Financial Illiteracy and Pension Contributions:

A Field Experiment on Compound Interest in China

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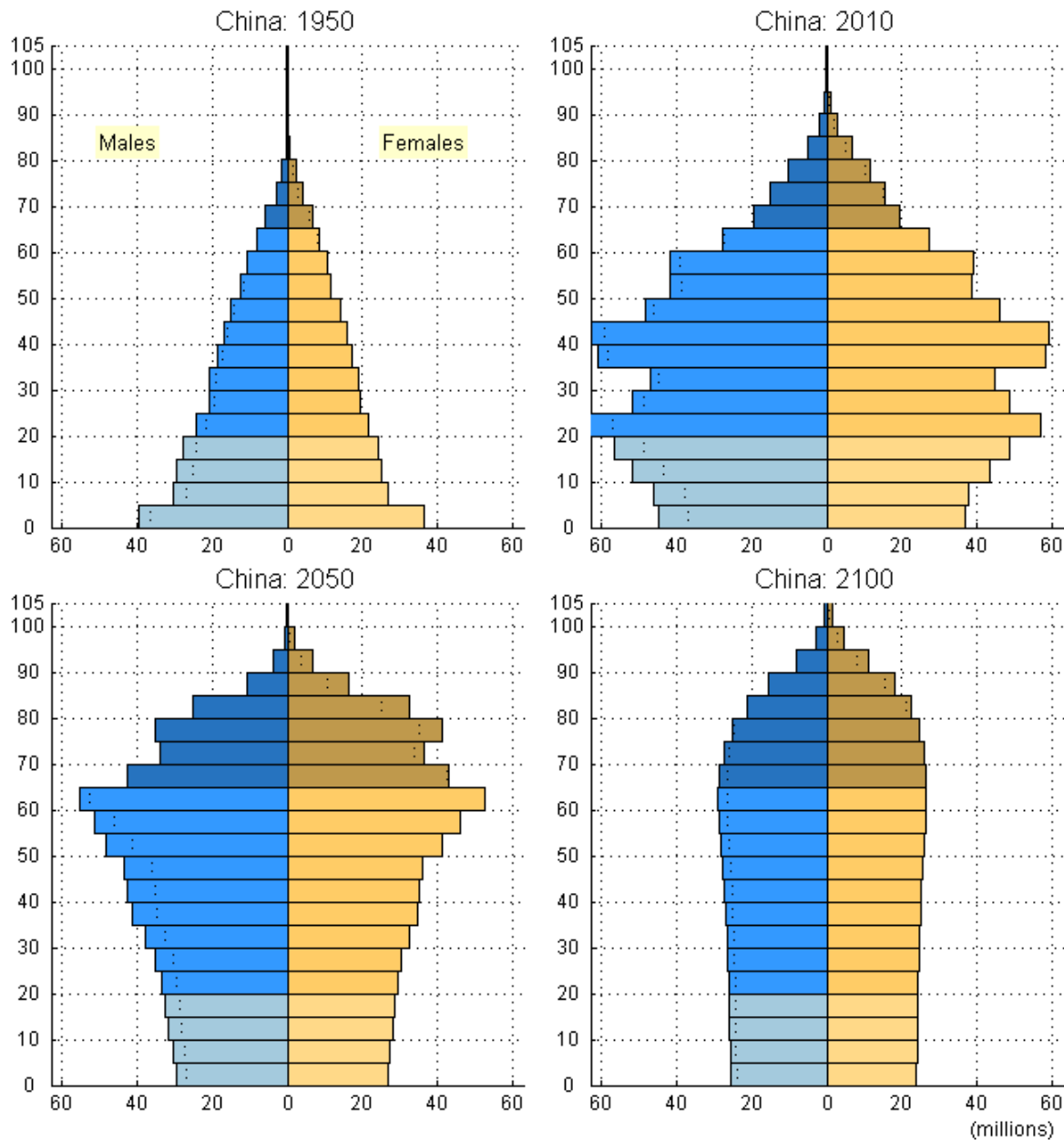
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Research Questions

- Why do farmers save little in their retirement plans in China?
  - ➢ Lack of trust in the government
  - ➢ Liquidity constraints (Gine *et al.* 2008; Cole *et al.* 2011)
  - ➢ Financial illiteracy: the neglect of compound interest

- This paper focuses on the neglect of compound interest
  - ➢ Individuals tend to *linearize exponential functions* when assessing them intuitively (Stango and Zinman 2009)
  - ➢ This implies that individuals underestimate the value of savings
  - ➢ Evidence in US: only 18% of subjects in HRS answered compound interest question correctly (Lusardi and Mitchell 2007)

  - I use a randomized field experiment to study whether teaching compound interest influences pension contributions in China

Background

- Question: why do farmers save little in pension plans in China?

- The savings rate is relatively high in China

- But, survey evidence suggests that rural households save little for their retirement due to the traditional reliance on children.
  - 10% of the rural elderly saved for their retirement
  - Only 2% thought they saved enough for their retirement (Guo and Chen 2009)
  - 4% of rural elderly reported that they relied on personal savings for old-age support
  - Most relied on their children (Zhao *et al.* 2009)

  - Rapid population aging starts to challenge this tradition

Source: United Nations (2011): World Population Prospects: The 2010 Revision. New York

Background

- Population aging and the lack of retirement savings together cause social problems in rural areas (Zhang and Tang 2008)
  - ➤ Tensions between the old and the young
  - ➤ Suicides among old farmers

- A pension system can potentially help to
  - ➤ Reduce the poverty and vulnerability (Schwartzer and Querino 2002; Barrientos *et al.* 2003)
  - ➤ Increase children's school attendance (Edmonds 2006)
  - ➤ Improve children's health and nutrition (Duflo 2000)

Pension Contract

The New Rural Social Pension Insurance Program:

- Introduced in a few pilot rural counties in 2009
- Eligibility: Farmers who are 16 years old or above, not students, and are not enrolled in urban pension plans
- Highly subsidized, voluntary
- Pensioners contribute before age 60 and will receive their pension monthly after reaching age 60
- The benefits:

$$\text{amount received per month} = \text{basic pension} + \frac{\text{individual account balance}}{139}$$
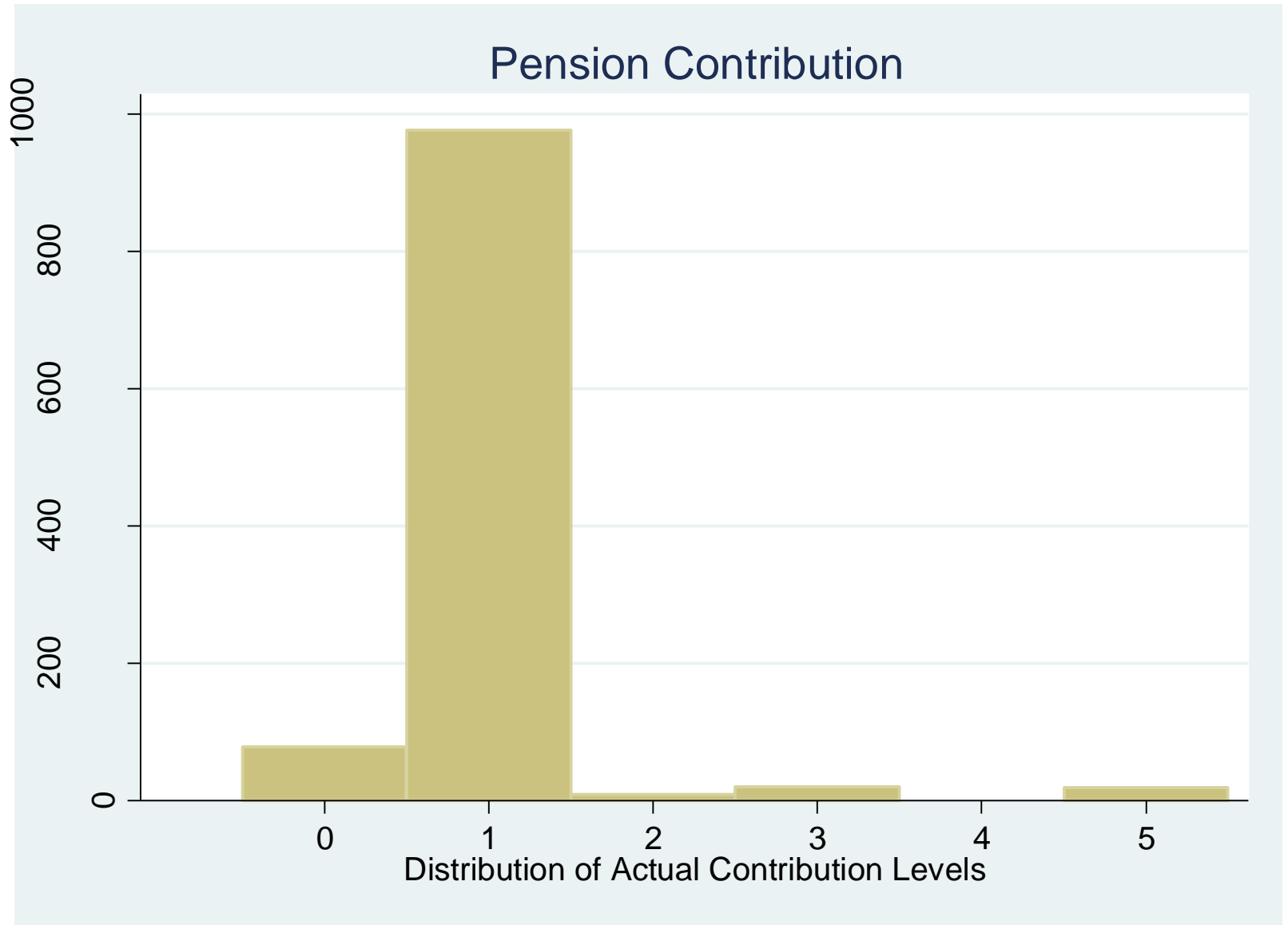
where basic pension is 80RMB per month

Table 1. Pension Contract

Panel A: Pension subsidy

Options	Contribution level(RMB/year)	Percentage of Annual per capita Income	Government Subsidy(RMB /year)
1	100	1.5%	30
2	200	3.1%	30
3	300	4.6%	40
4	400	6.2%	45
5	500	7.7%	50

Panel B: Example of Pension Benefit

Age when you start to contribute	30				
Annual Contribution level	100	200	300	400	500
Annual Subsidy (RMB/year)	30	30	40	45	50
A: Basic pension after 60 years old	960	960	960	960	960
B: Amount from individual account balance (RMB/year)	299	529	781	1023	1264
C=A+B: Amount received annually after 60 years old (RMB/year)	1259	1489	1741	1983	2224
Percentage of annual per capita income	19.4%	22.9%	26.8%	30.5%	34.2%

Pensioners start to contribute at age 30 and contribute for 15 years.
The interest rate is assumed to be 2.5%, which is the one year interest rate in China at the time of this study. The interest is compounded yearly.
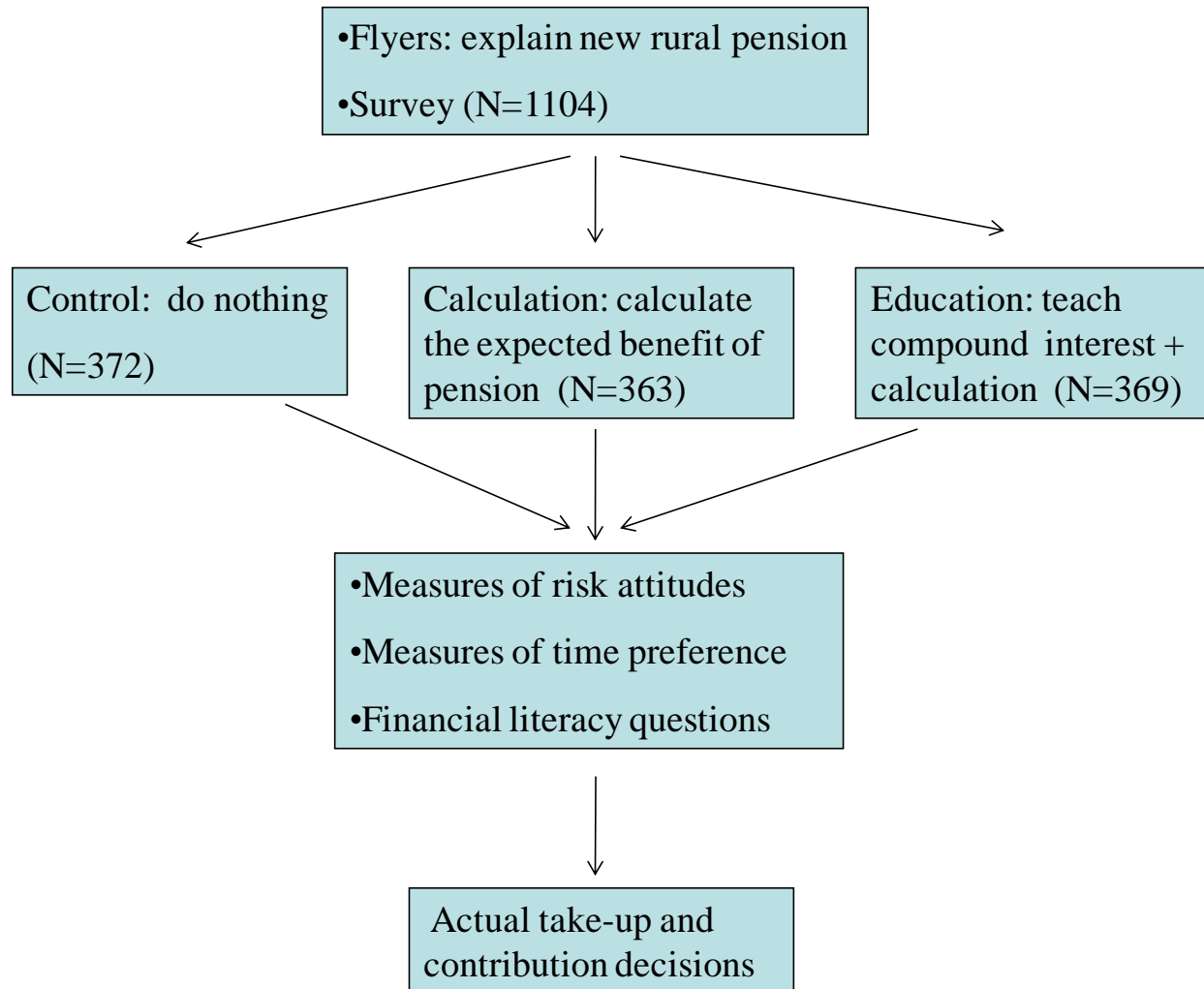
Pension Contribution

Distribution of Actual Contribution Levels

Design

- About 90% of households save at the lowest level

- The benchmark model implies 73% of households should save more in the pension

- Question: Why do farmers save low in the pension despite subsidy and variability of income?

- One possibility: financial illiteracy
  - People may not realize the power of compound interest

- We test this by debiasing individuals about compound interest, and examine the impact on the contribution to the pension

Design


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          │ •Flyers: explain new rural   │
          │  pension                     │
          │ •Survey (N=1104)             │
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| Control: do nothing (N=372) | Calculation: calculate the expected benefit of pension (N=363) | Education: teach compound interest + calculation (N=369) |

•Measures of risk attitudes

•Measures of time preference

•Financial literacy questions

Actual take-up and contribution decisions

Calculation treatment

Provide the expected benefit of each contribution level *without* explaining the concept of compound interest.

Panel B: Example of Pension Benefit

Age when you start to contribute	30				
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Education treatment

- Ask three compound interest questions

Question

a You deposit 100 RMB as a Certificate of Deposit this year at a constant interest rate of 9% per year. Interest is compounded annually. How much money could you receive in 30 years? 1) Less than 300 2) 300-500 3) 500-1000 4) 1000-1500 5) More than 1500

b Suppose you were 45 years old and you deposit 100 RMB every year for 15 years at a constant interest rate of 2.5% per year. Interest is compounded annually. How much could you withdraw when you are 60 years old? 1) Less than 1800 2) 1800-2000 3) 2000-2500 4)2500-3000 5) More than 3000

c Suppose you were 30 years old and you deposit 100 RMB every year for 15 years at a constant interest rate of 2.5% per year. Interest is compounded annually. How much could you withdraw when you are 60 years old? 1) Less than 1800 2) 1800-2000 3) 2000-2500 4)2500-3000 5) More than 3000
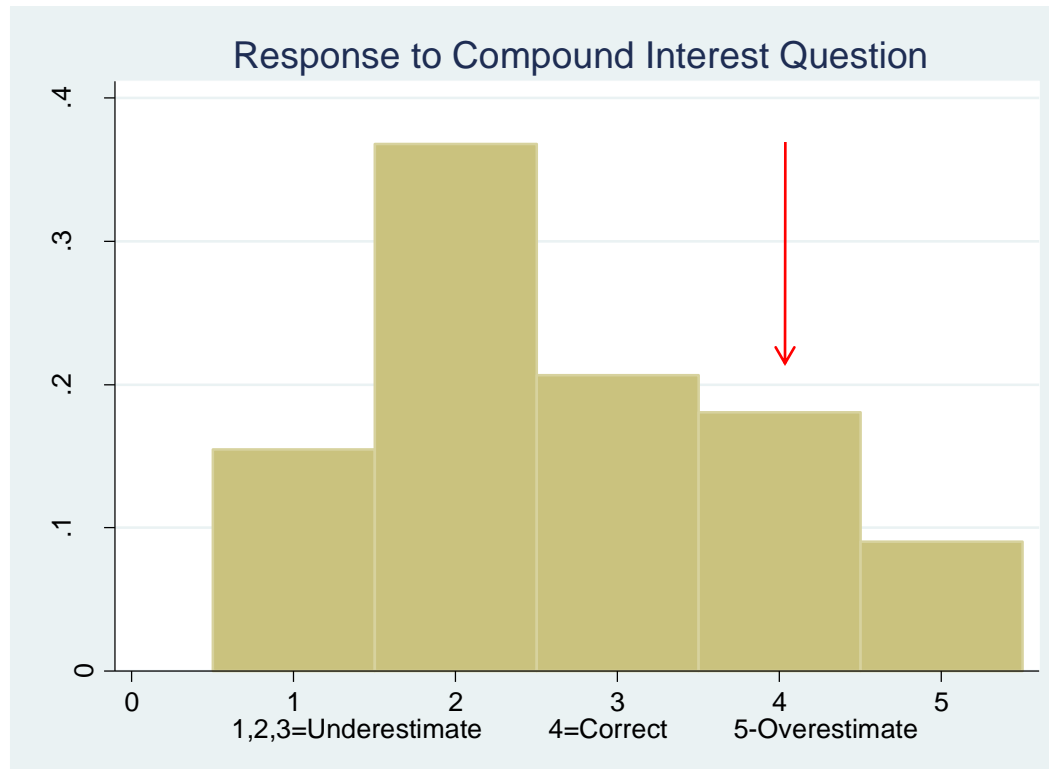
- Provide correct answer for the three questions
- Teach concept of compound interest
- Provide the expected benefit of each contribution level
  - This is the same as in the Calculation treatment

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Implementation

- Location: Shaanxi
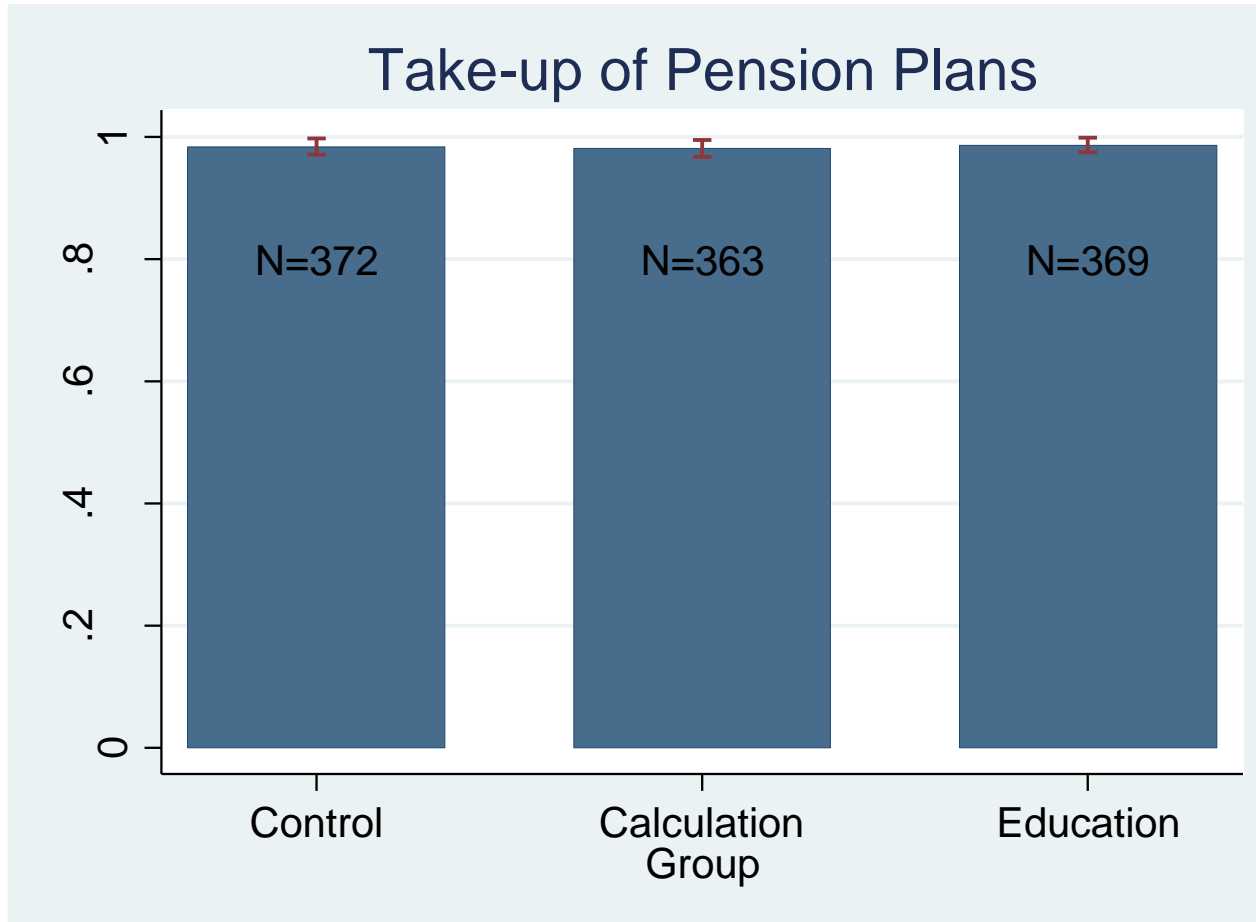- Per capita net income in the research county is slightly higher than national average

Results: Compound Interest Question

Response to Compound Interest Question

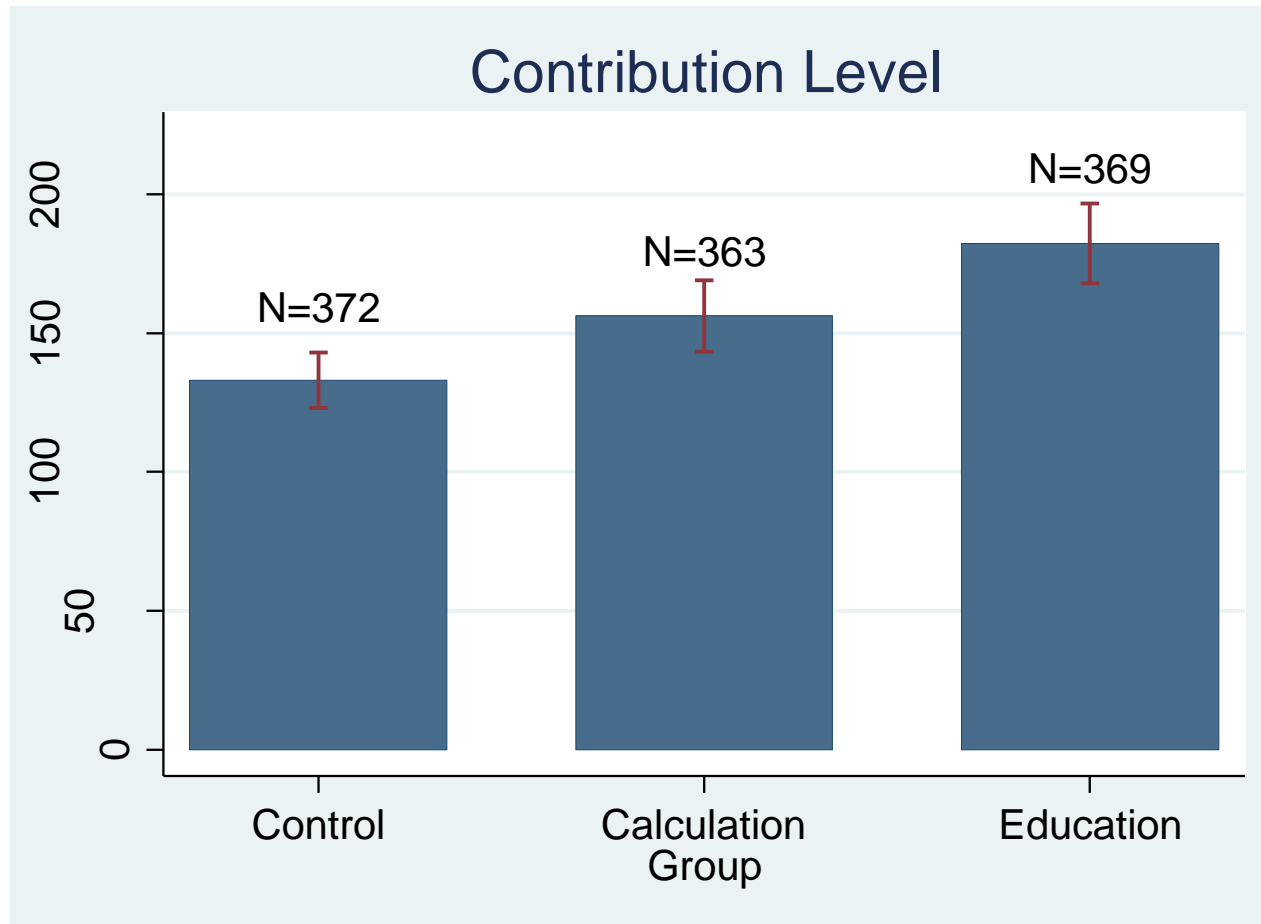1,2,3=Underestimate 4=Correct 5-Overestimate

- 58% of rural households were unable to answer the question
- 71% of those who answered the question underestimated compound interest
- Only 12% of rural household estimated the compound interest correctly or overestimated it.

Results: Participation

Take-up of Pension Plans

More than 90 percent of rural households participated in the pension plan. There is no effect of education treatment on individual take-up
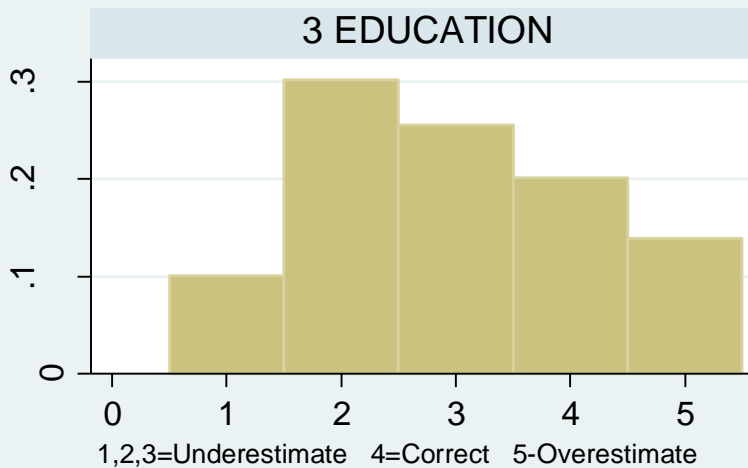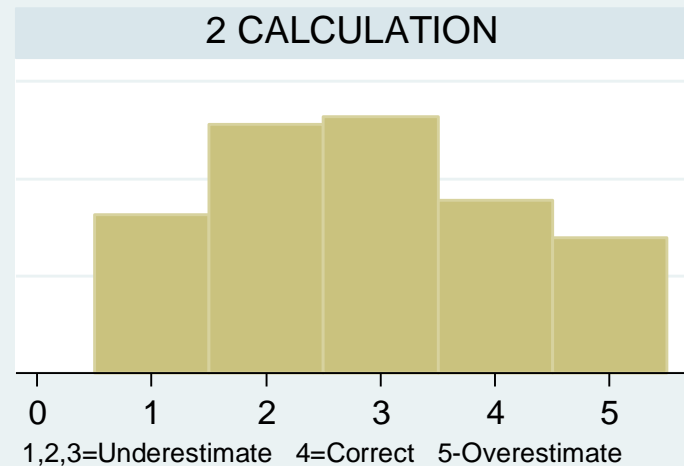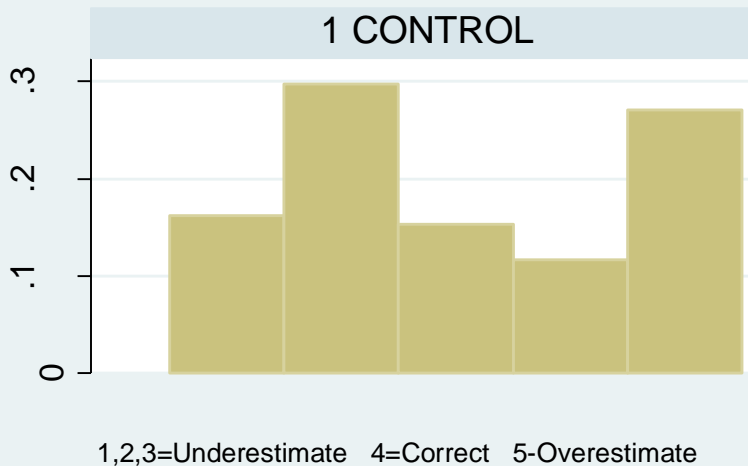
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Results: Contribution

The education treatment increased the annual contribution by 49 to 53 RMB, resulting in an increase of around 37 to 40 percent relative to the average contribution of 133 RMB in the control group.

Why do farmers increase pension contribution?

- A better understanding of compound interest

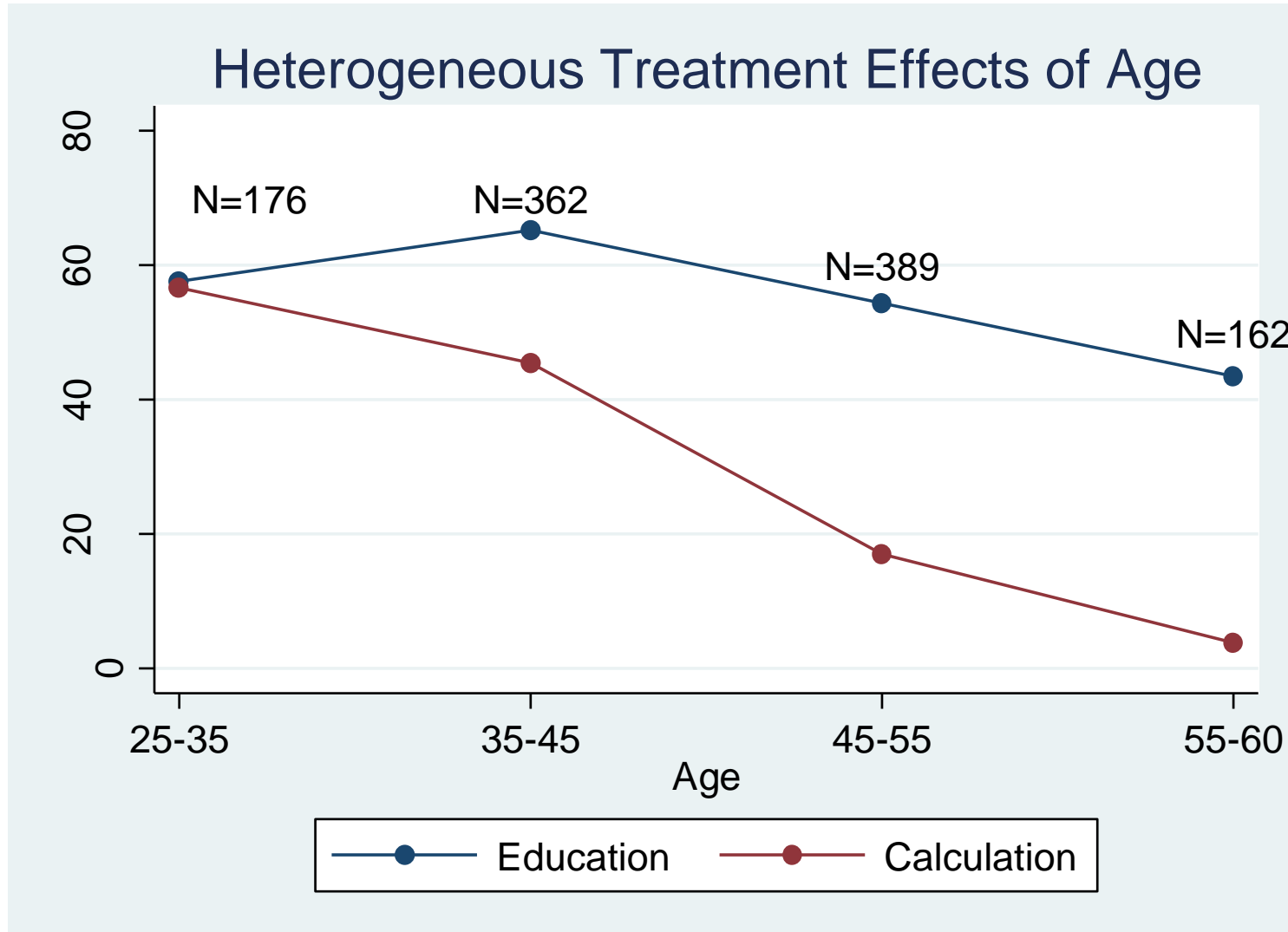- Learning the benefits in general

Alternative explanations

A better understanding of compound interest

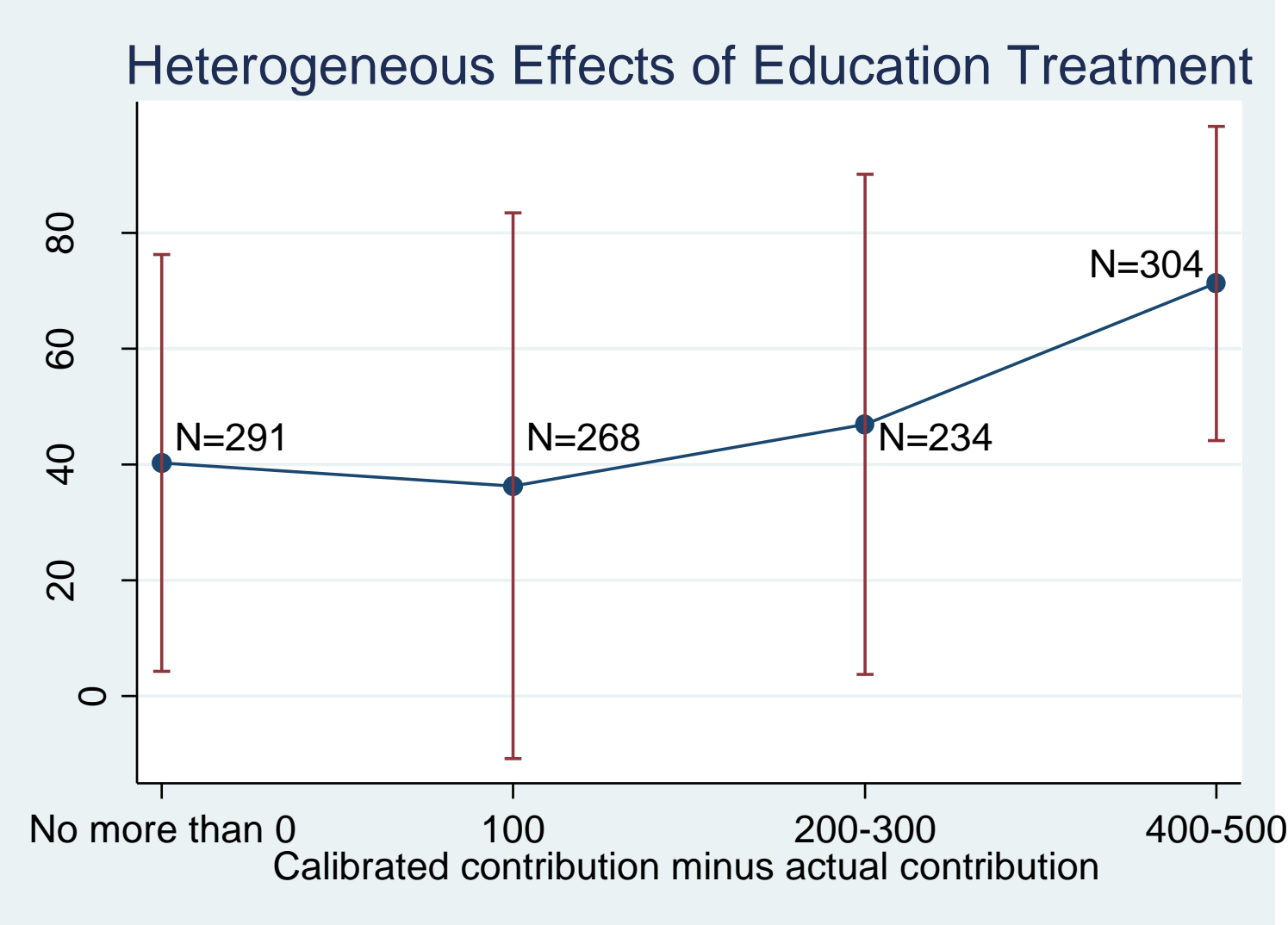Response to Compound Interest Question after Intervention

Graphs by group

Learning the benefits in general

Heterogeneous Treatment Effects of Age

Welfare Analysis

- Financial education increases total consumer welfare compared to the Control group which equivalent to a 3% increase in consumption each year after age 60

- The treatment effects are heterogeneous
  - Those who should save more do save more
  - Those who should not save more still save more, just in a smaller magnitude
  - Some households end up saving more than the level implied by the benchmark model

Welfare Analysis

Heterogeneous Effects of Education Treatment

Summary of Results

- Most rural households underestimate compound interest
- Teaching compound interest increases the annual contribution from 2 to 2.8 percentage points of annual per capita income
  - The increase accounts for 51% of the gap between the Control group's contribution and the level implied by the benchmark model
- My intervention increases understanding of compound interest
  - A better understanding of compound interest is the leading factor of the treatment effects
- Heterogeneous welfare effects
  - Those who should save more do save more
  - Some households end up saving more than the level implied by the benchmark model

Take away

- Financial education about compound interest increased their retirement savings in pension
- Financial education is likely to be effective if we first identify the barriers of individual participation and apply specific financial education
  - If the barrier is lack of information: information campaign
  - If the barrier is the ability to process information
    - Too complex: rule of thumb (Drexler et al. 2012)
    - Lack of experience: hypothetical experience (Gaurav et al. 2011, Cai and Song 2012)
    - Misunderstanding of compound: teach compound (Song 2012)
- Financial education is likely to be effective if it is close to the time of making financial decisions (decision support) (Carlin and Robinson 2011, Song 2012)