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Do lottery payments induce savings behavior? Evidence from the lab☆

Emel Filiz-Ozbay [a], Jonathan Guryan [b,c,*], Kyle Hyndman [d], Melissa Kearney [a,c], Erkut Y. Ozbay [a]

[a] Department of Economics, University of Maryland, United States
[b] Institute for Policy Research, Northwestern University, United States
[c] NBER, United States
[d] Naveen Jindal School of Management, University of Texas at Dallas, United States

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ABSTRACT

This paper presents the results of a laboratory experiment designed to investigate whether the option of a Prize Linked Savings (PLS) product alters the likelihood that subjects choose to delay payment. By comparing PLS and standard savings products in a controlled way, we find strong evidence that a PLS payment option leads to greater rates of payment deferral than does a straightforward interest payment option of the same expected value. The appeal of the PLS option is strongest among men and self-reported lottery players. We use the results of our experiment to structurally estimate the parameters of the decision problem governing time preference, risk aversion, and probability weighting. We employ the parameter estimates in a series of policy simulations that compare the relative effectiveness of PLS products as compared to standard savings products.

1. Introduction

There is now widespread recognition that individual decision-making with regard to savings behavior often deviates from the standard neoclassical model of a risk-averse consumer making decisions according to the tenets of expected utility theory.[1] In recent years, many policies have been suggested or implemented that make use of observed deviations from the standard neoclassical model to "nudge" consumers towards increased savings.[2] Notable examples include changes in default 401(k) settings such that employees are automatically enrolled in savings plans (cf, Madrian and Shea, 2001) and the "Save More Tomorrow" (SMarT) plan that has workers pre-commit to setting aside future wage increases in a savings account (Thaler and Benartzi, 2004). Chetty et al. (2012) present evidence that the impact of targeted savings policies is larger if they affect passive choice versus active choice. The policy interest in this question is largely driven by the observation that many low- and moderate-income households do not have adequate savings. For example, Lusardi et al. (2011) find that nearly half of Americans would potentially have trouble coming up with $2000 in 30 days. There is increasingly a recognition that current savings products do not appeal to many low- to moderate-income consumers, generating an interest in innovation in the savings product space.

Prize Linked Savings (PLS) accounts constitute an alternative policy innovation in the domain of savings behavior. The concept of a Prize Linked Savings account is to add a stochastic element to an otherwise standard account, such that depositors periodically receive a chance to win a specified (and potentially large) prize that is a function of deposit amounts. PLS products are new to the United States, but have existed in some form around the world for hundreds of years. Currently the policy

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* Corresponding author at: Institute for Policy Research, Northwestern University, 2040 Sheridan Road, Evanston, IL 60208, United States. Phone: +1847 467 7144.
E-mail address: j-guryan@northwestern.edu (J. Guryan).

[1] The descriptive validity of expected utility theory has been challenged by a large body of experimental literature (e.g. Starmer, 2000 for a review).

[2] The use of this term in this context is due to Thaler and Sunstein (2008).

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movement on PLS is ahead of the research, moving under the assumption that the addition of lottery-like features to otherwise standard savings products will induce individuals to save more. In 2009 a set of credit unions in the state of Michigan introduced the "Save to Win" PLS program, in conjunction with D2D Fund, a policy group focused on savings innovations for lower-income consumers. This program is considered a great success because it has successfully attracted deposits. Driven by this observation, in 2013, the states of North Carolina and Washington adopted the Save to Win program. Legislative efforts in additional states and recently the federal government would expand the reach of PLS products in the United States. In December 2014, the U.S. Senate unanimously passed the American Savings Promotion Act (HR 3374), following passage in the House in September. The legislation removes legal impediments that currently prevent federally chartered banks and thrift institutions from offering "prize-linked savings" accounts (PLS).

But, crucially, there has yet to be research establishing that these products induce additional savings, as compared to a more standard savings account or product offering comparable expected returns. Attempts at running PLS field experiments with credit unions have not been successful, and so in this paper we turn to the experimental laboratory to generate evidence on this important question.

The idea behind PLS products is to leverage the appeal of gambling to entice people to invest in savings products that offer a positive expected return.[3] The stochastic return could be in addition to some guaranteed interest payment or it could constitute the entire return. A PLS product is unlike a traditional lottery ticket in that the principal is returned to the investor. The random component of the return on savings can take the form of in-kind prizes – as is commonly offered by commercial banks in Latin America – or as a cash prize awarded to account holders as a part of a semi-regular drawing — as is the case with Britain's Premium Bonds. Prize Linked Savings accounts are presumed to appeal to individuals' appetite for lottery-like products, either because of risk-loving preferences or probability weighting in the decision function that leads individuals to overweight the likelihood of a gain.[4] Alternatively, a preference for skewness (Mitton and Vorkink, 2007) or an entertainment value of gambling (Conlisk, 1993) might increase the appeal of the PLS.

In this paper we describe the results of a laboratory experiment designed to investigate whether the option of a PLS-type product alters the likelihood that subjects choose to save (i.e., delay payment). We also use the observed choice behavior to jointly estimate risk, discount, and probability weighting parameters under certain modeling assumptions. The popularity of PLS products in the settings in which they have been offered is often cited by policy advocates as evidence that they would be effective at encouraging savings. By comparing PLS and standard savings products in a controlled way, we are able to test whether the offer of PLS generates more savings behavior than otherwise equivalent non-PLS savings products.

The first main contribution of this paper is to determine whether the offer of a PLS type product increases the rate at which subjects choose to defer payment (which we take as indicative of savings behavior) as compared to the offer of a guaranteed interest payment. We establish this in a laboratory experiment run on 96 students in the University of Maryland Experimental Economics Laboratory during March 2012. We followed the well-established practice of using binary choices to elicit preferences paired with probabilistically determined payments. We find strong evidence that a lottery-like payout leads to greater rates of payment deferral as compared to a straightforward interest payment of the same expected value. In other words, subjects make choices such that they appear to be more patient when the option paid later is a risky gamble than when it is a sure thing.[5] The appeal of the PLS product appears to be greatest among men, self-reported lottery players, and, although the effect is somewhat weaker, those who report relatively low amounts in their existing bank accounts. Our experiment establishes that subjects defer payment for a stochastic return even if they find an equivalent certain payment too low to invest. Our paper is the first one making this foundational point based on controlled binary choice problems while jointly estimating parameters of a general model.

A few other papers have also considered the interaction between time and risk preferences. The most closely related is Atalay et al. (2014) who also describe the results of a portfolio-choice experiment designed to investigate the appeal of a PLS product over interest-only savings as well as lottery tickets. They show that the offer of PLS increases savings and reduces lottery expenditures.[6] Two other papers — Keren and Roelofsma (1995) and Ahlbrecht and Weber (1997a) — report similar results to us in that making the delayed payment risky appears to make subjects more patient, while Anderson and Stafford (2009) reports results suggesting that adding risk induces subjects to prefer the early payment.[7]

The second main contribution of this paper is to use the observations from our experiment to jointly estimate decision-problem parameters under well-specified modeling assumptions. Specifically, we assume that decision makers have a CRRA utility function and weight probabilities according to a Prelec (1998) probability weighting function.[8] As first pointed out by Yaari (1987), in models with probability weighting, one's risk attitude cannot be solely described by the curvature of the utility function, but rather, the shape of the utility function together with probability weighting jointly determine the risk attitude of a decision maker. In addition, Andersen et al. (2008) have demonstrated the importance of joint elicitation of risk and time preferences. Building on these insights, we designed our experiment to facilitate the joint elicitation and estimation of the various decision problem parameters. We adopt the theoretical framework and structural maximum likelihood methods of Andersen et al. (2008) to estimate jointly the consumer's discount factor, CRRA weighting parameter, and the Prelec probability weighting parameter.[9] Our framework does not presume or test for an

[3] Kearney et al. (2010) provide an overview of prize-linked savings (PLS) products, including discussions of the history of such products, potential legal barriers, and descriptive evidence from some recent product roll outs in the United States.

[4] Nonlinear probability weighting has been put forth as an explanation for several behavioral phenomena. For example, Barberis and Huang (2008) show that such biased decision makers have a preference for skewness of returns in stocks. Sydnor (2010) argues that the over-weighting of small probabilities of a loss explains the fact that decision makers over-insure their homes against modest-scale risks. Similarly, Barseghyan et al. (2013) argue that probability distortions (i.e., overweighting of claim probabilities) play a key role in determining households' deductible choices and lead them to risk-averse behavior. Snowberg and Wolfers (2010) argue that probability misperceptions can explain the so-called "favorite-long shot bias" in pari-mutuel markets, although Ottaviani and Sørensen (2009; 2010) provide game theoretical models which are also capable of explaining this behavioral finding. Finally, Hu and Scott (2007) argue that longevity annuities may be more attractive to consumers than immediate annuities because they overweight the small probability of living long enough to receive a large payment.

[5] See Epper and Fehr-Duda (2013) for a summary of evidence of such behavior in the literature, and a model unifying time discounting and risk taking by allowing for interactions between these two concepts.

[6] Although interesting and closely related, there are a number of important distinctions. Their design differs from ours in that they do not always fix the expected return of the PLS product to be the same as the interest-only option. They also do more to explain to subjects that the PLS product is essentially a lottery, which raises concerns about priming. Additionally, they offer subjects a choice between a PLS product and a lottery ticket, but by design, their PLS option second order stochastically dominates the lottery.

[7] However, in this study there is a confound in the experimental design between the presence of downside risk and the timing of payments, which casts doubt on their interpretation. Specifically, the only question in their experiment in which subjects frequently chose the early payment was for questions of the form: $20 now versus $28 or $16 with equal probability later. Therefore, it is unclear whether the effect is driven by the presence of risk alone or by the fact that it is possible to earn less money than by taking the safe, early payment. In any case, our experiment does not include downside risk, so our results are not necessarily in contradiction to Anderson and Stafford (2009).

[8] Lichtenstein et al. (1978) were the first to show that subjects tend to over-estimate rare events. Following the cumulative prospect theory of Tversky and Kahneman (1992), many studies, including Gonzalez and Wu (1999), Abdellaoui (2000) and Bruhin et al. (2010) have found strong experimental support for an inverse *S*-shaped probability weighting function. Unlike our setting, these papers only consider choices over lotteries at a fixed point in time.

[9] Stott (2006) finds that among 256 models, Prelec's one-parameter weighting function is preferable to its two-parameter version and to other non-parametric models when combined with a CRRA utility function.