who trust the drought index insurance concept are by 5.98 percentage points more likely to imitate their peers. Intuitively, trusting the peer decision before peer behavior is in fact observable slightly reinforces peer imitation patterns. However, it is interesting that farmers who state initial distrust still follow their peer uptake by roughly 20 percentage points, compared to other insurance options. Peers can overcome trust barriers, which is a powerful finding.

Moreover, we explore the relation between peer imitation and practical understanding in Figure 4. Panel (3) shows that peer imitation and own practical understanding complement each other in the first game half ( $p \leq .001$ ), but seem to become substitutes in the second game half ( $p \leq .001$ ). Higher practical understanding (in the second half) may induce farmers to rely less on their peer behavior and follow their own experiences. This again confirms former experience effects. However, the average effect over all rounds still increases peer imitation patterns by approximately 5.15 percentage points ( $p < .001$ ).

Further heterogeneity analyses in the Supporting Information Material reveal that older (see Figure S4) and more educated farmers (see Figure S5) are less likely to imitate peer

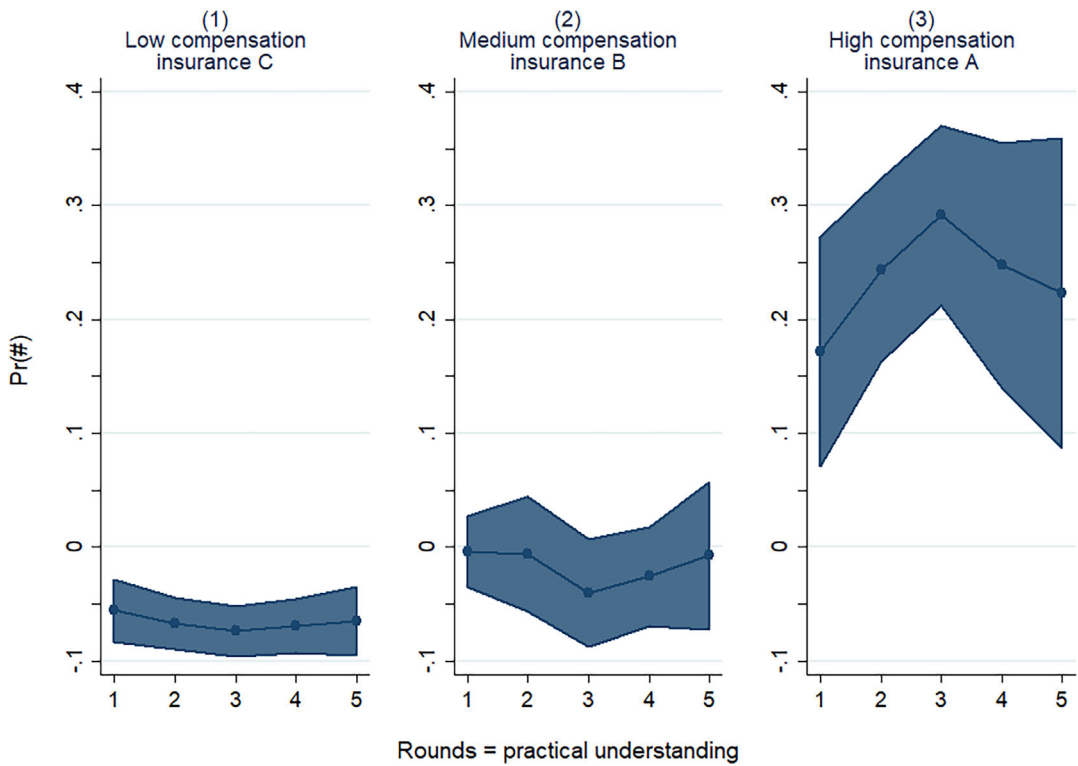


FIGURE 4 Peer imitation conditional on practical understanding. [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

behavior. Older and educated farmers may trust their own expertise most. Besides, gender differences in peer imitation are significant ( $p \leq .001$ ), but low in magnitude ( $\leq 0.38$  percentage points, see Figure S6). Finally, an  $F$ -test shows insignificant imitation differences between Kyrgyz and Russian speakers ( $p = .8732$ ).

### 6.3 | Robustness tests

In this section, we test whether our baseline results are robust over (1) alternative peer adoption definitions, (2) the subsample of farmers completing all five game rounds, (3) village heterogeneity, and (4) an attempt to solve the simultaneity issue by instrumenting for peer behavior.

So far, we defined peer insurance adoption as the average peer insurance choice (oneself excluded). However, we can also model it as a binary variable. Defining peer behavior as the share of zero adopters (see Table S6) and insurance A adopters (see Table S7) validates previous peer imitation estimates (both  $p < .0001$ ).

Due to external events (time scarcity due to arrival of harvester services in the village) two sessions could only play three (instead of five) game rounds. This accounts for 85.7% of all farmers that dropped out the game early. The remaining dropouts (four farmers) left for the same exogenous event, this time however not affecting other session participants. To test whether there is a systematic difference in peer imitation behavior among farmers that dropped

out early and others, we run the baseline and extension regressions on the subsample of farmers completing all rounds. A comparison in the peer imitation effect between the full and subsample is displayed in Table S8. We find that peer imitation behavior does not differ between the two comparison groups ( $p \geq .5457$ ). Dropouts were exogenous and do not yield to biased estimates.

Next, we check the robustness of our results when controlling for village heterogeneity. Every session experimented with a different village, and we can take session heterogeneity to account for it. Since there are up to three game groups per session, game group fixed effects and session fixed effects are collinear. Including session heterogeneity and dropping peer group fixed effects in the baseline and two dynamic extension models (see Table S9) reveals similar findings as those presented before. However, this robustness test for the second extension model shows a dominant role of peer imitation over an experienced insurance payout in the (hitherto) last drought state. This deviates from findings in the original model (see Table S5) and implies the wrong attribution of peer influences to peer imitation if peer fixed effects are not controlled for. As already pointed out by Manski (1993), a thorough understanding of peer imitation, however, requires peer fixed effects to enter the model. Moreover, the model with peer fixed effects can slightly better explain the data variability, and we conclude it to have a superior model fit (on the basis of  $R^2$ , AIC, and BIC).

Finally, we apply an IV approach to circumvent the potential endogeneity bias in the peer behavior variable (see discussion in Section 5). This way we can preclude the possibility that the estimated peer imitation effect partially captures reverse causality. We use the exogenous peer characteristics from the baseline model to instrument for peer behavior: average peer residency duration in village and average peer production sold. Several tests reveal the suitability of the IV approach: Both instruments are relevant in the first stage regression ( $p \leq .001$ ;  $p = .096$ ), and the chi-squared test statistic rejects the null hypothesis that the specified instruments are endogenous ( $p = .0822$ ). Using the Hansen J statistic, we fail to reject the null hypothesis that all instruments are valid ( $p = .2354$ ), and a Wald test reveals the joint significance of all instruments ( $p \leq .001$ ). Finally, we test for weak instruments. The Kleibergen-Paap Wald  $F$ -statistic of 21.467 exceeds the Stock-Yogo weak ID critical value of 19.93, signaling that the two-stage IV bias deceeds 10% of the OLS bias. Overall, the specified peer characteristics seem to successfully instrument for endogenous peer imitation.<sup>14</sup> In this model specification, we use session fixed effects instead of peer fixed effects to obtain valid instruments. Findings from the IV approach in Table S10 validate the robustness of our variables of interests: peer imitation, trust and understanding. Even if the magnitude size of peer imitation may be slightly overestimated by the IV model, the direction and significance levels hold.

## 7 | CONCLUSION

Agricultural index insurance is associated with great expectations to improve farmers' climate resilience. Aiming to better understand uptake behavior, various studies have explored key determinants but so far have had limited practical success. In lab-in-the-field experiments we introduced crop index insurance, surveyed participants, and conducted experimental economic games. Along the data, this article is the first approach to replicate real farm and market conditions, and analyze simultaneous peer imitation, trust and understanding in index insurance decisions among early adopters.

We come to four conclusions: (1) Within peer effects, peer behavior seems to be an important heuristic in innovative index insurance adoption. In less individual-based societies, it is not quite apparent who *participates* in individual decision-making. Group sessions and promotions for complex but promising individual index insurance may help farmers in Kyrgyzstan (and other developing countries) to overcome initial skepticism and accept it as a reliable climate adaptation. Contrary to previous research, our model predicts simultaneous *peer imitation* (opposed to *observational learning*) as the dominating peer influence. Innovation-affine peers embody the role of unintended multipliers—the actual innovation decision alone (without knowing the decision outcome) motivates participation in others. (2) In extension models we learn that experienced insurance payouts substitute peer imitation attitudes. A higher peer size, signaling social acceptance, greatly influences imitation attitudes, whereas its effect is only marginal for trusting and understanding individuals. Peers' choices mainly serve as a heuristic, if decision-makers lack own expertise and confidence. Complementing previous evidence of social learning in later diffusion processes, we argue that social networks already matter in early adoption. Agricultural innovation promotions on the village level which allow farmers to exchange information prior to uptake and imitate trustworthy peers can boost index insurance adoption in Kyrgyzstan. (3) Farmers that trust the general drought index insurance concept (or the local insurer) are more willing to invest in higher compensation index insurance—understanding effects seem to be less pronounced among our sample. Therefore, we advocate group promotions to also engage in trust-building activities prior to product launch. (4) Finally, comparing three marketable insurance products, we observe farmers to intrinsically favor more costly contracts with higher compensations. Taken altogether and beyond the common understanding of economic factors, we believe that piloting projects can increase index insurance demand once community-based and trust-building extension programs are internalized and implemented.

One caveat of our research is that our experimental economic game simplifies agricultural risks to drought only, but we believe the bias to be minimal due the great stated drought risk. Aiming to reveal the general attitude toward *ideal* index insurance we neglect the common issue of basis risk, which may overstate the high observed adoption rates. Moreover, there might be a potential difference between decision-making in experiments and real life. However, we learned in the feedback rounds that farmers revealed their real preferences, but might be more financially constrained in reality. We claim that the underlying game with its distinct characteristics enables us to understand farmers' *true* preferences (prior to insurance purchase) better than stated preferences. We assume external validity of the study results for less individualistic societies. Future research should validate this hypothesis, and address the reasons for the identified imitation effect: Is it due to the complex index insurance concept? Superior trust in peers' perceptive skills? An incentive to build reputation? Or alternative reasons? Deeper and multifaceted understanding in these regards can increase the dissemination of innovative climate adaptations, which are highly needed to increase climate resilience.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

## DATA AVAILABILITY STATEMENT

Data and codes can be made available upon request.

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## ENDNOTES

- <sup>1</sup> We should note that the meaning of peer effects is multifaceted. Many scholars define it as the influence of average peer behavior on individual behavior (e.g., Case & Katz, 1991; Deconinck & Swinnen, 2015; Wydick et al., 2011). Yet these are endogenous peer effects in Manski's (1993) terminology, opposed to exogenous peer effects (peer characteristics) and correlated effects (unobservables). Goldsmith-Pinkham and Imbens (2013) apply a looser definition as "correlations between outcomes for individuals only indirectly connected" (p. 254). Another strand of literature regards peer effects as the influence of peer characteristics on individual behavior (e.g., Ammermueller & Pischke, 2009).
- <sup>2</sup> In Central Asia, research on agricultural index insurance so far has addressed index advancements within the insurance product development (e.g., Eltazarov et al., 2021).
- <sup>3</sup> As stated by Hellmuth et al. (2009) index insurance options are available for farmers ("micro-level"), input suppliers/banks ("meso-level"), or governments ("macro-level"). This article only focuses on micro-level index insurance for individual farmers.
- <sup>4</sup> Before the experiment, we coordinated with local partners how agricultural index insurance could be launched in Kyrgyzstan. Incorporating treatments in the pilot project were not planned for the region.
- <sup>5</sup> Roughly 84.95 KGS equal 1 USD. Based on nationally representative data collected by Bobojonov and Aw-Hassan (2014), average annual revenues among Kyrgyz farmers are situated at 640 USD (3.2 tons  $\times$  200 USD/t). More recently, an expert assessment proposed average net farm incomes in the pilot region of 43,000 KGS/ha. We compared this value with information from the hitherto most recent representative "Life in Kyrgyzstan" (LIK) survey (Brück et al., 2014). In 2016, LIK reports a median farm income in the Chuy province of 43,901 KGS/ha. In the survey during the experimental session sample farmers stated an average agricultural income of 47,728 KGS. Thus, game endowment approximates their real available income situation.
- <sup>6</sup> The game investment options resemble local reality. For the three main crops (barley, winter wheat, and summer wheat), farmers stated in the survey that they use savings (29%–44%) or take a credit (16%–25%) to cope with shocks, instead of selling assets (9%–17%) or relying on relatives' help (5%–17%).
- <sup>7</sup> The game includes relevant climate adaptations local farmers can flexibly decide upon (see Section 2), extended by index insurance. Variation of alternative inputs or productivity are constant in the parameterization. We neglect the common issue of basis risk because its detrimental impact on adoption behavior is anyhow undisputed (Giné et al., 2008; Hill, Hoddinott, et al., 2013). Furthermore, due to farmers' scarce time, we waived a classical practice round—a Wald test validates that the first round did not function as a practice round.
- <sup>8</sup> Comparing all model covariates between farmers that successfully played all rounds and their counterpart in a *t*-test reveals that early dropout farmers have significantly lower insurance-friendly peers ( $p = .0002$ ), choose lower credit amounts ( $p = .006$ ), are less likely to meet the local insurer during the session ( $p = .0015$ ), are less risk averse ( $p = .0130$ ), have a lower high subjective discount rate ( $p = .040$ ) and fewer household

members ( $p = .020$ ). In a robustness test (see Section 6.3), we estimated whether there is a related systematic difference in our main variable of interest (peer imitation).

- <sup>9</sup> In the full sample of 142 farmers, 66.9% stated to have formal insurance. Of these, 42.3% participate in health insurance, compared to vehicle, building (each 14.3%), life (4.7%), property (1.6%), and other insurances (5.4%). While there are no official insurance statistics, 33.99% of farmers (34.64% in Chuy) indicated health insurance coverage in the representative LIK dataset 2016 (Brück et al., 2014). More recent WHO data reveal that 74% of the Kyrgyz population pays for employment-based mandatory health insurance through payroll tax (Jakab et al., 2018). A higher insurance awareness in our sample may derive from the rigid insurance focus in our setting that may have stimulated a reflection on existing insurance coverage. We do not assume this to vary in the real implementation.
- <sup>10</sup> According to Manski (1993), a causal analysis of peer influences needs to distinguish between (1) *endogenous effects* (“propensity of an individual to behave in some way varies with the behavior of that group”), *exogenous effects* (“... varies with the exogenous characteristics of the group”) and (3) *correlated effects* (“individuals in the same group tend to behave similarly because they have similar individual characteristics or face similar institutional environments”) (p. 532f.).
- <sup>11</sup> Peer’s residency duration in the village serves as a proxy for age and a trusted villager alike.
- <sup>12</sup> Comprehension of index insurance questions captures whether rainfall is measured on one’s farm and whether one can suffer from drought without receiving any drought-based insurance payout. Therefore, this variable includes an understanding of basis risk.
- <sup>13</sup> Table S2 in the Supporting Information Material controls for *peer imitation* and *observational learning* alike. The model predicts peer imitation effects that are high in scale and significance level ( $p = .005$ ), whereas the observational learning effect is low in magnitude and insignificant ( $p = .960$ ).
- <sup>14</sup> In the baseline model, peer characteristics comprise peer residency duration in the village, peer production sold and peer yield losses. However, in the IV estimation, peer yield losses do not satisfy the relevance criteria, and hence does not enter the set of instruments. We also tested alternative instrument choices. Game endowment and trust were key determinants in an individual adoption model that does not control for peer effects. However, instrumenting peer behavior with any combination of its means values fails the instrument validity tests.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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