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Paper/Poster Title	The impact of crop index insurance on welfare and climate resilience: Experimental evidence from Uzbekistan
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Abstract prepared for presentation at the 96th Annual Conference of the Agricultural Economics Society, K U Leuven, Belgium

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Abstract	200 words max
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As index insurance is often discussed as a promising climate adaptation for agricultural producers, growing literature has examined its effectiveness. Yet, a clearer understanding on the differentiation between ex-ante and ex-post impact is often missing. This study uses a lab-in-the-field/framed experiment to analyse both effects on welfare (*risky* fertilizer input, consumption, agricultural income) and climate resilience (financial independence) among rainfed farmers in Uzbekistan. Applying an instrumental variable estimation, our results suggest that crop index insurance can induce ex-ante and ex-post welfare gains for all aspects under exploration and strengthen climate resilience after a drought. On the practical side, our results contribute to better assessing the efficacy of crop index insurance and its positive implications on rural welfare directly and indirectly through an adoption stimulating narrative.

Keywords	Crop index insurance; Ex-ante and ex-post impact analysis; Experimental economics; Uzbekistan
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JEL Code	G22, O12, O13, O33, Q14
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Introduction	100 – 250 words
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Farmers in developing countries face various risks. Weather shocks pose production risk and require adequate climate adaptation strategies. Prominent examples exist for agricultural inputs (e.g. irrigation, drought-resilient seeds) and in the field of microfinance (savings, credit and insurance). However, access to these climate adaptations is usually limited due to missing markets or capital constraints, and evidence predicts devastating effects of uninsured risks to vulnerable farmers: volatile agricultural income and household consumption.

Intending to smooth income, farmers may decide for farming practices inducing stable but lower crop productivity, and the role of consumption is twofold: In a tradeoff between consumption smoothing and asset sale, it conditions short-term asset endowment. Further, it influences health, and thus human capital formation and maintenance. Declines in economic growth and wellbeing can be long-term impacts of weather shocks.

Index-based agricultural insurance is an often discussed instrument to provide remedy here. Growing evidence from the developing world indicates that index insurance improves an efficient resource allocation and decreases ex-post losses. Since most studies did not differentiate between ex-ante and ex-post impacts, more

research is needed to better understand its true implications.

Aiming to contribute to this research gap, our study examines the ex-ante and ex-post efficacy of marketable crop index insurance in Uzbekistan. Our focus on welfare-enhancing (*risky* fertilizer use, household consumption, farm income) and resilience-increasing (credit uptake) characteristics combined with heterogeneity effects enriches the impact research. Our results are relevant for academia, political stakeholders and practitioners.

Methodology

100 – 250 words

The basis of our analysis is a series of comprehensive and approximately *realistic* lab-in-the-field experiments that we conducted with 199 Uzbek farmers in 2019.¹ These sample farmers are located in Uzbekistan's pilot region for crop index insurance and are representative for the rainfed population. So far, the local index insurance product is still in its implementation phase and recognizing potential impact can prepare and improve synergy effects in related areas. Therefore, our experiment mimics five subsequent farming seasons in which farmers decide for farm and household investments under local conditions. In this setting we introduce innovative marketable and unsubsidized index insurance that allows farmers to interact with the new climate adaptation before real uptake, and allows us to observe revealed behaviour and explore impact empirically. To overcome endogeneity problems resulting from self-selection of index insurance adoption, we use exogenous peer insurance coverage as a valid instrument and apply the instrumental variable approach. Our outcome variables of interest are fertilizer input, household consumption, credit uptake and farm net income. This focus contributes to a clearer understanding of welfare and resilience-related impacts in agricultural-intensive and drought-prone Uzbekistan.

Results

100 – 250 words

Descriptively we find that 56.3 to 87.9% per round adopted index insurance. Over all experimental rounds, only 4.0% refused any adoption, whereas 39.7% decided for index insurance coverage every season (\bar{X} : 3.86, SD: 1.30). For this reason, we mainly expect potential impacts on time-varying experimental behaviour.

Regression results then indicate that insured farmers have a higher probability to invest in fertilizer ex-ante ($p=0.008$), thus before knowing the seasons' weather conditions and potential insurance payments. After suffering drought, farmers use (part of) their insurance payments to purchase fertilizer ($p<0.001$), whereas comparison farmers lack the financial resources. This ex-post effect remains but reduces in magnitude even two seasons post drought ($p=0.086$).

While household consumption expenditures are ex-ante higher among insured farmers ($p=0.046$), we cannot identify any ex-post effect on average consumption spending. However, heterogeneity effects exist – our model predicts that richer farmers tend to invest more into consumption when receiving insurance indemnity ($p=0.014$). The role of credit is essential here. The probability to take up a loan tremendously decreases when having successfully received insurance payments the

¹ Lab-in-the-field experiments are an alternative term for framed experiments.

season prior ($p < 0.001$) and even after two time lags ($p = 0.018$). Similar can be observed in the impact on total farm net income. Insurance protection during adverse weather conditions results in insurance payouts that raise agricultural revenue ($p < 0.001$). This income effect remains for three years post drought with diminishing marginal returns ($p < 0.001$).

Discussion and Conclusion

100 – 250 words

Our empirical results indicate that index insurance (ex-ante and ex-post) stimulates investments in (climate) riskier but more productive farm activities because climate-related losses receive compensation. A similar logic explains the ex-ante consumption effect. Access to credits enables farmers to maintain their consumption levels after drought shocks, whereas more wealthy farmers use the insurance payment to raise consumption expenditures. Generally, insurance compensations induce farmers to not rely on credit/external help any longer, which signals strengthened climate resilience. All these contribute to augmented farm net incomes in up to three years after the suffered but insured weather shock. In summary, crop index insurance coverage can boost on-farm welfare and climate resilience. Embedding this narrative into promotion activities may further motivate index insurance adoption and its synergies.

Within the growing impact literature from developing countries, proponents often promise positive impacts on other risky but more profitable agricultural investments, wealth and climate resilience. Our results support this argumentation for crop production in Uzbekistan, if respective challenges (short payout times and basis risk) are minimized. Revealed behaviour of sampled farmers as the real target group gives reasons to regard index insurance as an efficient climate adaptation strategy in an optimistic manner. Future research can shed light on the external validity of these results. Finally, we are aware of the limitations of experimental data conclusions but believe lab-in-the-field experiments to be a powerful tool to learn about farmers' behaviour and its consequences before market/policy implementation.

