Referee report on "Why not borrow, invest, and escape poverty?" by D. Katreniak,A. Khazanov, O. Moav, Z. Neeman, and H. Zoabi

Summary

This paper proposes a theoretical model where an agent's investment increases the probability of success in a two-outcome environment and shows that with CARA utility, expected utility is U-shaped in the agent's investment and to the extent there is a safe option that gives expected utility as a horizontal line, this creates a threshold for the investment level such that the agent's expected utility is decreasing in the investment level for lower values of investment than the threshold, and increasing for higher values. It then shows that there is a threshold level of risk-aversion, such that if agents are more risk-averse than this threshold value, they do not invest but otherwise they invest at the maximum possible level. The paper then develops an alternative model where agents invest in the project's return upon success rather than the probability of success and show that the agent's choice of investment is still decreasing in the degree of risk-aversion but unlike in the probability model it is continuous in the level of risk aversion. They show that if given a choice between a probability model or a reward model such that expected mean returns and the downside returns are the same but one has lower probability of success but higher return upon success than the other, it will be less preferred by a risk-averse agent for standard reasons of second-order stochastic dominance.

In the online experiment, the paper presents results that elicit the risk-preferences of the subjects, and then offered them several incentivized decisions relating to the games outlined in the two theoretical models above (referred to as the "probability game" and the "reward game"), and some variations thereof (referred to as the ste-by-step game). The main results are, in the probability game the investment decisions have a bimodal distribution, while in the reward game, they have a unimodal distribution in line with the theoretical predictions. Moreover, the evidence suggests that risk-averse individuals from wealthier backgrounds tend to invest the maximum amount in the probability game while in the reward game they tend to invest some interior positive amount. Risk-neutral or risk-loving agents behave similarly in the probability and reward games.

Comments

I will first comment about the theoretical model and the empirical results (section A):

A.

A1. The proof of Proposition 1 seems incomplete. What we have is that if $U(p)$ is increasing in p for some p it is increasing for all higher values of p. It does not follow that the expected utility with a CARA utility function has a U-shape. For that we need to know what happens for low values of p and show that $U(p)$ is decreasing for some interval $[0, \hat{p}]$.

A2. Given that the cost of investment is αp in the probability game, it is not justified why the expected payoff

$$U(p) = -pe^{\lambda(H-\alpha p)} - (1-p)\, e^{\lambda(L-\alpha p)}$$

and not

$$-pe^{\lambda H} - (1-p)\, e^{\lambda L} - c(\alpha p)$$

which would be the more standard formulation as the costs are made up-front and there is no uncertainty about that. I realize that a linear cost function αp would make the problem linear in p but that can be easily fixed by allowing a convex cost function (e.g., $\frac{1}{2}\alpha p^2$), or having a linear cost function but making the probability of success a concave function (e.g., $\sqrt{p}$). The formulation the authors take does seem to matter for the corner solution property that they highlight. However, even if p will now have an interior solution for all agents, if there is a certain option that would be a horizontal line (say, earning a wage) that can be compared with $U(p)$ that does not have a U-shape with respect to p and it would still mean that more risk-averse agents would not invest at all as the $U(p)$ curve will lie below the horizontal line. Is there something in the environments that the authors want to apply their model to that justifies taking the certain cost of upfront investment out of the uncertain rewards subsequent to the investment?

A3. What kind of applications correspond to the reward game? If microfinance is the leading motivating example, what kind of loans allow agents to boost their high-state payoffs conditional on the outcome of a risky project?

A4. Proposition 4 follows from the definition of second-order stochastic dominance and does not merit the status of a Proposition.

A5. There are theoretical models in the development context that deal with risk aversion and no fixed-costs that are similar to the ones the paper considers. See for example, Mookherjee, 1997, Review of Development Economics. Even though cast in terms of a moral hazard problem with effort choice, if we reinterpret effort as investment, the structures are similar and the results seem to go in the other direction, namely, optimal effort levels (here, amount of investment) are initially constant, subsequently increasing and eventually decreasing in wealth (with wealth being inversely related to risk-aversion). Is the separable cost function responsible for the difference, as conjectured in comment A2 earlier?

Now I turn to how the authors interpret the results, and describe the contribution to and relationship with existing literature and the facts that motivate the paper (section B).

B.

B1. The empirical results are indeed consistent with the theroetical predictions and they are interesting. I think this is the most interesting and useful contribution of the paper. Could they also be consistent with the variation of the theoretical model outlined in A1?

B2. To truly counter the hypothesis that fixed costs are not important in many contexts but risk-preferences are for the investment decision of the poor, would not another experiment that tested for the former more directly be more convincing? Suppose people are told that a fixed amount x that is invested (say buying a coffee machine) has some stochastic return (setting up a coffee stall on the sidewalk) along the lines of the current experiment, but then people are given a direct transfer in a randomized way that fall short of x. Then we would expect those who are wealthier in the treatment group to be able to carry out the investments.

Finally I turn to the paper's relation to the existing literature and the stylized facts that are presented to motivate the analysis (section C).

C

C1. It is not the case, as the authors claim, that the literature has ignored the role of risk-aversion in studying the economic decisions of the poor, focusing instead only on fixed-costs or non-convexities. It is well-known empirically that risk-aversion causes the poor to underinvest (see, for example, Rosenzweig and Binswanger, 1993, Economic Journal). Even in the theoretical litereature, it is well-understood that without any non-convexities, strong income effects that work through risk-aversion or discounting of the future or how much people save or bequeth may cause poverty traps. The work of one of the authors of this paper (Moav, 2002, Economics Letters) is indeed an example of this, but even review papers like Azariadis, 1996, Journal of Economic Growth, and Ghatak, 2015, World Bank Economic Review discuss this.

C2. As to why microfinance did not succeed, the explanation the authors advance may well be valid but there are others that also hold, including those that focus on lumpiness of investments and the fact that the microfinance loans are too small in size. One paper that is particularly relevant here is by Banerjee, Breza, Duflo, and Kinnan, 2019, NBER Working Paper 26346) which shows that those loan-recipients that already had a business managed to improve their incomes siginficantly and permanently even though the average treatment effects showed insufficient gains.