

# Poverty, Risk Behaviour and Time Preferences of Smallholder Farmers: Experimental Evidence from Ethiopia

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# Introduction

- A multitude of factors contribute to the ongoing existence of poverty particularly in the developing world:
  - Physical geography,
  - Lack of government investment in public goods and services,
  - Governance failures,
  - Political conflicts and
  - Cultural barriers (Sachs, 2005)
- Fundamentally, the ongoing existence of poverty has been attributed to the idea that the poor remain poor because attempts to escape poverty are hindered by the fact that they are poor (World Bank, 2000; Mosley and Verschoor, 2005)
- This argument is often referred to as the 'vicious circle of poverty'

- This paper investigates the correlation between poverty and individual preferences for time and risk.
- This relationship is important in understanding the 'vicious circle' because two key elements in many versions of this 'vicious circle' are that those living in poverty have both high levels of risk aversion and high rates of impatience (Fisher, 1930; Lipton, 1968; Lumley, 1997; Fafchamps, 2003).
- Time preferences, or the propensity to prefer current consumption to that in the future, is known to present an important aspect of economic behaviour, especially under conditions of risk.
- In emerging economies, this propensity is associated with the poverty cycle: risk-averse and poor farmers are usually reluctant to invest in new technologies, setting in motion various mechanisms (including a lack of savings), which contribute to poverty.

- Decision makers with different risk and time preferences will respond differently to similar economic stimuli.
- Poverty motivates farmers to prioritize on short-term planning horizons in which they exploit resources for immediate uses regardless of the long-run consequences.
- When people live for a day-to-day activity, survival, rather than long-term wealth maximization, is considered as the main goal by decision makers.
- The precise relationship and the direction of causality between poverty, risk behaviour and time preferences is yet to be investigated.
- Are farmers risk averse and time impatient because they are poor or are they inhibited from escaping poverty because they are risk averse and impatient?
- The manner in which individuals discount the future and make decisions that involve risks are important for understanding behaviour in developing countries.

- Economists have been examining the correlation between poverty, risk and time preferences.
- However, empirical evidence on whether individual time and risk preferences vary with wealth has been inconclusive (Binswanger 1980; Pender 1996; Cardenas and Carpenter 2008).
- Binswanger (1980) found no statistically significant correlation between wealth and risk aversion.
- Similar to Binswanger, Mosley and Verschoor (2005) and Liu (2008) found no significant correlation between wealth and risk aversion.
- Yesuf and Bluffstone (2009) found a significant positive relationship between income and risk aversion.
- Neilson (2001) and Wik (2004) found a significant negative relationship between income and risk aversion.
- Over the last three decades, researchers have also endeavored to measure time preferences by estimating a discount rate.

- Some discount rates have been derived from “real-world” behaviors while others have been derived from experimental elicitation procedures.
- Some questions were hypothetical, while others involved real monetary rewards.
- As with the relationship between risk preferences and poverty, empirical finding related to the relationship between time preferences and poverty have also been mixed.
- Most studies use exponential discounting, however such model often does not fit experimental and field data well (Frederick et al., 2002)
- Pender (1996) found weak evidence in India that wealthier respondents had lower discount rates
- Neilsen (2001) in Madagascar and Yesuf and Bluffstone (2008) and Holden, Shiferaw, and Wik (1998) in Ethiopia both found that wealthier households had significantly lower discount rates, indicating that the poorer a household is, the more impatient they are.

- However, Bauer, Chytilová, and Morduch (2010) and Kirby et al. (2002) found that wealth was not correlated with the discount rate.
- There are also some studies that showed the effect of risk preferences and poverty on time preferences.
- Holden *et al.* (1998) found a negative correlation between risk-aversion and time preference implying that high risk-averse farmers have low rates of time preference.
- Yesuf and Bluffstone (2008) reported a positive association between risk-aversion and discount rate suggesting that more risk-averse farmers have high time preference rates.
- However, most of these studies considered risk-aversion and household wealth or income (as proxy variable for poverty) as purely exogenous variables in their model that might have endogeneity problem and hence parameter estimates may be inconsistent.

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- Risk behaviour and time preferences must be approached as interdependent variables: risk-aversion, in particular, may be considered as a useful predictor of time preference rates and vice-versa.
  - On the other hand, lower time preference rates stimulate wealth creation which can further lower time preference rates and increase wealth.
  - This paper examines the relation between risk behaviour and time preferences of smallholder farmers in rural Ethiopia, as well as their association with household income.

# Research Questions

- How do wealth indicator variables affect farmers risk behaviour and time preferences?
- Is there any significant interdependence between farmers time preferences and risk behaviour?
- How far individuals rate of time preference and market rate of interest are comparable?
- What is the direction of causality between poverty, risk behaviour, and time preference rates?

# Materials and Methods

- To examine the above research questions, we used a data collected from 420 randomly selected sample households in eastern Ethiopia, Haramaya District.
- Data collected from two methods were employed to analyse such relationships between risk and time preferences, and poverty.
- Risk and time preference data were collected using experimental games with real payoffs and hypothetical setup, respectively.
- We designed the experiment for time preferences to test for the presence of the two most common anomalies of discounted utility theory: magnitude and time frame effects.
- The first two sets of the experiment (experiment one and two) were designed to have the same reward but different time periods representing relatively shorter time frame(3 to 6 months)
- The other two sets of the experiment (experiment three and four) were designed to have the same reward with different time periods (6 to 12 months) representing relatively longer time frame.

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- Data on other household characteristics were collected using survey method (structured questionnaire)
  - The risk and time preference data collected from experimental games were used as dependent variables in an econometric regression model.
  - More than one dependent variables were used to establish such relations between risk, time preference and poverty.
  - Household income is another dependent variable used in the model as a proxy variable for poverty.
  - Three-stage least square regression model was employed to establish such relations and identify important covariates affecting these variables.

# Result and Discussion

- **Risk Experiment**

- Table 1: Percentage Distribution of Respondents Risk Preference

Risk-aversion category	Percentage
Extreme	18
Severe	16
Intermediate	13
Moderate	14
Slight to neutral	17
Neutral to risk-seeking	22

- A significant proportion of respondents falls within the first three categories of risk-aversion(extreme, severe, and intermediate) implying that close to half of the sampled farmers are risk-averse.

- Comparing the distribution of risk preferences in the study area to other similar studies in developing countries;
- Binswanger (1980) found that the proportion of respondents in the intermediate and moderate risk category amounts to 83% in India
- Wik and Holden (1998) found that 52% of Zambian farmers fall in these risk categories.
- However, Yesuf and Bluffstone (2009) reported that 27% of the respondents chose these categories in Northern Ethiopia.
- Farmers in Ethiopia are more risk-averse than those in India and Zambia, and possibly perhaps also elsewhere
- The high risk-aversion behaviour may reduce farmers innovativeness behaviour that may, in-turn, reduce their investment decisions.

- **Time Preference Experiments**

- Table 2: Percentage Distribution of Respondent Choices by Experimental Set

Experimental set	Reference time=Current			Mean	Median	SD
	Right Censored	Interval	Left Censored			
Set 1	70.48	20.95	8.57	160.58	169	25.33
Set 2	84.53	11.9	3.57	83.87	85	7.26
Set 3	70.95	24.05	5	79.5	88	18.45
Set 4	83.33	13.81	2.86	43	44	5.24

- The majority of sample respondents chose the current reward followed by the interval and future rewards, respectively.
- The supremacy of current reward over that of the future reward is an indication that households have high subjective discount rates.
- The mean and median discount rates are comparable in all experimental sets and are greater than the market interest rate.
- High time preference rates may reduce farmers innovativeness behaviour and hence influence farmers wealth creation process in the long-run.
- The above table shows the existence of both time frame and magnitude effects in the sample respondents' choices.
- The percentage of respondents who preferred current rewards increases from about 70 percent in the shorter period-smaller rewards experiment (experiment one) to about 83 percent in the longer-larger rewards experiment (experiment four).

- This total effect could be decomposed into two effects – time frame effect and magnitude effect.
- A higher proportion of right-censored respondents in experiment two than that of experiment one and/or in experiment four than that of experiment three is an indication that people discount more when they are asked to delay consumption than when they are asked to expedite it.
- Table 3: Statistical Tests of Time Frame and Magnitude Effects

Hypothesis	Effect to be tested	Chi-square test <sup>+</sup>	t-test <sup>+</sup>
Experimental set 1 is equivalent to experimental set 2	Time frame effect	344.126 <sup>***</sup> (0.000)	1.970 <sup>**</sup> (0.025)
Experimental set 3 is equivalent to experimental set 4	Time frame effect	388.499 <sup>***</sup> (0.000)	4.488 <sup>***</sup> (0.000)
Experimental set 2 is equivalent to experimental set 3	Magnitude effect	322.324 <sup>***</sup> (0.000)	5.611 <sup>***</sup> (0.000)

# Econometric Results

- **Risk Preferences Estimates**

- Table 4: Three Stage Least Square Regression Estimates of Risk Preferences

Variables	Parameter Estimates
Age	0.0157** (0.007)
Gender (Female=0)	-0.637*** (0.246)
Education	0.069*** (0.024)
Cooperative Membership	0.121 (0.150)
Extension Visit	-0.662*** (0.242)
Frequency of Shock	-0.170 (0.144)
Value of Domestic Animals	0.006 (0.007)
Saving	0.546*** (0.168)
Access to Credit	0.479* (0.326)
Household income	0.004 (0.004)
Time preference	-0.006 (0.007)

- **Time Preferences Estimates**

- Table 5: Three Stage Least Square Regression Estimates of Time Preferences

Variable	Parameter Estimates
Age	0.105(0.075)
Gender (Female=0)	-5.411 <sup>**</sup> (2.639)
Education	0.168(0.272)
Land security	3.646(2.334)
Value of Domestic Animals	-0.418 <sup>***</sup> (0.073)
Saving	1.783(1.806)
Number of plots	-2.944 <sup>***</sup> (1.024)
Access to Credit	3.689(3.629)
Cash liquidity	-1.177 <sup>***</sup> (0.259)
Access to non-farm income	-14.574 <sup>***</sup> (2.140)
Innovational activities	4.857 <sup>**</sup> (2.043)



<b>Family labour</b>	<b>-0.052<sup>***</sup> (0.013)</b>
Hired labour	-0.163 <sup>***</sup> (0.041)
Credit received	-0.739(0.658)
Risk preference	-1.741 <sup>**</sup> (0.825)
Household income	1.306 <sup>***</sup> (0.243)

## ● Household Income Estimates

- Table6:Three Stage Least Square Regression Estimates of Household Income

Variable	Parameter Estimates
Gender (Female=0)	3.95(2.677)
Education	0.258(0.247)
Land security	-3.295(2.430)
Value of Domestic Animals	0.238 <sup>**</sup> (0.098)
Access to Credit	2.503(3.574)
Access to non-farm income	7.854 <sup>**</sup> (3.287)
Innovational activities	-1.390(2.322)
Family labour	0.494 <sup>***</sup> (0.013)
Farm implements	0.576 <sup>***</sup> (0.207)
Irrigated land	8.00(5.176)
Fertilizer use	3.166 <sup>***</sup> (0.951)

<b>Manure use</b>	<b>0.011<sup>*</sup> (0.006)</b>
Average plot slope	-7.850(5.658)
Access to information	2.363(1.813)
Pesticide use	-2.865 <sup>*</sup> (1.773)
Risk preference	0.350(0.804)
Time preference	-0.021(0.311)

# Conclusion

- Farmers in the study area have high levels of risk-aversion and high rates of impatience which has its own effect on farm households' investment on durable goods and services ultimately leading to have low capacity in wealth accumulation.
- Policy interventions targeting for reducing poverty are important to address individual decision makers behaviour and their wealth creation process.
- Public investments on basic infrastructures such as in health, education and financial sectors are important to reduce time preferences to the take-off stage and inducing innovation to individual decision makers.
- Development of *facilitative institutions* such as future markets, insurance programmes, and credit institutions are important to help decision makers to manage risks and become innovative.



Thank you!!!