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Exposure to climate-change related extreme weather events and risk preferences: evidence from farmers in Central Highland Afghanistan

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We study whether long-term exposure to climate-change-related extreme weather events is associated with farmers' risk preferences. We combine (i) a household survey of 1,502 farmers across 14 districts in Afghanistan's Central Highlands with (ii) an incentivized lab-in-the-field risk task for 239 farmers, and (iii) farm-level GPS coordinates that proxy drought exposure via distance to rivers/streams. Our analysis shows that farmers in (very) high-exposure locations are systematically less risk-averse: exposure predicts choosing riskier gambles in the Eckel–Grossman task and reporting greater willingness to take risks. Plausibility checks using GPS distances corroborate self-reported exposure. We discuss mechanisms consistent with adaptation to a persistently riskier environment and with background risk dampening aversion to additional independent risks. Our findings highlight that climate change can alter economic preferences themselves, with implications for adaptation policy design (e.g., uptake of new seeds, irrigation, or insurance).

KEYWORDS

risk preferences, climate change, extreme weather events, exposure, adaptation, Afghanistan

1 Introduction

In recent decades, changes in climate and global warming have impacted natural and human systems on all continents and across oceans. With continuing climate change, the likelihood of climate-related extremes, such as drought, floods, as well as cold and heat waves, has increased severely. Impacts of such extreme events reveal significant vulnerability and exposure of ecosystems and human life to current climate variability. The evidence of climate change impacts is comprehensive for natural systems and humans alike, including impacts on health, well-being and economic prosperity.

In order to reduce the vulnerability of natural and human systems to the impacts of climate change and related extreme events, adaptation is crucial, especially in developing countries (Smit and Wandel, 2006; Dixon et al., 2014; IPCC, 2014; Jianjun et al., 2015). For designing and implementing adaptation plans, understanding the current and future impacts is essential. A large body of research is devoted to studying the physical and ecological implications of climate change and related extreme events (e.g. Edwards and Richardson, 2004; Kelly and Goulden, 2008; Moritz et al., 2008; IPCC, 2014). Some studies address individuals' behavioral adjustments in response to the realized impacts (Adger et al., 2005). However, the question of whether the effects of climate change and related extreme events trigger changes in individuals' economic behavior and risk preferences remains an understudied subject (Dang, 2012; Di Falco and Vieider, 2022). Investigating such an association is particularly relevant to the adaptation process, as adaptation is a decision under uncertainty and related to individuals' risk preferences.

Among other sectors, agriculture is very susceptible to the impacts of climate change and extreme events (Kurukulasuriya and Rosenthal, 2003; Chen et al., 2013). Due to the limited adaptive capacity, farmers in developing countries are more vulnerable to climate change-related impacts (Khanal et al., 2019). In such a setting, farmers' adaptation is key to their livelihood, food security, employment, and development (Khanal et al., 2018). Hence, understanding the factors that are associated with farmers' adaptation is a crucial research and policy question.

The central motivation of this study is to examine the possible association of farmers' exposure to climate-change related extreme weather events and economic behavior, specifically risk-taking. To this end, we combine geographic, survey, and experimental data of farmers in the Central Highlands of Afghanistan (Bamiyan, Ghazni, and Diakundi provinces). We gathered information on weather and climate of the region from 1979 to 2014. Next, we conducted a survey collecting information on household and community characteristics, climate change, extreme weather events, and related risks, covering 1,502 farmers. Finally, we conducted a lab-in-the-field experimental task to elicit farmers' risk preferences in an incentive-compatible fashion with 239 participants.

Our results suggest a strong association between farmers' risk preferences and their long-term exposure to extreme weather events. We find that farmers who experienced a higher intensity of extreme events are less risk-averse. The result is obtained for both survey answers and experimental choices.[1] Linking our findings to the review articles on the stability of risk preferences by Chuang and Schechter (2015) and Schildberg-Hörisch (2018), our findings are in line with works such as Balgah and Buchenrieder (2011), Voors et al. (2012), and Page et al. (2014) who show that risk-taking is endogenous and increases with short-run exogenous shocks of violence and extreme weather events. Given certain factors of our specific setting in Central Afghanistan, such as immobility of farmers, extreme poverty and no government intervention and climate adaptation, we interpret our results as evidence that farmers' risk preferences have been affected by their long-term exposure to extreme weather events, such as drought, flood, and cold/heat waves.

The rest of the paper is organized as follows. Section 2 provides a review of literature. Section 3 presents information about the setting, i.e. climate change and extreme events in the Afghan study area. Sections 4 and 5 discuss the methods and present the results. Section 6 presents the discussions and section 7 concludes.

1 This result is in line with Dohmen et al. (2011) and Falk et al. (2023)'s observation for the consistency between these two measures.

2 Literature review

The literature on the endogeneity of risk preferences has surged in recent years. Studies investigate the problem from various angles. The effect of prior losses and gains on current risk-taking has been investigated both in the lab (Weber and Camerer, 1998; Haigh and List, 2005; Weber and Zuchel, 2005) as well as in the field (Odean, 1998; Locke and Mann, 2005). Several studies investigate the effect of short-run natural disasters on risk preferences (Hanaoka et al., 2018; Page et al., 2014; Cameron and Shah, 2015; Cassar et al., 2017). Similarly, the endogeneity of risk preferences has been studied in the context of long-run effects such as occupation (Nguyen, 2011), the environment (Bchir and Willinger, 2013), and exposure to conflict (Voors et al., 2012; Callen et al., 2014).

A substantial number of studies show that (risk) preferences may be endogenous and vary across time (Campbell and Cochrane, 1999), living and working environments (Bchir and Willinger, 2013; Nguyen, 2011; Di Falco and Vieider, 2022), experienced events (Callen et al., 2014; Page et al., 2014; Imas, 2016), institutions (Bowles, 1998; Palacios-Huerta and Santos, 2004) and exposure to conflict (Voors et al., 2012). Our result contributes to this literature by flagging the importance of climate change and long-term events for economic preferences. We contribute to the literature by opening a new dimension in the sense that not only experiencing short-term, high-intensity shocks affect behavior, but also long-term exposure to extreme events (with relatively lower intensity) appear to affect preferences.

Complementing this, studies from South Asia show how climatic and hydrologic risk shape subjective perceptions and risk-mitigating choices among smallholders, e.g. flood risk and willingness to pay for crop insurance in Bangladesh, and perceptions of production risk among farmers in Pakistan (Fahad et al., 2018; Hossain et al., 2022; Hossain, 2024, 2025). Together, these strands support our empirical premise and underscore the relevance of studying long-run exposure, beyond high-intensity shocks, for economic behavior. Our study adds evidence from Afghanistan where institutional adaptation options are limited, immobility is high, and background risk is salient, sharpening identification by leveraging farm-level geography (GPS-based proximity to water).

3 Climate change and extreme weather events in the study area

Central Highlands is one of the five climatic zones in Afghanistan. Deep valleys and mountain range up to 6,400m above the sea level widely characterize the region. Baba Mountain Range is extended from North-East to the South-West of the area providing the source for many of the country's major rivers, such as Helmand, Kabul, Harirood, and Baghlan (Aich and Khoshbeen, 2016). The climate in the Central Highlands has changed since the second half of the 20th century.

An analysis of the weather data shows that the temperature over the study area has increased by about 1.5 degrees Celsius, and the average precipitation has decreased, although with higher heterogeneity. Almost all farmers in our sample have perceived changes in the climate of the region and nearly 90% of them reported a warmer and drier climate now compared to 20–30 years ago. Hence, drought is the most common problem associated with climate change. For our identification strategy it is crucial that we move beyond self-reported perceived impacts of climate change. To this end, we also collected exact GPS coordinates of the farms, since the drought risks can differ greatly between farms, even in the same village. The geography of deep valleys in the mountainous areas of our study and the lack of machinery for irrigation imply that short distances from rivers and streams can make a great difference in farming success and yields in periods of drought.

Due to climate change, the intensity and frequency of cold/heatwaves have also increased (Ali and Erenstein, 2017). Considering the extreme nature of these events, they can cause considerable losses in the farm's production. A cold wave in spring when most of the products blossom, for instance, can freeze the premature seeds. A heat spell in the summer, when water scarcity is at its peak, can damage products.

Climate change has been happening uniformly across all three provinces under study, yet the consequences in different locations have been mainly depending on the topography (mountain ranges, river, altitude, etc.) and the exact location of each farm. As a result, some farmers faces losses due to climate change and some farmers benefit from these changes, for instance due to a warmer climate for their crops.

4 Research design

4.1 Data collection

The data for our analysis were collected from a total of 1,741 farmers. Of this total, 1,502 farmers participated in our survey and 239 farmers participated in a lab-in-the-field experimental measure, both run to study the association between risk-taking and exposure to extreme events. The participants of the survey were sampled from across 14 districts in three central provinces (Bamiyan, Ghazni, and Diakundi) of Afghanistan in May and June 2017. The survey includes variables on the local risk of drought, flood, cold/heatwaves, and change in the climate, their consequences, and a range of household, farm, and community characteristics. In order to gauge the farmers' risk perception, a variable on general risk perception was included in the survey. The summary statistics of these variables are reported in Table 2. The key variable of interest is our (self-reported) measure of the intensity of the extreme weather events (drought, flood, and cold/heatwaves). We have used the risk of three main extreme events, drought, flood, and cold/heatwaves, to define our treatment variable.

During the lab-in-the-field experimental task later in July 2017, we randomly sampled 239 farmers from 20 communities in Bamiyan center and Nili districts, inviting them to participate. From these farmers, 61 of them experienced high intensity of extreme events, and 178 of them experienced no or very low intensity of extreme events. To elicit their risk preferences, we have employed a well-established method proposed by Binswanger as well as Eckel and Grossman (Binswanger, 1981; Eckel and Grossman, 2002).

The farmers were presented with six lottery choices and were asked to choose the one they prefer. Each option, listed in Table 1, involves a 50% chance of receiving the low payoff and a 50% chance of the high payoff. Before asking the farmers to make a choice, a research assistant explained the method in a simple language to ensure understanding[2].

Following Eckel and Grossman (2002), Gamble 1 involved a guaranteed payoff of 150 Afghani.[3] For Gambles 1–5, the expected payoff increases linearly with risk (given by the standard deviation). Gamble 6 has the same expected payoff as Gamble 5 but with higher standard deviation. The gambles are designed so that the risk-averse farmers should choose those with lower risk (Gambles 1–4). Risk-neutral farmers should choose Gamble 5, and risk-seeking farmers should choose Gamble 6. Under the assumption of constant relative risk aversion (CRRA), the farmers' utility function can be represented by a power function of the form $u(x) = x^{1-r}$, with r corresponding to the coefficient of relative risk aversion and x corresponding to wealth. Farmers with $r > 0$ can be classified as risk-averse, $r < 0$ as risk-seeking, and $r = 0$ as risk neutral.

Importantly, we also collected GPS coordinates from the farmers who participated in the experimental task. We take advantage of these coordinates by computing distances between farms and the nearest body of river or stream, in order to achieve exogenous variation in the intensity of drought, with drought being less severe for farms that are located closer access to water, ceteris paribus.[4] Figure 1 shows the farm locations of Bamyan participants.

4.2 Conceptual framework

We conceptualize a pathway in which long-run exposure to climate-related extremes (droughts, floods, heat/cold waves) shapes economic choices via two channels: (1) Preference adaptation, i.e. repeated decision-making under elevated background risk shifts reference points and increases tolerance for additional independent risk, and (2) constraints, i.e. exposure tightens liquidity and insurance constraints, altering the marginal utility of risky vs. safe options. Observable implications are higher risk-taking in incentivized tasks and survey measures among farmers with greater historical exposure, after controlling for on household, farm, and community co-variates. GPS-based proximity to rivers provides plausibility and reduces concerns about biases.

5 Results

In this section we first provide an overview of the descriptive statistics and then provide our analyses.

2 A detailed summary of experimental procedure is provided in Appendix B.

3 At the time of the research, the exchange rate of Euro to Afghani was 1:72. The average daily wage on the farm is about 400 Afghani.

4 In our setting in Afghanistan irrigation machinery is non-existent for smallholders and therefore distance to water plays a crucial role.

TABLE 1 Eckel-Grossman task (EG task).

Choice (50/50 gamble)	Low payoff	High payoff	Expected return	Standard deviation	Implied CRRA range
Gamble 1	150	150	150	0	$r > 1.251$
Gamble 2	120	190	155	35	$0.99 < r < 1.251$
Gamble 3	100	220	160	60	$0.70 < r < 0.99$
Gamble 4	80	260	170	90	$0.49 < r < 0.70$
Gamble 5	60	300	180	120	$0 < r < 49$
Gamble 6	10	350	180	170	$r < 0$

All payoff amounts are in Afghani (Afghanistan's national currency).

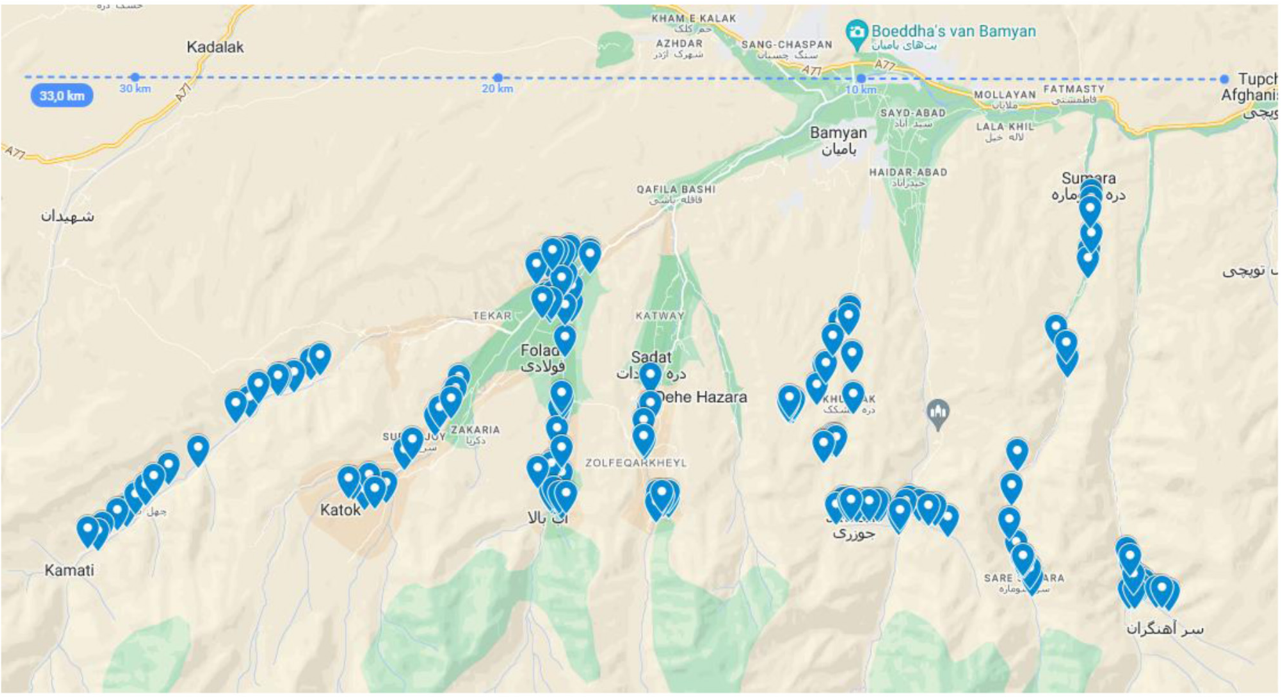

FIGURE 1
Map of farm locations in Bamyan Centre District (We used Google Maps to create the map, ©2024 Google).

5.1 Descriptive statistics

In order to examine differences in descriptive statistics between farmers who are exposed to climate-change extremes and those farmers who are not, we define a dummy variable which equals 1 if the average risk of such events is high to very high and 0 otherwise. Table 2 provides a summary of variables by exposure (0 stands for low exposure; 1 for high or very high exposure), including the *p*-values of corresponding two-tailed *t*-tests. The statistics in Table 2 show that more exposed farmers are less risk-averse ($p < 0.01$). The result is true for both survey data and experimental evidence.

Furthermore, households' on-farm employment is higher among less exposed farmers. The difference is, however, only significant for experimental data. The number of farmers who sell a part of their farm product in the market is higher among less exposed farmers ($p < 0.05$). The change in farm production (as a result of climate change) is less negative among less exposed farmers ($p < 0.01$). In the same way, the overall impact of climate change is less negative for less exposed farmers ($p < 0.01$). A similar result is observed on the degree of farm's vulnerability to the effects of climate change (and related extremes) in the sense that less exposed farmers reported that their farms are less vulnerable ($p < 0.01$). The statistics in Table 2 further show that farmers in our sample are risk-averse on average.

5.2 Exposure to climate-change-related extremes and risk preferences

In the previous sub-section, we have seen a considerable heterogeneity in farmers' risk preferences and perception with respect to their exposure to extreme events. Farmers spend a considerable amount of time (mostly their whole life) working on

TABLE 2 Summary statistics.

Variable	Experiment		Survey	
	Mean (SD)	Exposure 0 (1)	Mean (SD)	Exposure 0 (1)
Exposure (high to very high = 1)	0.26 (0.44)	-	0.76 (0.40)	-
EGTask (risk preferences)	3.94 (1.5)	3.75 (4.48)***	-	-
Risk perception (0–4)			1.54 (1.40)	1.30 (1.60)***
Risk of drought (0–4)	2.28 (1.8)	1.71 (3.95)***	3.09 (1.19)	1.71 (3.75)***
Risk of flood (0–4)	1.60 (1.2)	1.15 (2.93)***	2.94 (1.11)	1.83 (3.22)***
Risk of cold/heatwaves (0–4)	2.25 (0.93)	1.96 (3.08)***	2.58 (1.22)	1.29 (2.91)***
Gender (male = 1)	0.94 (0.23)	0.97 (0.87)***	0.97 (0.16)	0.97 (0.97)
Literate (yes = 1)	0.578 (0.49)	0.56 (0.57)	0.58 (0.49)	0.66 (0.56)***
Farming experience (in years)	24.3 (15)	25.9 (20)***	22 (14)	22 (21.8)
Works only farm (yes = 1)	0.51 (0.50)	0.57 (0.36)***	0.37 (0.47)	0.30 (0.38)***
Cause of climate change (God's will = 1)	0.41 (0.79)	0.44 (0.31)	0.62 (0.93)	0.62 (0.63)
Main source of income (farming = 1)	0.79 (0.41)	0.83 (0.67)**	0.71 (0.45)	0.67 (0.72)***
Household members work on farm	3.2 (2)	3.4 (2.7)**	2.5 (5.4)	2.9 (2.4)
Access to electricity (in hours)	6.3 (3.3)	6.7 (5)***	4.9 (5.8)	5.3 (4.7)
Selling farm products (yes = 1)	0.69 (0.46)	0.85 (0.25)***	0.21 (0.41)	0.26 (0.20)**
Change in farm production as a result of climate change (−1;0;1)	0.31 (0.93)	0.56 (−0.42)***	−0.40 (0.83)	−0.17 (−0.45)***
Overall impact of climate change (−1; 0; 1)	0.05 (0.98)	0.28 (−0.64)***	−0.34 (0.88)	−0.08 (−0.40)***
Farm vulnerability to climate change (0;1;2)	0.88 (0.84)	0.69 (1.46)***	1.36 (0.61)	1.12 (1.41)***
Agricultural adaptation (yes = 1)	0.78 (0.42)	0.88 (0.47)***	0.85 (0.35)	0.82 (0.86)*
Ngo/government support (yes = 1)	0.39 (0.49)	0.36 (0.48)	0.18 (0.35)	0.23 (0.16)***
Nonfarm capital index	0.26 (0.33)	0.25 (0.29)	0.32 (0.38)	0.39 (0.30)***
District (Nili = 1)	0.29 (0.45)	0.13 (0.75)***	-	-
N (0/1)		239 (178/61)		1,502 (1,192/310)

***p-value < 0.01.
**p-value < 0.05.
Exposure 0 means no or low exposure to climate change related risk and Exposure 1 for high or very high risk. Table A1 provides a detailed description of the instruments.

and being engaged with their farms. Thus, a significant interaction between farmers' occupation-related events and their beliefs and attitudes appears likely.

Table 3 presents the regression estimation results. The ordered Probit estimations in Ia, Ib (experimental data), IIa, and IIb (survey data) suggest a significant association between farmers' risk-taking and their exposure to extreme weather events. In particular, the more exposed farmers are less risk-averse. Our evidence suggests that the farmers' risk preferences are strongly associated with their exposure to extreme events. Notably, farmers who have been facing the higher intensity of extreme events (such as drought) are less risk-averse. The observation holds true for both survey data as well as experimental evidence. To control for the effects of other factors, we run the ordered Probit regression of both risk preferences and risk perception for experimental and survey data, including personal, farm, community, and regional characteristics, including gender, experience (age), migration background, employment, religious belief, market engagement and regional differences. Note that in regressions Ib and IIb we control for all collected co-variates as well as the province fixed effects. The correlation between risk preferences in the experimental task and the survey measure remain robust and statistically significant and the 5% and 1% level respectively.

5.3 GPS coordinates and plausibility

In addition to the experimental risk-taking task decisions and co-variates, our research team also collected GPS coordinates for farmers who participated in this task. Using maps of the districts, we were able to compute the distance of each farm from the closest river or stream (in meters). A potential limitation of using the measure of self-reported exposure to climate change related extremes as our main variable of interest is its non-incentivized nature. In order to investigate the plausibility of this measure and other self-reported measures of farming risk, we use their pairwise correlations with the distance from the closest river. Figure 2 provides graphs for correlations of the distance from the closest

TABLE 3 Exposure to climate change-related extremes and farmers' risk preferences.

Independent variables	Experiment dependent variable: EG task risk decision		Survey dependent variable: risk-taking survey answer	
	Ia	Ib	IIa	IIb
Exposure to climate change-related extremes [(very) high = 1]	0.52*** (0.14)	0.59** (0.28)	0.21(0.065)***	0.236*** (0.065)
Gender (male = 1)		−1.0 (0.55)		−0.212 (0.193)
Farming experience (in years)		0.008 (0.009)		0.001 (0.002)
Farming primary source of income (=1)		0.12 (0.36)		0.139* (0.075)
Number of household members working on the farm		0.02 (0.08)		0.001 (0.008)
Hours with access to electricity (in 24 h)		0.02 (0.04)		−0.003 (0.005)
Further controls	No	Yes	No	Yes
District fixed effects	No	Yes	No	Yes
Observations	239	239	1,502	1,502

The table reports coefficient results from an ordered Probit model with robust standard errors.
***p-value < 0.01.
**p-value < 0.05.
In regressions Ib and IIb we control for all collected co-variates and province fixed effects.

river and a set of farm characteristics, namely % of farms using irrigation from a river (top left), % of farms reporting a risk of drought (top right), % of farms reporting exposure to climate change related extremes (bottom left) and risk-taking in the Eckel-Grossman task (bottom right), with all four correlations being statistically significant $p < 0.01$. This plausibility check shows that participating farmers took our questions seriously and that the self-reported measures appear meaningful. Given that the distance to the closest river is unlikely exogenous due to the immobility of farm(er)s in our study, we establish a relationship between the exposure to climate change-related extremes and greater risk-taking that is likely causal.

6 Discussion of possible mechanisms

Our findings, presented in the previous section, suggest that there is a significant association between farmers' risk preferences/perception and their exposure to climate-change-related extremes. Past studies indicate that exposure to extreme events (such as conflict) affect behavior (Voors et al., 2012; Callen et al., 2014; Page et al., 2014; Imas, 2016). Voors et al. (2012), for instance, show that more exposed (to violent conflict) individuals in Burundi are more risk-seeking, more impatient, and display more altruistic behavior toward their neighbors. They have used survey and experimental data to show the endogeneity of risk, time, and social preferences to the exposure to violent conflict. At a similar setting, we intend on exploring the association of exposure to extreme weather events and farmers' risk preferences. Following Voors et al. (2012), the endogeneity of risk preferences can explain our result.

If the observed association is not just a simple correlation (because of a common cause), each factor (risk preferences and exposure) can cause the other one. The first scenario is that the risk preferences have caused the farmers to choose their degree of exposure. Under this scenario, it is possible that more risk-averse farmers have chosen to live and work in the areas with lower risk of extreme events. Or, only more risk-seeking farmers in highly exposed areas have chosen to stay, and the rest have migrated to the big cities—due to a significant decrease in agriculture production in recent years, such internal migration has been happening. The design of our research addresses the first mechanism. Selective migration within the area is controlled for, as almost all of our subjects live and farm in the villages where they have been born and raised. For migration to the big cities, although we cannot directly control for such an effect, the fact that immigration to big cities, searching for new job opportunities, and setting a new life imply a high degree of uncertainty, the chance that very risk-averse farmers systematically would have chosen to move to the big cities is unlikely.

We regard it as the likely causal direction that exposure to extreme weather events affects risk preferences. In this setup, the change in risk preferences could be caused by continual exposure to extreme events. In this case, risk preferences are endogenous to exposure to extreme events. Psychological evidence suggests that individuals' preferences can undergo some form of adaptation (Dang, 2012). For example, Nguyen (2011) argues that risk preferences are shaped and adapted over time by the working environment. The longer one works in the same environment the more her/his reference of risk is adapted to it. The preference, in turn, plays a crucial role in determining how much risk one is willing to take. Adaptation seems to be a compelling explanation for the endogeneity of farmers' risk preferences to their exposure to climate change-related extremes. Farmers' long-term exposure to extreme events might have caused their preferences to adapt to a harsher and riskier environment. Specifically, the farmers—who repeatedly and for years have been making decisions in the face (relatively) higher average risk of extreme events—might have developed a higher tolerance for accepting risks.

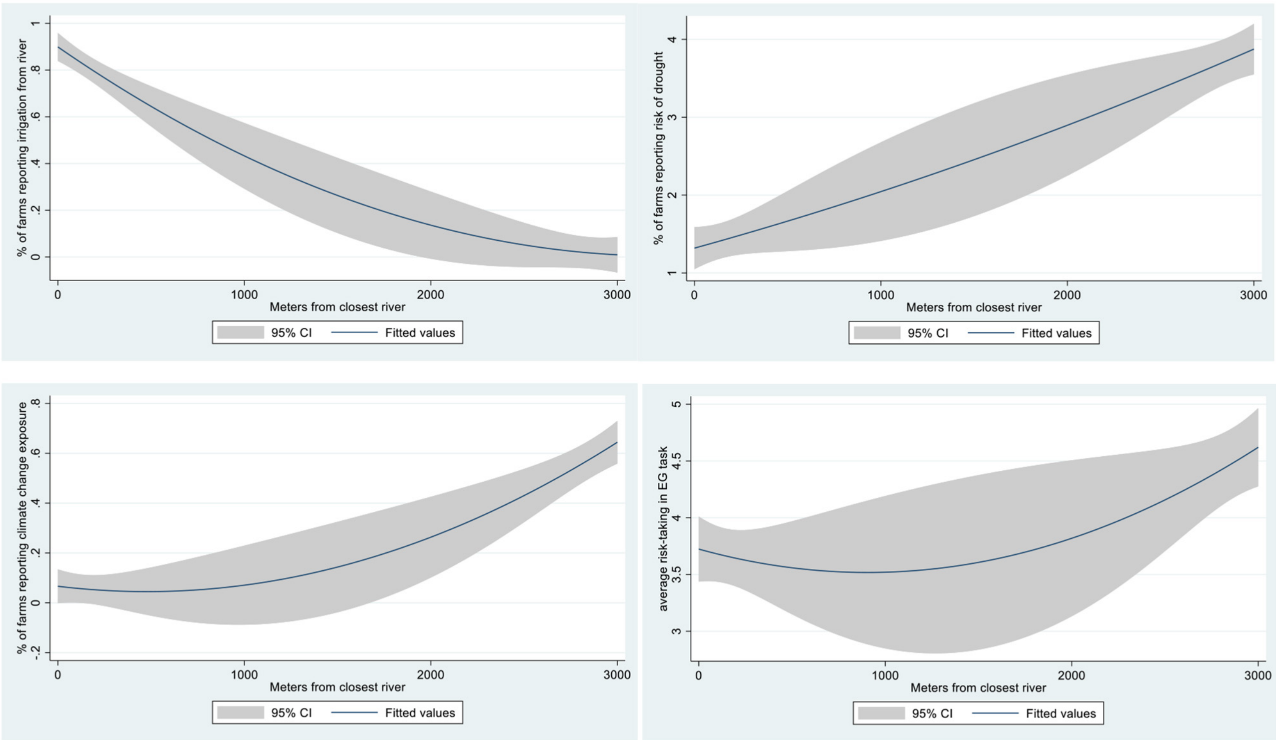

FIGURE 2
Correlations between the distance of the farm from the closest river (based in GPS coordinates) and farm characteristics.

A second possible explanation is the effect of background risk. In areas where the farmers are more exposed, background risk of this sort is higher, and one might expect to observe different risk-taking behavior than those living in less exposed areas (Cameron and Shah, 2015). Hanaoka et al. (2018), for instance, observe that people who are exposed to higher intensities of Japan's 2011 Earthquake become more risk tolerant. A key argument on the effect of background risk is that the people living in areas with high background risk are less concerned about additional small independent risk (Cameron and Shah, 2015).

It may be the case for the Afghan farmers in our study as well. If we consider the climate-change-related extremes as the background risk, it is evident that more exposed farmers are facing higher background risk. Farmers who live in areas with higher background risk may be less concerned about additional small independent risk. As a result, they might have systematically chosen riskier gambles in the Eckel-Grossman risk elicitation task.

The significant association between farmers' risk preferences and their exposure to extreme events might have several other explanations. The association might have resulted from a common cause (missing variable in our models). Factors such as violent conflict over land and water could have affected preferences and correlated to extreme weather events. Exposed farmers might have systematically been facing various shocks in the past which could have affected their risk preferences. While we regard our study as a worthwhile contribution to the literature, more research is necessary to investigate such potentially confounding factors.

Evidence from South and Southeast Asia aligns with our findings that higher hazard exposure can coincide with greater risk tolerance. For instance, studies on smallholders facing flood risk in Bangladesh report stronger stated willingness to adopt insurance or other risk-mitigation under salient exposure; work from Pakistan documents that perceived production risk shapes attitudes and input choices (Fahad et al., 2018; Hossain et al., 2022; Hossain, 2024, 2025). Our Afghan setting differs along state capacity and mobility, suggesting stronger adaptation of preferences where formal safety nets are thin.

7 Conclusion

We contribute to this literature by investigating the association of risk preferences to the long-term exposure to climate-change-related extremes. We investigate the problem among farmers in the Central Highlands of Afghanistan by pulling together a survey and experimental data. Our analyses suggest consistently that more exposed farmers (those who are living in high-risk areas) are less risk-averse. A primary explanation for our finding is the adaption of the risk preferences as a result of repeated and long-term exposure to the events that are relevant for farmers' income and employment.

Furthermore and in the light that risk-taking determines important household and individual decisions (such as investment, saving, and employment), our results have important policy implications for rural economic development. In particular, with climate change happening, adaptation has become a key policy issue. Since adaptation is primarily a decision under uncertainty, farmers' degree of risk tolerance plays a central role in exercising various adjustments (both physical and behavioral) in response to climate change. Hence, policy makers in adaptation sector shall consider the heterogeneity of farmers' risk preferences with respect to their exposure to extreme events. Such a consideration, for instance, would include the introduction of a new type of seed. Whether a farmer would use it highly depends on her or his degree of risk aversion.

Considering the cross-sectional nature of our data, we cannot establish a watertight causal relationship. Still, for our case of Afghan farmers, we regard selective migration and selective climate change adaptation as very unlike mechanisms. Likewise, the explanatory value of the GPS data on risk-taking provides us with further confidence in our findings. Hence, our study opens a new dimension in the literature of endogeneity of the risk preferences in the sense that behavior might be affected by long-term exposure to climate change. As the impacts of climate change become more distinct, we regard more research on the consequences of endogenously changing preferences on economic, social and migration choices and consequences as an important avenue for future research.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was not required for the studies involving humans because there was no ethical review board process established at the University of Kiel, Germany, at the time this study was conducted. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and institutional requirements because there was no written consent, because many participants were not fully literate. Still, participation was absolutely voluntary.

Author contributions

AJ: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing. MK: Conceptualization, Methodology, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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