Your Decisions Reveal Who You Are

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To be presented at ACSF
Sep 16, 2015

Decision making under uncertainty

- Uncertainty is a fact of life so people's attitudes towards risk enter every realm of economic decision-making.
- We *must* study individual behavior with respect to choice involving uncertainty.
- Models of decision making under uncertainty play a key role in every field of economics.

Life is full of lotteries :-(

$$x := \begin{array}{ll} \overset{p}{\nearrow} & \$A \\ & \\ \underset{1-p}{\searrow} & \$B \end{array} \qquad y := \begin{array}{ll} \overset{p}{\nearrow} & \$A \\ \overset{q}{\longrightarrow} & \$B \\ \underset{1-p-q}{\searrow} & \$C \end{array}$$

A risky lottery (left) and an ambiguous lottery (right)

$$x := \begin{array}{ll} \overset{1/2}{\nearrow} & \$A \\ \searrow_{1/2} & \$B \end{array} \qquad y := \begin{array}{ll} \overset{?}{\nearrow} & \$A \\ \searrow_{1-?} & \$B \end{array}$$

Preference ordering

For any pair of lotteries x and y,

if the decision maker says that x is at least as good as y, we write

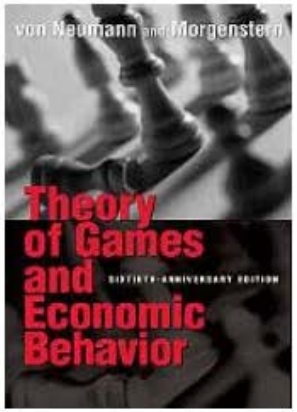
$$x \succsim y$$

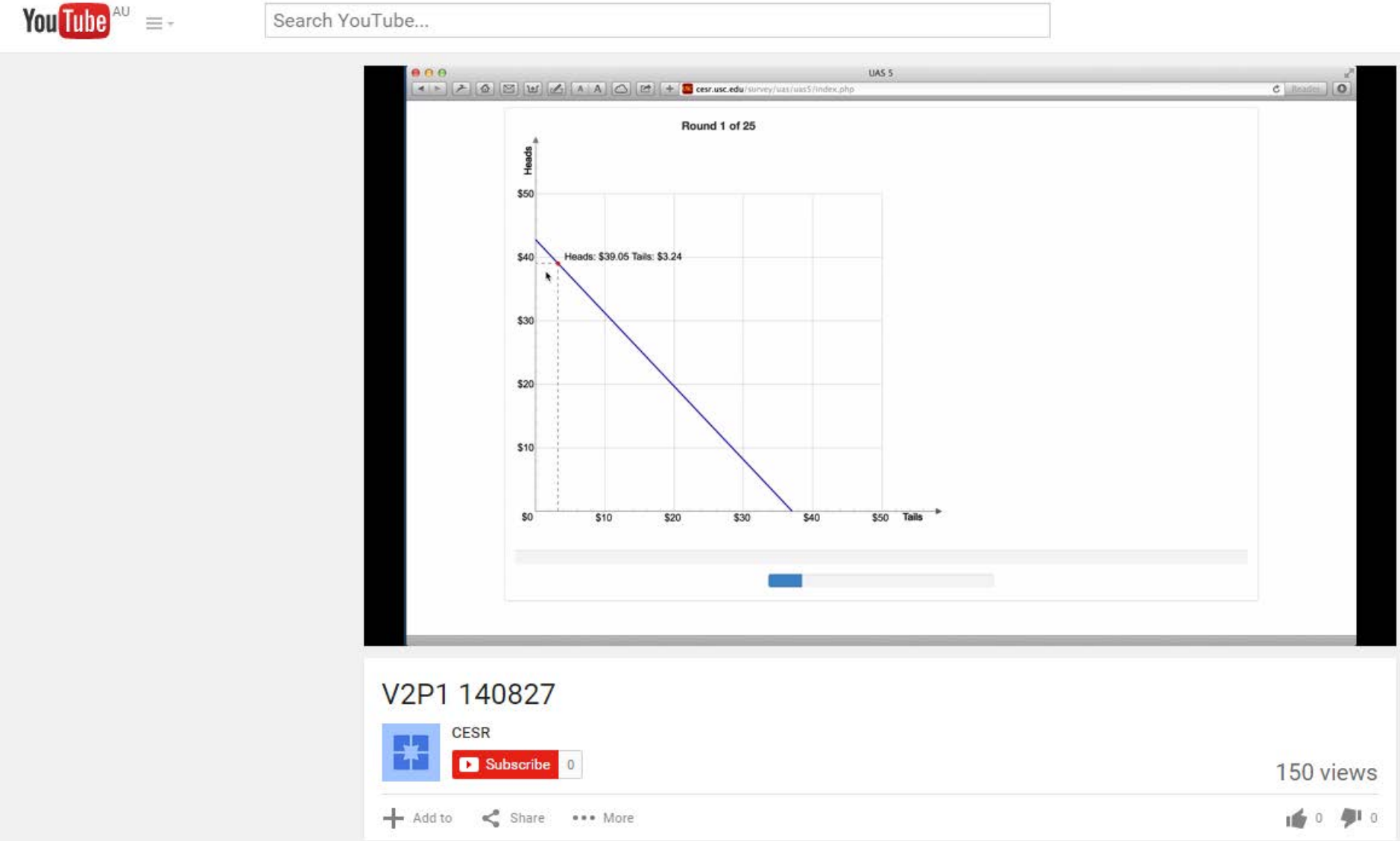
and say that x is weakly preferred to y.

Foundations of Economic Analysis (1947)

Paul A. Samuelson (1915-2009) – the first American Nobel laureate in economics and the foremost (academic) economist of the 20th century (and the uncle of Larry Summers…).

The paternity of decision theory and game theory (1944)





To watch the video go to:

https://www.youtube.com/watch?v=LziiVNMHusg&feature=youtu.be

The basic assumptions about preferences

The theory begins with three assumptions. These assumptions are so fundamental that we can refer to them as the "axioms" of decision theory.

[1] <u>Completeness</u>

$$x \succsim y \text{ or } y \succsim x$$

for any pair of lotteries x and y.

The second axiom is called transitivity:

[2] <u>Transitivity</u>

$$\text{if } x \succsim y \text{ and } y \succsim z \text{ then } x \succsim z$$

for any three lotteries x, y and z.

Together, completeness and transitivity constitute the formal definition of *rationality* as the term is used in economics.

Rational decision makers are ones who

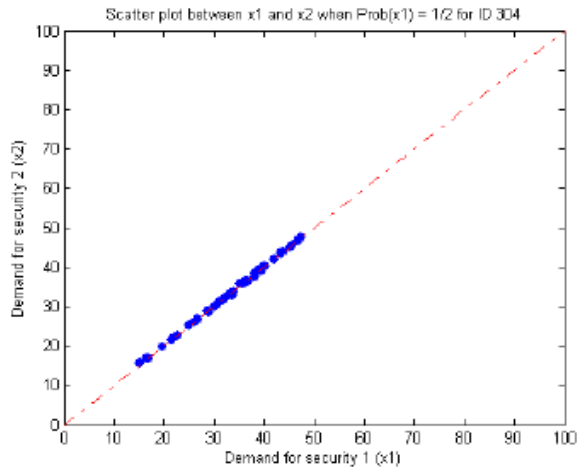
> have the ability to make choices [1], and whose choices display a logical consistency [2].

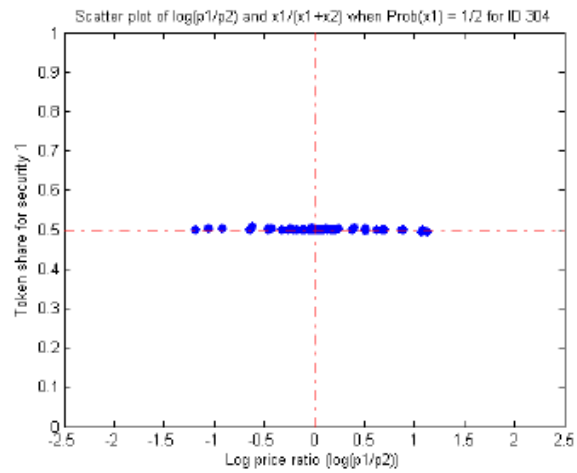
A new experimental design

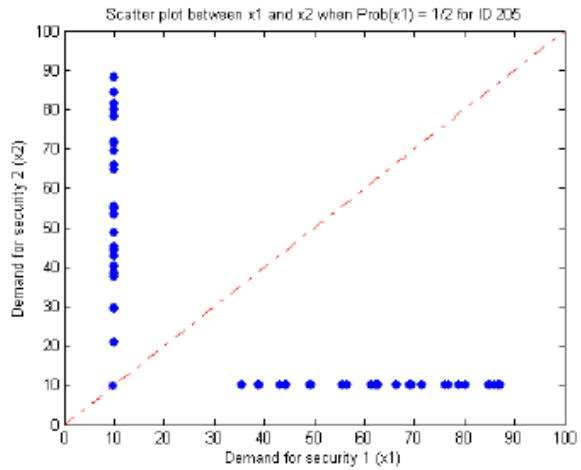
An experimental design that has a couple of fundamental innovations over previous work:

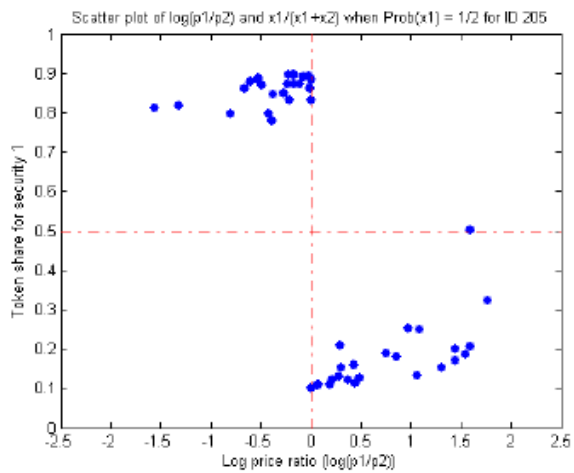
- A selection of a bundle of contingent commodities from a budget set (a portfolio choice problem).
- A graphical experimental interface that allows for the collection of a rich individual-level data set.

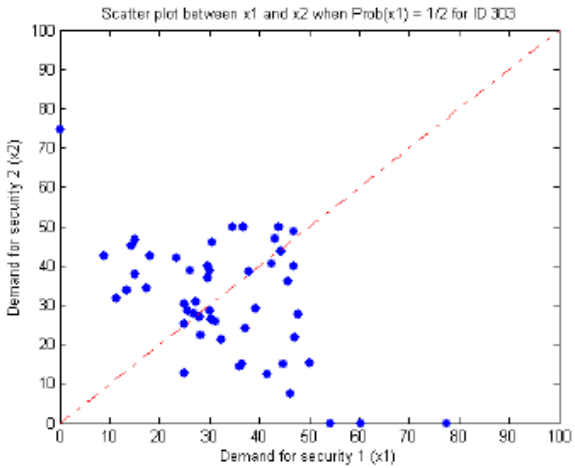
Individual-level data

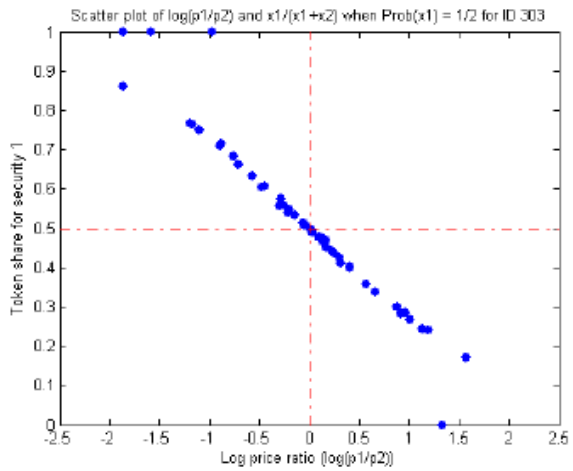


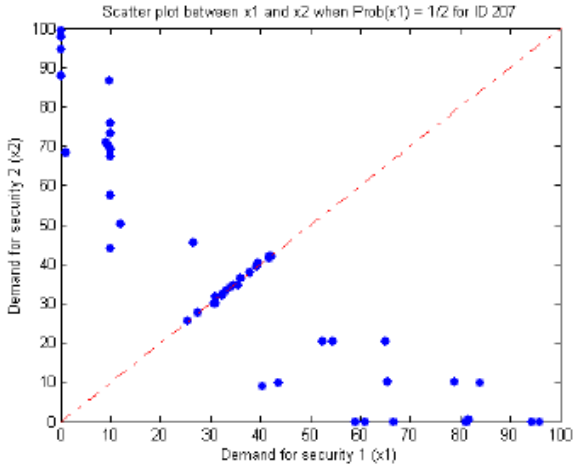


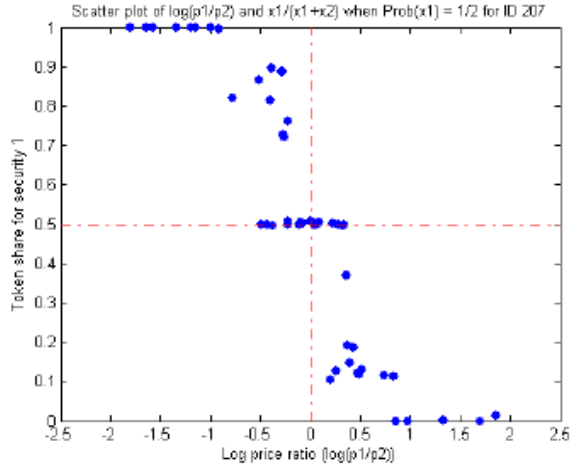

Scatter plot between x1 and x2 when Prob(x1) = 1/2 for ID 205
Demand for security 2 (x2)
Demand for security 1 (x1)
0
10
20
30
40
50
60
70
80
90
100

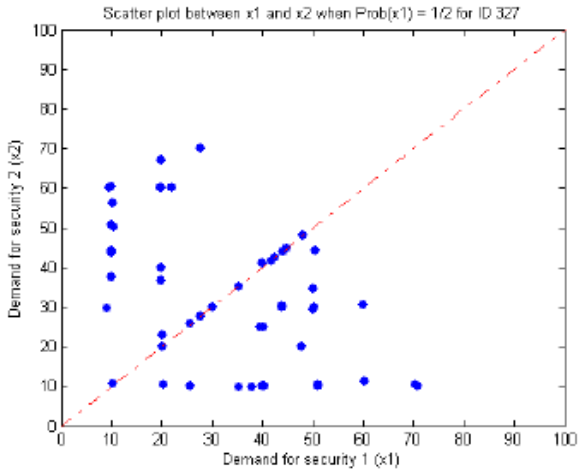

Scatter plot of log(p1/p2) and x1/(x1+x2) when Prob(x1) = 1/2 for ID 205
Token share for security 1
Log price ratio (log(p1/p2))
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5

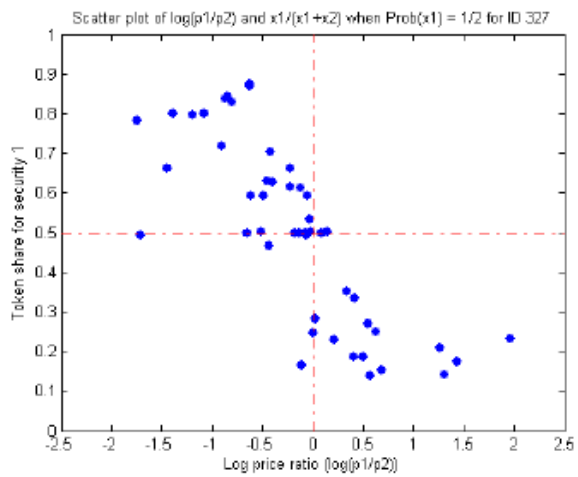

Scatter plot between x1 and x2 when Prob(x1) = 1/2 for ID 303
Demand for security 2 (x2)
Demand for security 1 (x1)
0
10
20
30
40
50
60
70
80
90
100

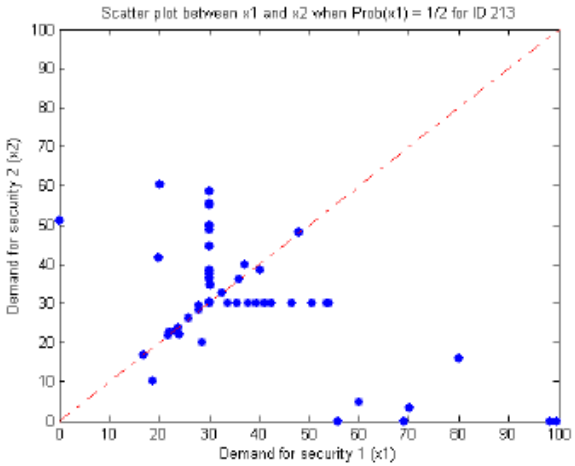

Scatter plot of log(p1/p2) and x1/(x1+x2) when Prob(x1) = 1/2 for ID 303
Token share for security 1
Log price ratio (log(p1/p2))
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5

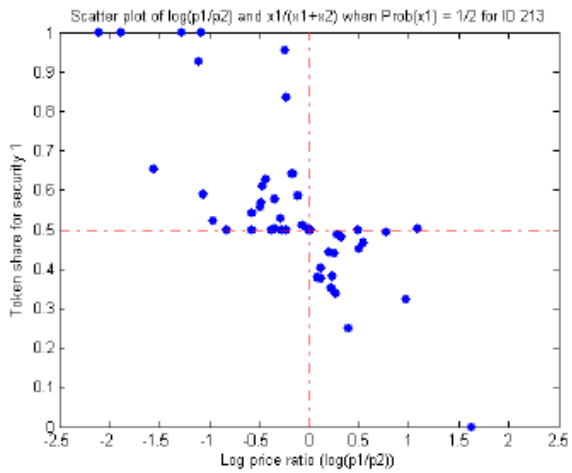

Scatter plot between x1 and x2 when Prob(x1) = 1/2 for ID 207
Demand for security 2 (x2)
Demand for security 1 (x1)
0
10
20
30
40
50
60
70
80
90
100


Scatter plot of log(p1/p2) and x1/(x1+x2) when Prob(x1) = 1/2 for ID 207
Token share for security 1
Log price ratio (log(p1/p2))
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5

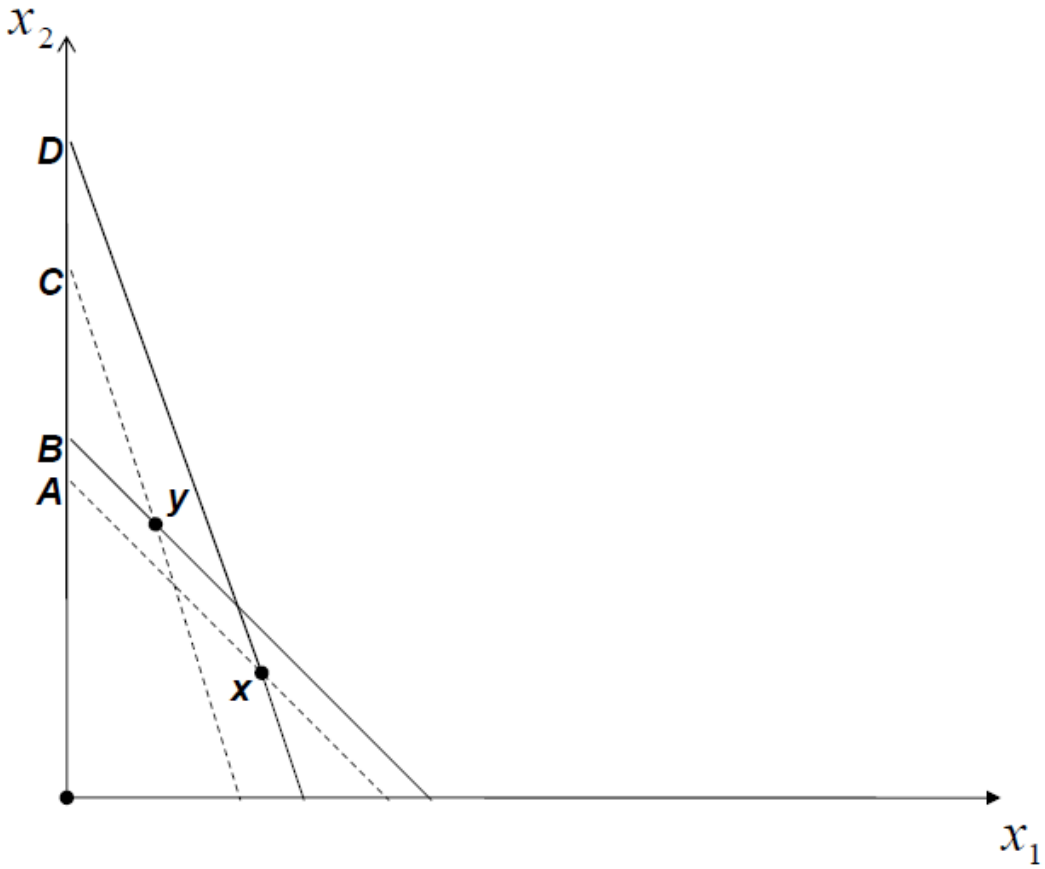

Scatter plot between x1 and x2 when Prob(x1) = 1/2 for ID 327
Demand for security 2 (x2)
Demand for security 1 (x1)
0
10
20
30
40
50
60
70
80
90
100


Scatter plot of log(p1/p2) and x1/(x1+x2) when Prob(x1) = 1/2 for ID 327
Token share for security 1
Log price ratio (log(p1/p2))
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5


Scatter plot between x1 and x2 when Prob(x1) = 1/2 for ID 213
Demand for security 2 (x2)
Demand for security 1 (x1)
0
10
20
30
40
50
60
70
80
90
100

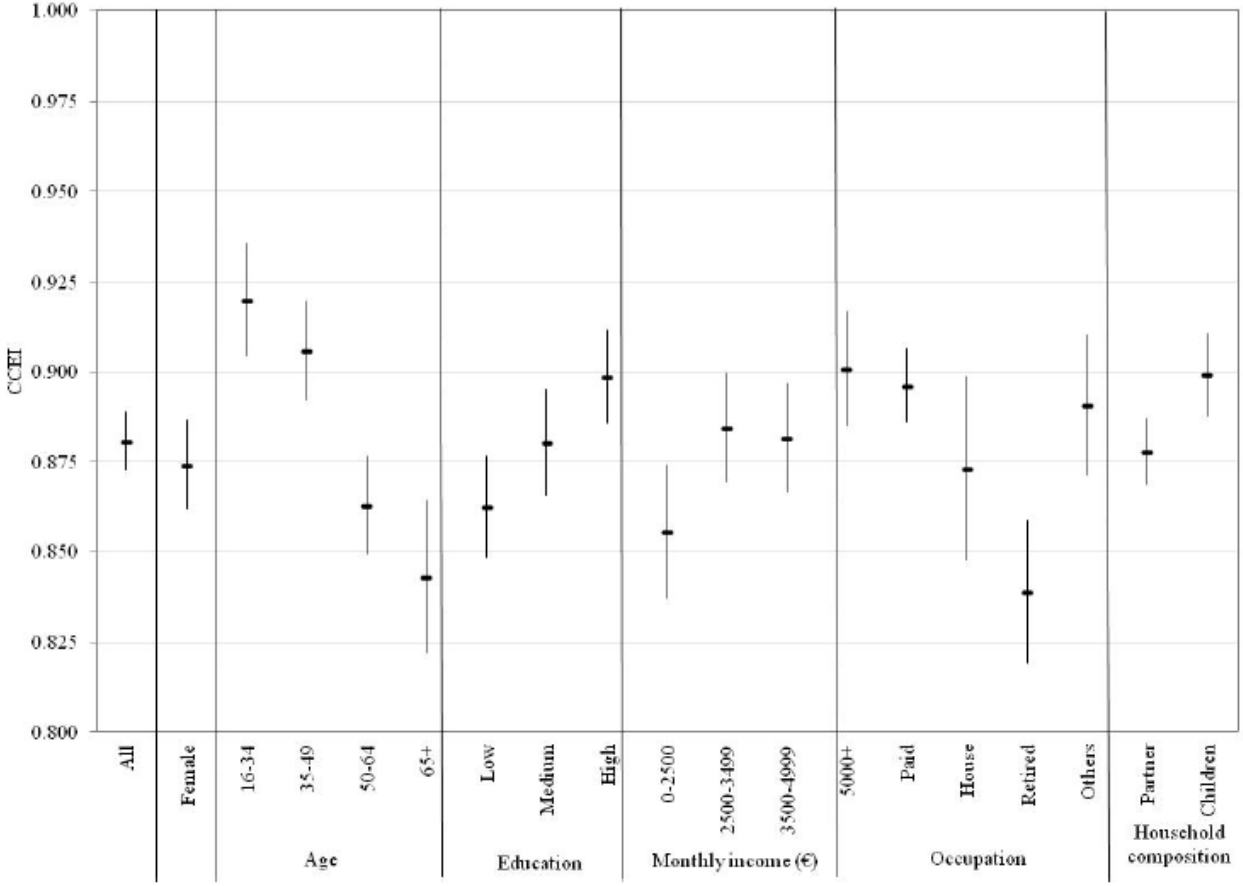

Scatter plot of log(p1/p2) and x1/(x1+x2) when Prob(x1) = 1/2 for ID 213
Token share for security 1
Log price ratio (log(p1/p2))
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5

The construction of the Homo Economicus score

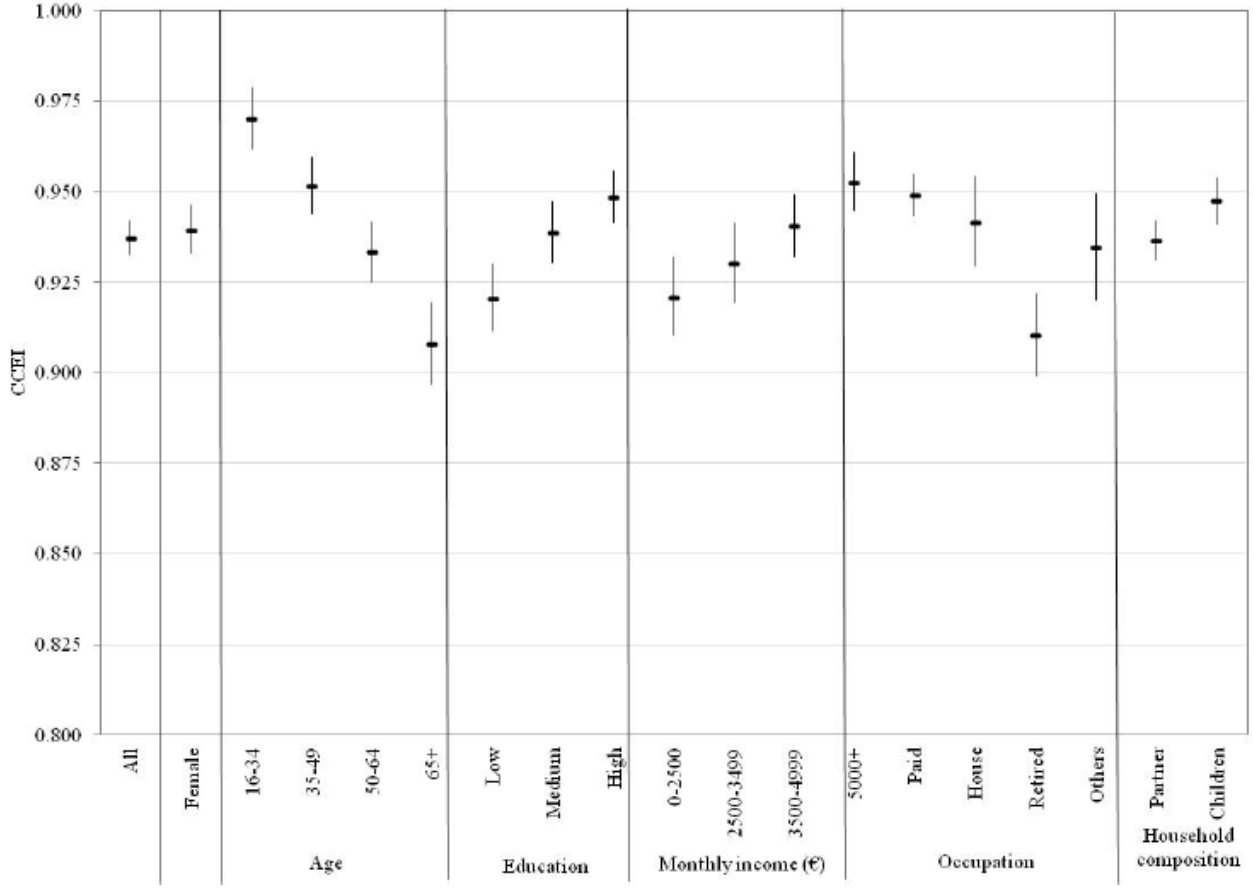


The agent is 'wasting' as much as *A/B<C/D* of his income by making inefficient choices.

Homo Economicus: equiprobable lotteries



Homo Economicus: income in a few days and income 60 days after that



Wealth differentials

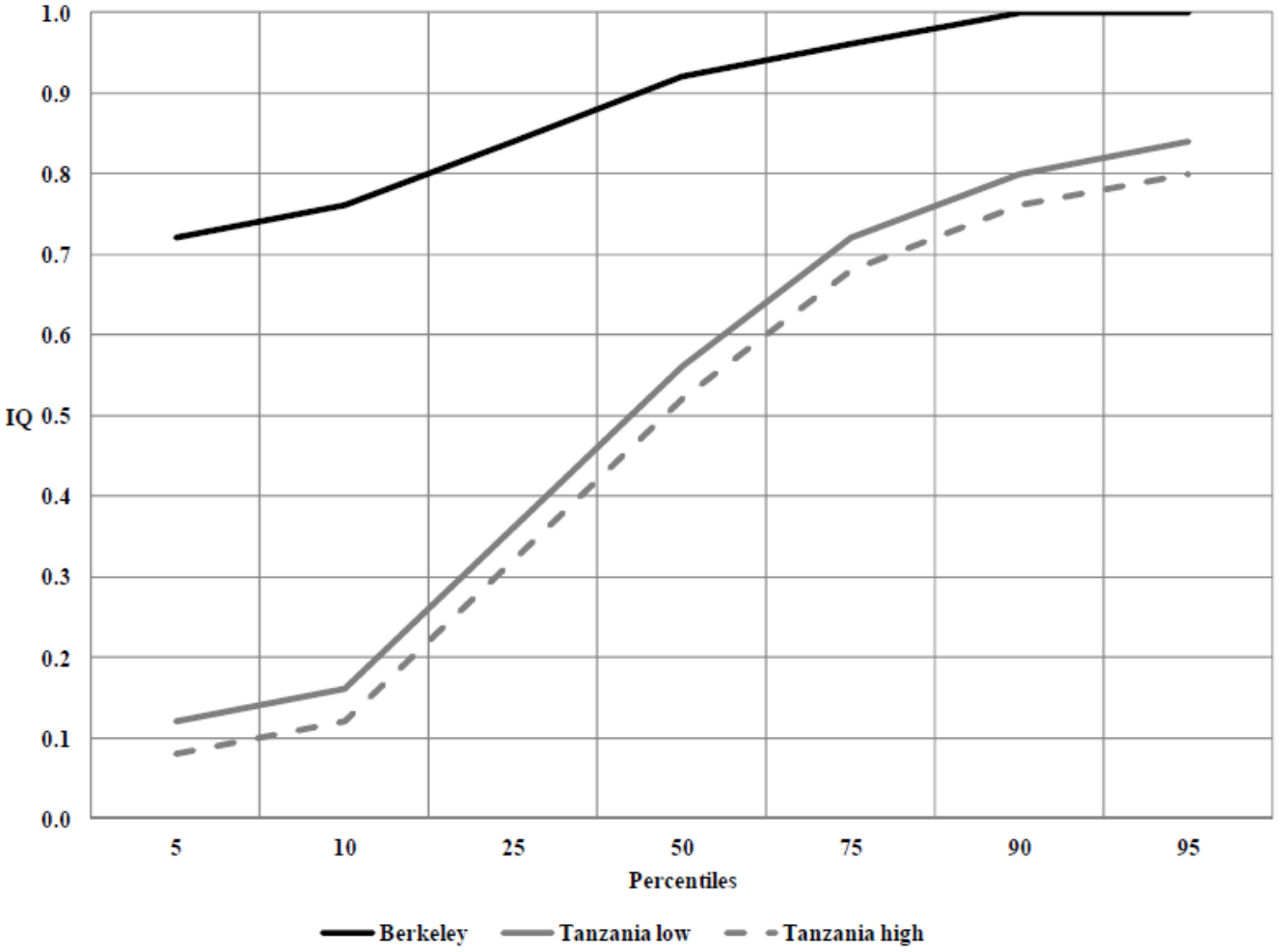
$\Longrightarrow$ The heterogeneity in wealth is not well-explained either by standard observables (income, education, family structure) or by standard unobservables (intertemporal substitution, risk tolerance).

$\Longrightarrow$ If consistency with utility maximization in the experiment is a good proxy for (financial) DMQ then the degree to which consistency differ across subjects should help explain wealth differentials.

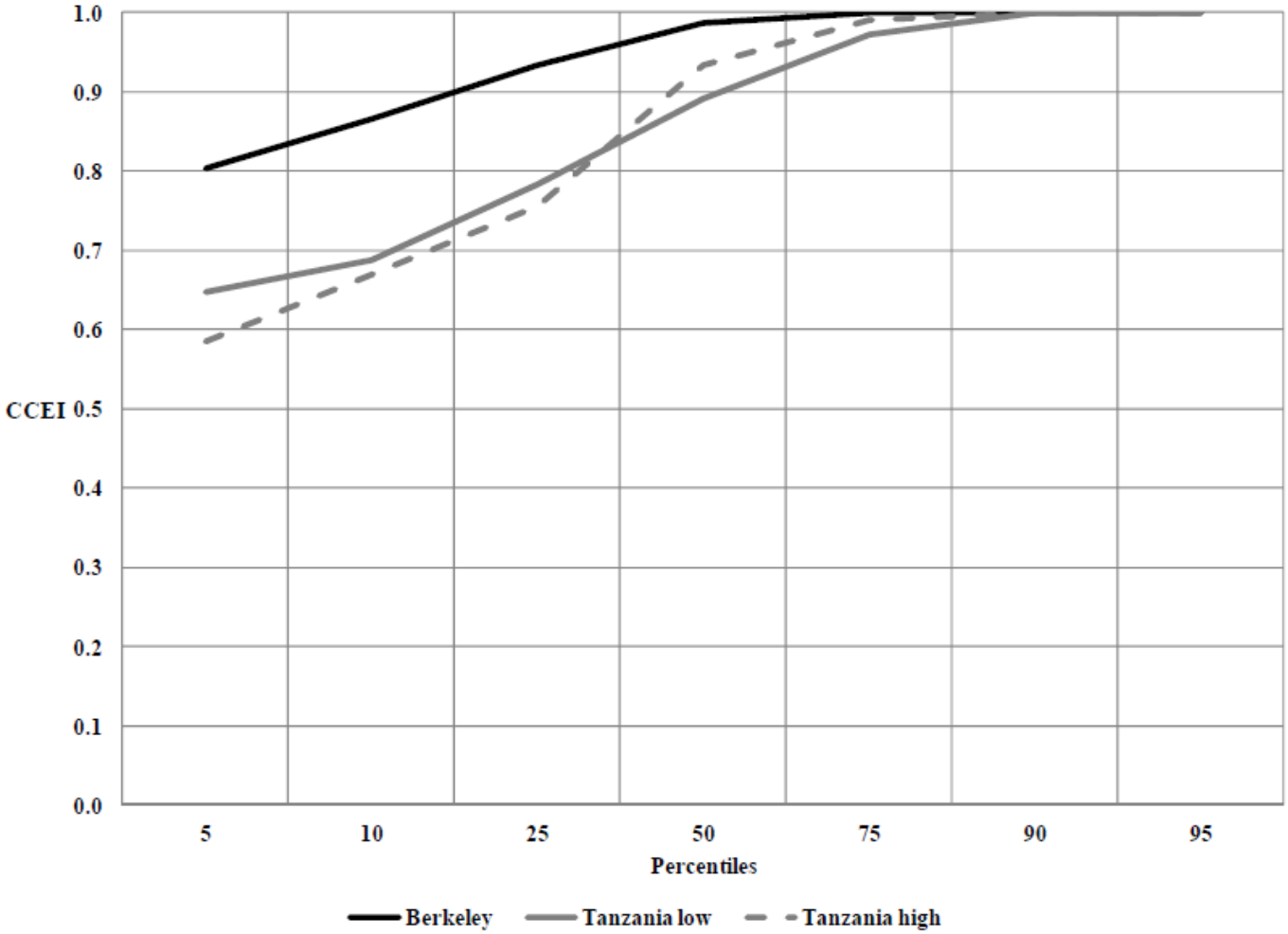
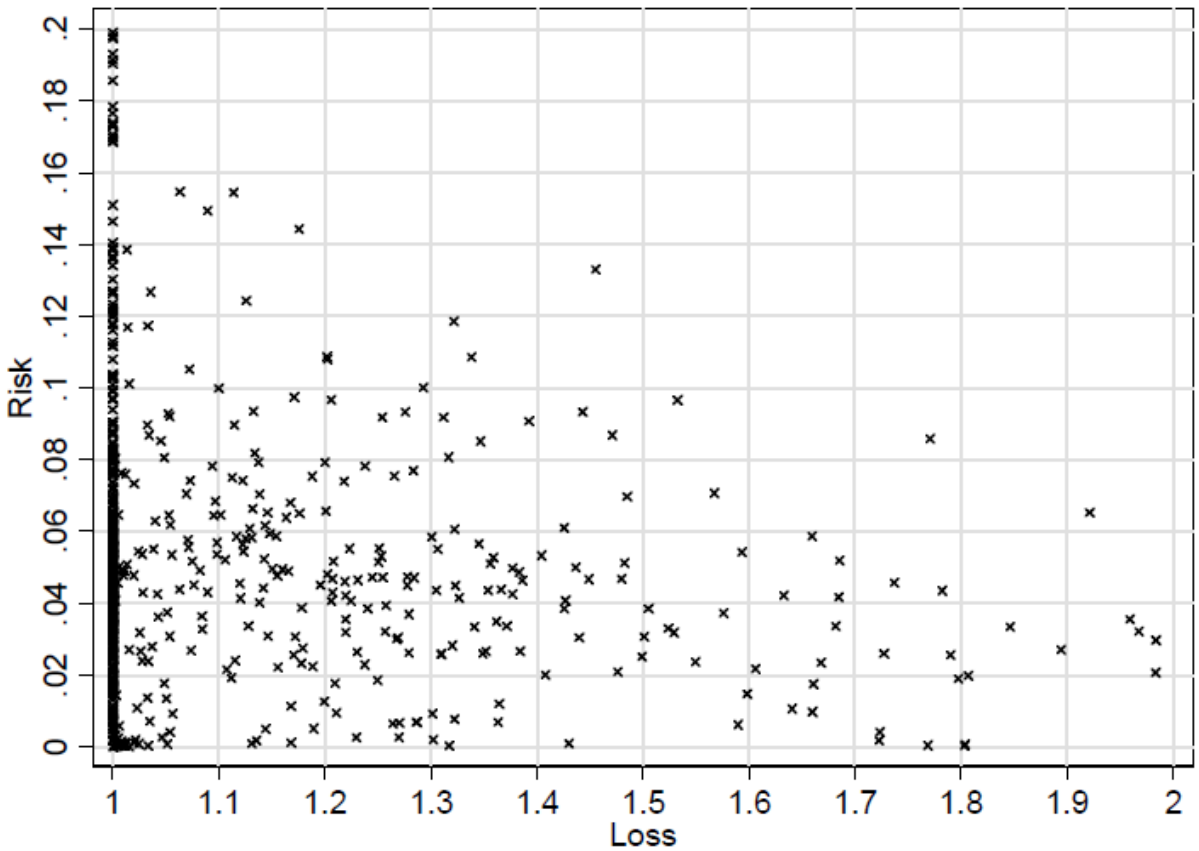
The relationship between CCEI scores and wealth

	(1)	(2)	(3)
CCEI	1.351**	1.109**	101888.0*
	(0.566)	(0.534)	(52691.9)
Log 2008 household income	0.584***	0.606***	
	(0.132)	(0.126)	
2008 household income			1.776***
			(0.4)
Female	-0.313*	-0.356**	-32484.3*
	(0.177)	(0.164)	(17523.9)
Partnered	0.652***	0.595***	46201.9***
	(0.181)	(0.171)	(17173.7)
# of children	0.090	0.109	14078.6*
	(0.093)	(0.086)	(8351.5)
Age	Y	Y	Y
Education	Y	Y	Y
Occupation	Y	Y	Y
Constant	6.292	0.469	76214.4
	(6.419)	(3.598)	(559677.5)
R^2	0.179	0.217	0.188
# of obs.	517	566	568

Is there a development gap in rationality (IQ)?



Is there a development gap in rationality (CCEI)?



Scatterplot of the risk and loss aversions estimates