How Large is the Endowment Effect in the Risky Investment Game?

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Endowment Effects: Fact or Fiction?

1. Richard Thaler(1981) introduced the “Endowment effect” concept and associated it with loss aversion and prospect theory
2. Associated with commodity ownership, "Exchange asymmetries", and the "WTA-WTP gap",
3. Explanations? Loss aversion, status quo bias, default effects, changing reference points, psychological transaction costs
4. Our experiment is based on the one-shot version of the risky investment game of Gneezy and Potters (1997, first used by Gneezy et al. (2009).
5. In this game the respondents are free to invest all, some or nothing of an initial monetary endowment that they are allocated where they have 50% chance of winning the tripled amount of their investment or nothing

Are there Endowment Effects for Safe and Risky Money?

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2. They demonstrate this by comparing investment levels when the respondents are endowed with safe and risky initial monetary endowments

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In this paper we build on Holden and Tilahun (2021) and investigate the relative size of the endowment e ects associated with safe and risky initial monetary endowments.

RQ1. Are the endowment e ects of similar size for risky and sure monetary endowments? Or, is the endowment e ect stronger for safe than for risky money?

RQ2. How can we explain the dominance of interior choices in the risky investment game?

For RQ1 we need to establish a benchmark treatment that does not invoke any endowment e ects. We introduce a new treatment to do this. This is the rst contribution of this paper.

Prospect Theory predicts that respondents should invest all or nothing in the game but in reality interior choices dominate. Our second contribution is to provide an alternative theoretical model to explain this empirical regularity.

- Respondents are given an initial endowment X
- They can invest a share $0 \le x/X \le 1$
- They have 50-50 chance of winning $3x$ or 0
- The payouts will be:
- The lucky winner: $X - x + 3x = X + 2x$
- The loser: $X - x$

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Does the initial endowment initiate an endowment e ect that reduces investment in the game?

- The game does not distinguish risk-lovers, risk-neutral and slightly risk averse respondents
- A linear utility function implies a corner solution in the game - all or nothing investments, with loss aversion > 2 explaining no investment.
- Interior choices in the game point towards non-linear utility functions that also are concave in the loss domain (contradicts Prospect Theory which assumes convex or linear value function in the loss domain)

Most studies in developing countries use small samples but

Dasgupta et al. (2019) applied the game to a large student sample in India (2000 students) and found interior choices to dominate (above 90%)

Gong and Yang (2012) used the one-shot game to study one matrilineal and one patrilineal society in China with a small sample (N=132). Most females invested nothing in the patrilineal society. 10-30% of the males invested the whole amount and 15-20% invested nothing.

Charness and Viceisza (2016) compare three risk elicitation methods in rural Senegal (small sample, N=46 for the risky investment game). Interior choices dominate.

Respondents are endowed with the 50-50 lottery of winning $3X$ or 0

They can sell a share $0 \; y = 3X \; 1$ back to the researcher

The researcher pays $y = 3$ for the lottery amount sold

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- The loser retains $y/3$

- Holden and Tilahun (2021) (HT21) showed that treatment T2 resulted in a substantially higher average investment level than treatment T1. A risky endowment enhances investment in the game but to what extent is this due to an endowment effect for the risky prospect?
- HT21 also found that a larger share of the respondents ($\approx$ 37%) invest the full amount in treatment T2 than in treatment T1 (10%) - and 58% in T2 and 90% in T1 preferred interior choices

- Respondents are given a sequence of binary choices starting with the choice between an initial 50-50 lottery endowment X 3 or 0 and X with certainty
- They are not allocated any amount till after the completion of all the binary choices, thereby preventing endowment e ects
- Depending on their choice above, they are given a new binary choice between the preferred choice above and $X=2$ with certainty and 50-50 lottery of getting $3X=2$ or 0
- Depending on the choice, further binary choice options are provided to zoom in on the preferred combination of lottery investment and sure amount
- The exchange price between lottery and sure amounts is the same as in Treatments T1 and T2

The AEET models allow for probability weighting like in prospect theory and rank-dependent utility theory. Unlike in prospect theory, the AEET models retain the concave utility in the loss domain.

$$\max AEET1(T1) = \quad {}_s[(u^s(30) \quad u^s(30 \quad x)]+[1 \quad w^+(0:5)]u^r(30 \quad x) + w^+(0:5)u^r(30+2x) \quad (1)$$

a $_s$ utility weight associated with the safe endowment reduction. The sophisticated subjects maximize the following problem for T2:

$$\max AEET1(T2) = \quad {}_r w^+(0:5)[u^r(90) \quad u^r(90 \quad y)] + w^+(0:5)u^r(90 \quad 2y{=}3) + [1 \quad w^+(0:5)]u^s(y{=}3) \quad (2)$$

Giving up safe amounts (T1) can invoke a stronger endowment e ect than giving up risky (lottery) amounts (T2), i.e. $_s \quad _r \quad 0$. We test this.

- Part of a study of rural youth business groups in Ethiopia
- Respondents are resource-poor rural youth with limited education (median=6 years completed education)
- They have been provided an opportunity to establish a joint business by being provided a communal land area
- Establish themselves as primary cooperatives with a board of ve members and their own bylaw
- Average group size: 20, about 1/3 are females
- Develop a business plan that has to be accepted by the local authorities
- Subject to auditing

- Treatment T1 was used in a baseline survey in 2016 for a sample of 1138 business group members in 119 groups in five districts in Tigray region of Ethiopia
- The initial endowment was 30 ETB and was equivalent to a daily wage rate in these rural areas
- The amount was split in two 10 ETB and two 5 ETB notes
- Allowing investment levels of $0; 5; 10; 15; 20; 25$ and 30 ETB
- This allowed us to avoid the use of coins in the experiment

- Treatments T2 and T3 were implemented as a pilot study in one district in January 2019
- Treatments T2 and T3 were randomly allocated to groups within the pilot district
- Member samples: Treatment T2: N=243, Treatment T3: N=304
- This sample to a large extent overlapped with the 2016 sample in this district

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Based on the results in the pilot, treatment T3 was scaled up to a much larger sample covering four districts (Full sample: N=2184)

This implies a mix between a within-subject design with time delay confounded with treatment T1 versus treatments T2 and T3 and a between-subject design

- We use the share invested from the maximum safe amount as dependent variable: $r = \frac{x}{X}$ and $0 \leq r \leq 1$:
- We used Wilcoxon rank sum tests, also called Mann-Whitney tests to compare the distributions of this risk-share (r) variable across treatments
- We also assessed the shares of the samples for each treatment with $r = 1$.
- We used Chi-square tests to compare the frequency of full investments across the treatment samples.

$$r_{gi} = r_1 + \quad {}_2 T1_g + \quad {}_3 T2_g + \quad {}_{4d} D_d + \quad {}_{5e} E_d + \quad {}_{gs} s_{gi} + g_g + \quad {}_{gi} \qquad (3)$$

where subscript g represents group, subscript i represents individual,
r_1 represents the estimated share invested in the baseline treatment (T3),
${}_2$ captures the treatment e ect for treatment T1 as the mark-up share invested in the risky lottery,
${}_3$ represents the treatment e ect for treatment T2 as the mark-up share invested in the risky lottery,
D_d represents a vector of district dummy variables,
E_d represents a vector of enumerator dummy variables,
s_{gi} represents a set of individual characteristics (sex, age, birth rank, education),
g_g represents group random e ects, and ${}_{gi}$ the error term.

A parsimonious model that only included the treatment dummies and the district and enumerator xed e ects on the full sample

A full sample model with additional individual controls,

A model for the sample using the same enumerators in 2016 and 2019, with additional controls

A model for the pilot district combining 2016 and 2019 data with group random e ects

As 4) but with group xed e ects

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Treatment	Variable	Mean	St.err.
T1	Average share invested	0.443	0.007
Safe Base	Share invest Full amount	0.101	0.009
T2	Average share invested	0.691	0.021
Full Risk	Share invest Full amount	0.374	0.031
T3	Average share invested	0.565	0.007
Binary	Share invest Full amount	0.208	0.009

	Full sample	
	z-score	P-value
T1 vs. T2	-10.965	0.0000
T2 vs. T3	5.744	0.0000
T1 vs. T3	-10.487	0.0000
	Pilot district sample	
T1 vs. T2	-9.078	0.0000
T2 vs. T3	2.770	0.0056
T1 vs. T3	-6.448	0.0000

VARIABLES	Full sample	Full sample	Same enumerators
T1.treatment	-0.096***	-0.101***	-0.111***
	(0.017)	(0.018)	(0.019)
T2.treatment	0.110***	0.110***	0.050
	(0.027)	(0.025)	(0.039)
Male		0.046***	0.054***
		(0.012)	(0.018)
Age of member		-0.000	-0.002**
		(0.001)	(0.001)
Birth rank		0.005**	0.005
		(0.002)	(0.004)
Education, years		0.006***	0.002
		(0.001)	(0.002)
Constant	0.472***	0.415***	0.507***
	(0.021)	(0.033)	(0.047)
Observations	3,565	3,565	1,487
Number of youth groups	308	308	305

All models with district FE, enumerator FE and group RE

VARIABLES	(1)	(2)	(3)
Panel controls	Group RE	Group FE	Individual FE
T1.treatment	-0.105***	-0.102***	-0.114*
	(0.033)	(0.034)	(0.064)
T2.treatment	0.081***	0.095**	0.060
	(0.029)	(0.047)	(0.049)
Constant	0.533***	0.532***	0.550***
	(0.045)	(0.043)	(0.064)
Observations	822	822	822
R-squared		0.141	0.292
Number of groups	53	53	53
Number of individuals			593

Cluster robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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It is common in many types of games (e.g. trust games, dictator games, public goods games) to provide an initial monetary endowment without this being associated with a potential endowment e ect, only a wealth e ect: This may imply that there are endowment e ects in such games but more research is needed to assess the external validity of our nding to other contexts and other types of games

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Predictions based on Alternative Theory model

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- A CRRA utility function with no asset integration
- Limited or no asset integration and very concave utility (high risk aversion) is needed as a sole explanation for the observed pattern if loss aversion does not play a role
- A moderately concave utility function, no or limited asset integration and weak loss aversion may be a more plausible explanation for the observed investment patterns

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- A moderately concave utility function, no or limited asset integration and weak loss aversion may be a more plausible explanation for the observed investment patterns
- A moderate utility cost for safe and risky amounts "given up" is sufficient to explain the treatment effects and dominance of interior choices (${}_s = {}_r = 0{:}1$), (Figure with alternative CRRA-r values)

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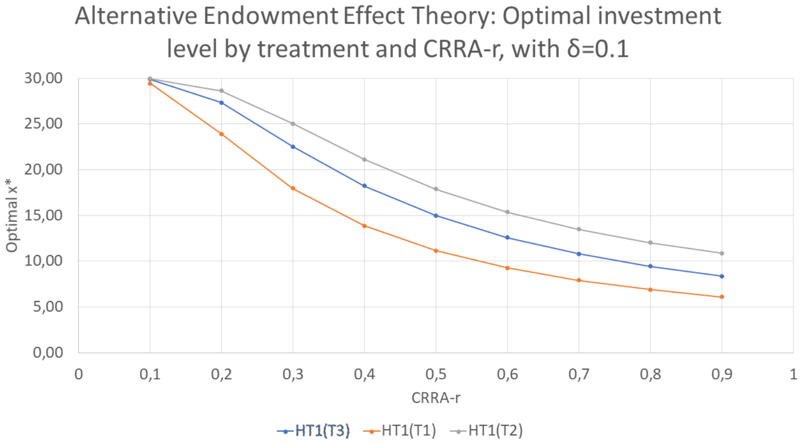

Conclusions

- We find evidence of **strong endowment e ects for monetary endowments both for safe and risky initial amounts provided in the game**
- We also found that interior choices dominated in all three treatments in the game while Prospect Theory, based on the diminishing sensitivity around the reference point assumption, predicts "all or nothing" choices in the game
- We have proposed an alternative theory with concave utility and reference point dependence that better predicts the observed pattern in the game
- We recommend more research on endowment effects associated with monetary endowments provided in experiments as such endowment/starting point effects can bias estimated preference parameters