# Gender Differences in Risk Preferences of Children and Adults

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Problem statement

Evidence

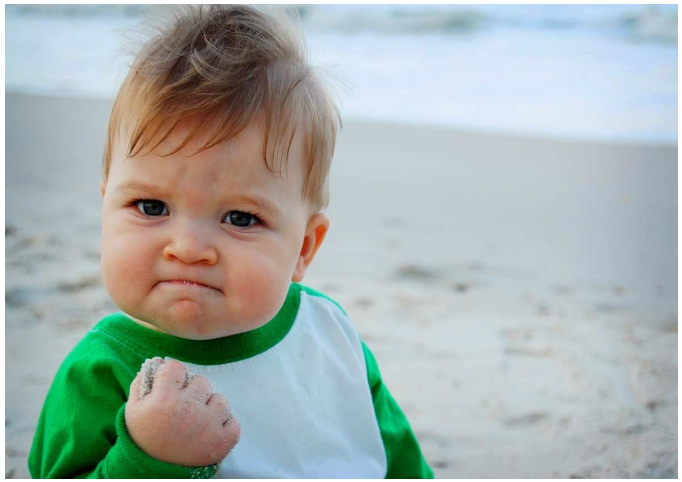
Experiment

Results

# Men are more tolerant to Risk than Women

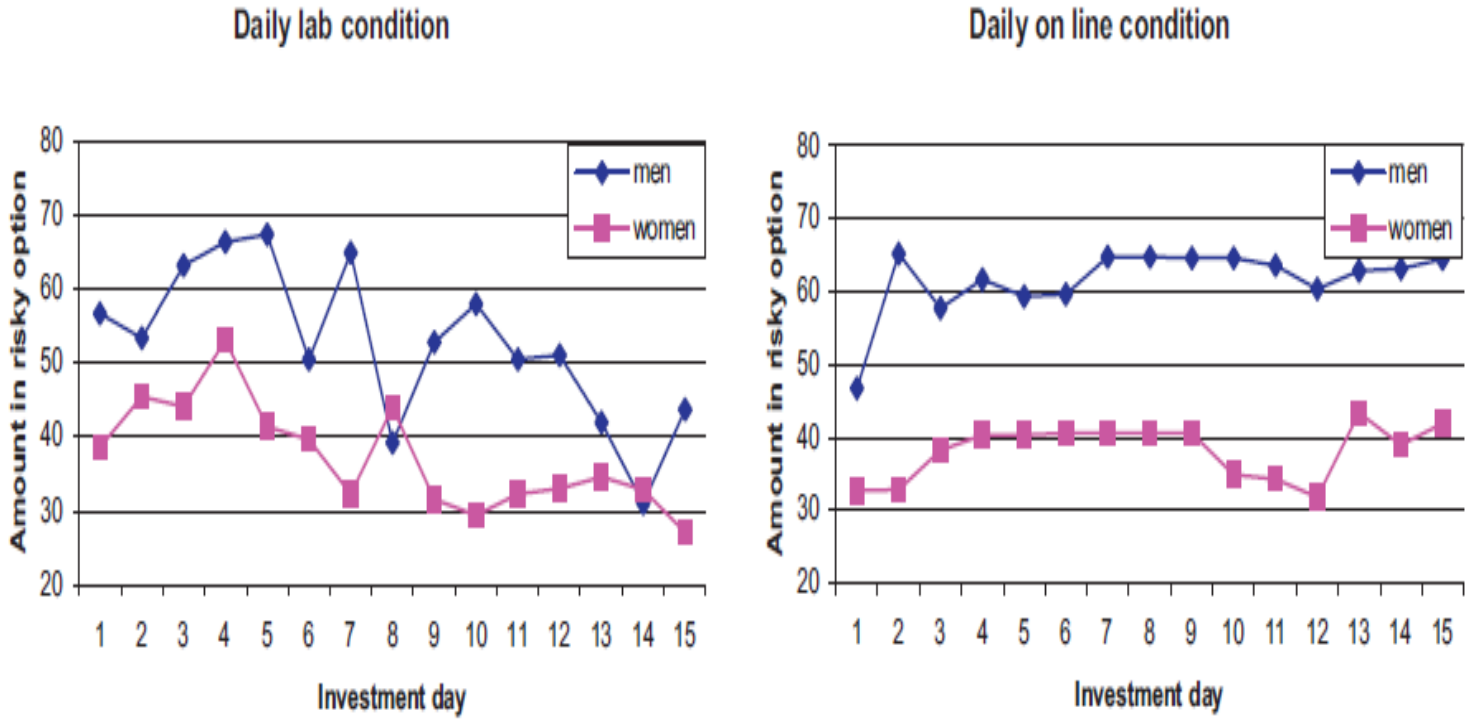

# Men are more tolerant to Risk than Women but why?


# Main problem



- Nature or nurture? Are men are genetically pre-programmed to be more risk tolerant than women, or is it a matter of socialization/education?
- The question is obviously tricky: socialization goes in parallel with genetically programmed changes.
- In this paper, we address part of the question, by proposing a novel, age-invariant method to measure risk tolerance.

# Some evidence




Yu (2006), using the Gneezy-Potters techniques (see below), in a 15-day experiment compared risk tolerance of online investors to that of lab investors.

# Used methods

Self-reported "Rate your willingness to take risks in general" on a 10-point scale, with 1-completely unwilling and 10-completely willing.

Domain-specific Similarly revealed willingness in health, finance, occupational, driving, personal etc. occasions

Investment lottery (Gneezy and Potters, 1997): "Of a windfall gain of 1 million, how much you would be willing to invest in a business venture which would result in doubling the invested amount or complete perish of investment with equal probabilities?"

Dominant pricing (Becker-DeGroot-Marshak, 1964)

Implied risk aversion (Eckel and Grossman, 2008)

Multiple price list (Holt and Laury, 2002)

# Methods

**Table 1**
The Eckel and Grossman measure.

| Choice (50/50 Gamble) | Low payoff | High payoff | Expected return | Standard deviation | Implied CRRA range |
|---|---|---|---|---|---|
| Gamble 1 | 28 | 28 | 28 | 0 | $3.46<r$ |
| Gamble 2 | 24 | 36 | 30 | 6 | $1.16<r<3.46$ |
| Gamble 3 | 20 | 44 | 32 | 12 | $0.71<r<1.16$ |
| Gamble 4 | 16 | 52 | 34 | 18 | $0.50<r<0.71$ |
| Gamble 5 | 12 | 60 | 36 | 24 | $0<r<0.50$ |
| Gamble 6 | 2 | 70 | 36 | 34 | $R<0$ |

TABLE 1—THE TEN PAIRED LOTTERY-CHOICE DECISIONS WITH LOW PAYOFFS

| Option A | Option B | Expected payoff difference |
|---|---|---|
| 1/10 of \$2.00, 9/10 of \$1.60 | 1/10 of \$3.85, 9/10 of \$0.10 | \$1.17 |
| 2/10 of \$2.00, 8/10 of \$1.60 | 2/10 of \$3.85, 8/10 of \$0.10 | \$0.83 |
| 3/10 of \$2.00, 7/10 of \$1.60 | 3/10 of \$3.85, 7/10 of \$0.10 | \$0.50 |
| 4/10 of \$2.00, 6/10 of \$1.60 | 4/10 of \$3.85, 6/10 of \$0.10 | \$0.16 |
| 5/10 of \$2.00, 5/10 of \$1.60 | 5/10 of \$3.85, 5/10 of \$0.10 | −\$0.18 |
| 6/10 of \$2.00, 4/10 of \$1.60 | 6/10 of \$3.85, 4/10 of \$0.10 | −\$0.51 |
| 7/10 of \$2.00, 3/10 of \$1.60 | 7/10 of \$3.85, 3/10 of \$0.10 | −\$0.85 |
| 8/10 of \$2.00, 2/10 of \$1.60 | 8/10 of \$3.85, 2/10 of \$0.10 | −\$1.18 |
| 9/10 of \$2.00, 1/10 of \$1.60 | 9/10 of \$3.85, 1/10 of \$0.10 | −\$1.52 |
| 10/10 of \$2.00, 0/10 of \$1.60 | 10/10 of \$3.85, 0/10 of \$0.10 | −\$1.85 |

# Existing evidence

- Higher tolerance to risk among men than among women is well-acknowledged in the literature (Eckel and Grossman, 2008; Croson and Gneezy, 2009):
  - In laboratory setting — e.g. Holt and Laury lotteries (Holt and Laury, 2001), investment games (Charness and Gneezy, 2012) etc.
  - In real life — e.g., financial decisions (Powell and Ansic, 1997) and sports competition (Lackner and Böheim, 2013), where women are shown not to take risky opportunities in pole vault and high jump, even if it is beneficial for them.
  - In social interactions — although here women are more competitive in all-women than in mixed environments (Booth and Nolan, 2012)
- In connection to this, in an influential paper, Niederle and Vesterlund (2007) have shown that women are significantly less competitive than men, even controlling for risk preferences.
- Some studies question significant differences in self-reported (Ronay and Kim, 2006) and laboratory (Filippin and Crosetto, 2016) contexts.

# Hypotheses

H1: Age effect Differences in risk preferences hold between between men and women, but not between boys and girls.

Method: Incentivized individual decisions under uncertainty offered to people at different ages — from kindergarden to university.

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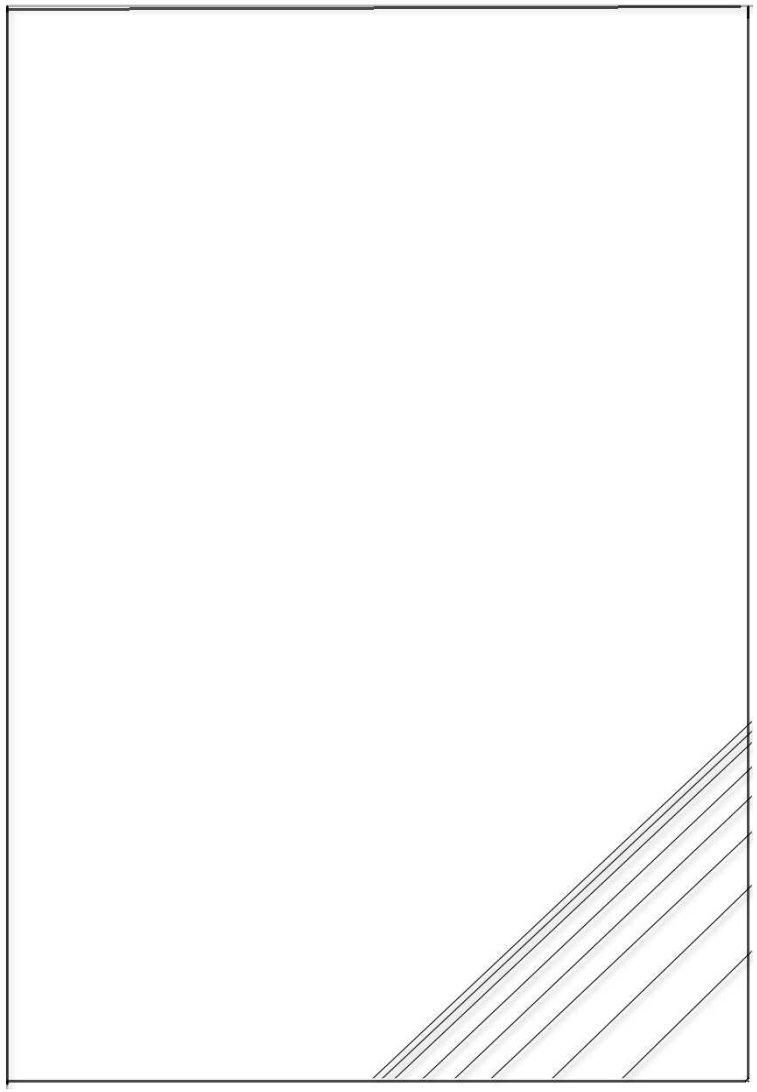
Method: Incentivized individual decisions under uncertainty offered to people at different ages — from kindergarden to university.

H2: Predetermination Observed discrepancies in risk tolerance of the adults emerge as a result of socialization rather than by force of biologically pre-programmed differences between the sexes.

Method: Incentivized experiments with twins (to be conducted).

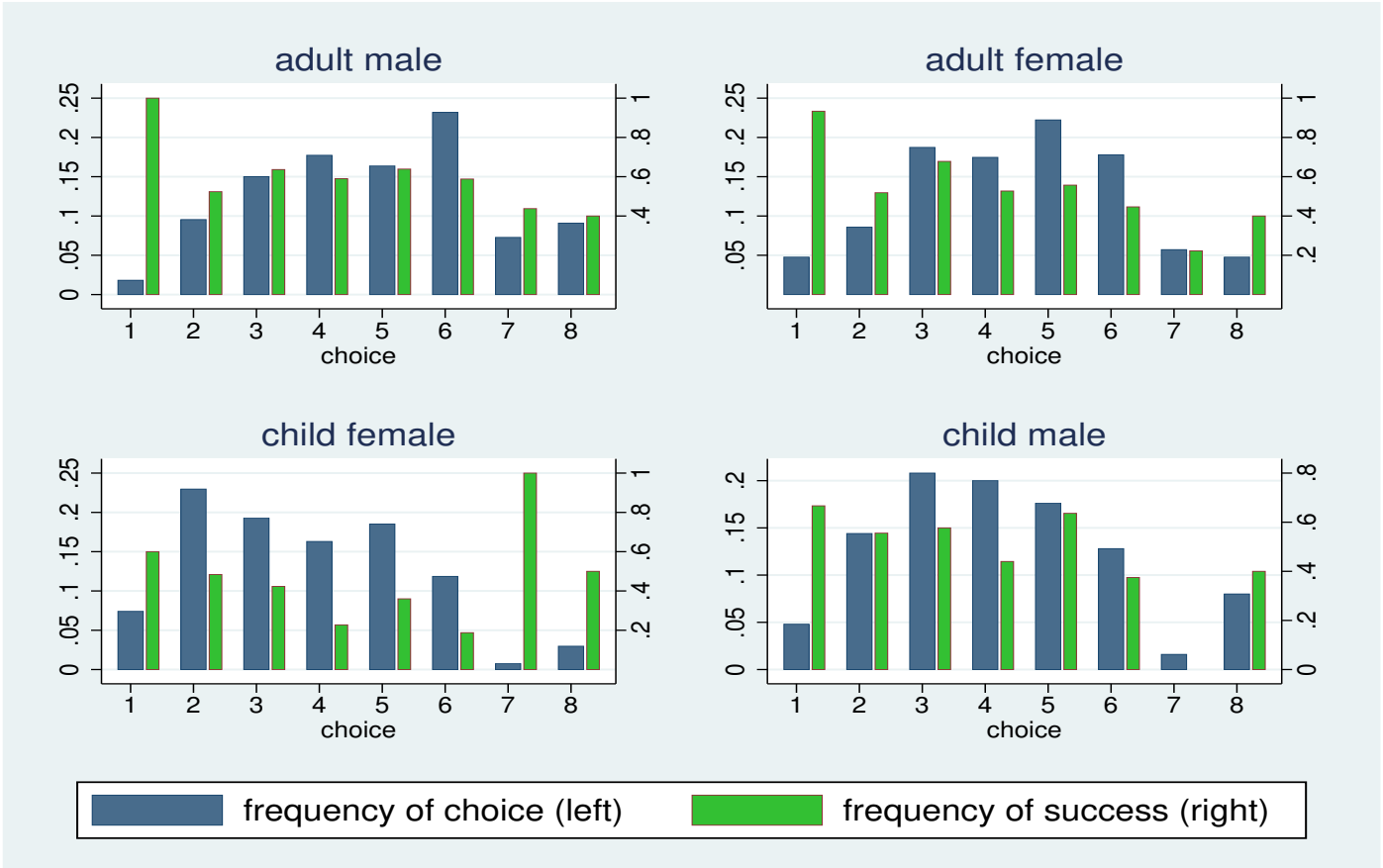
# Our experiment



# Design

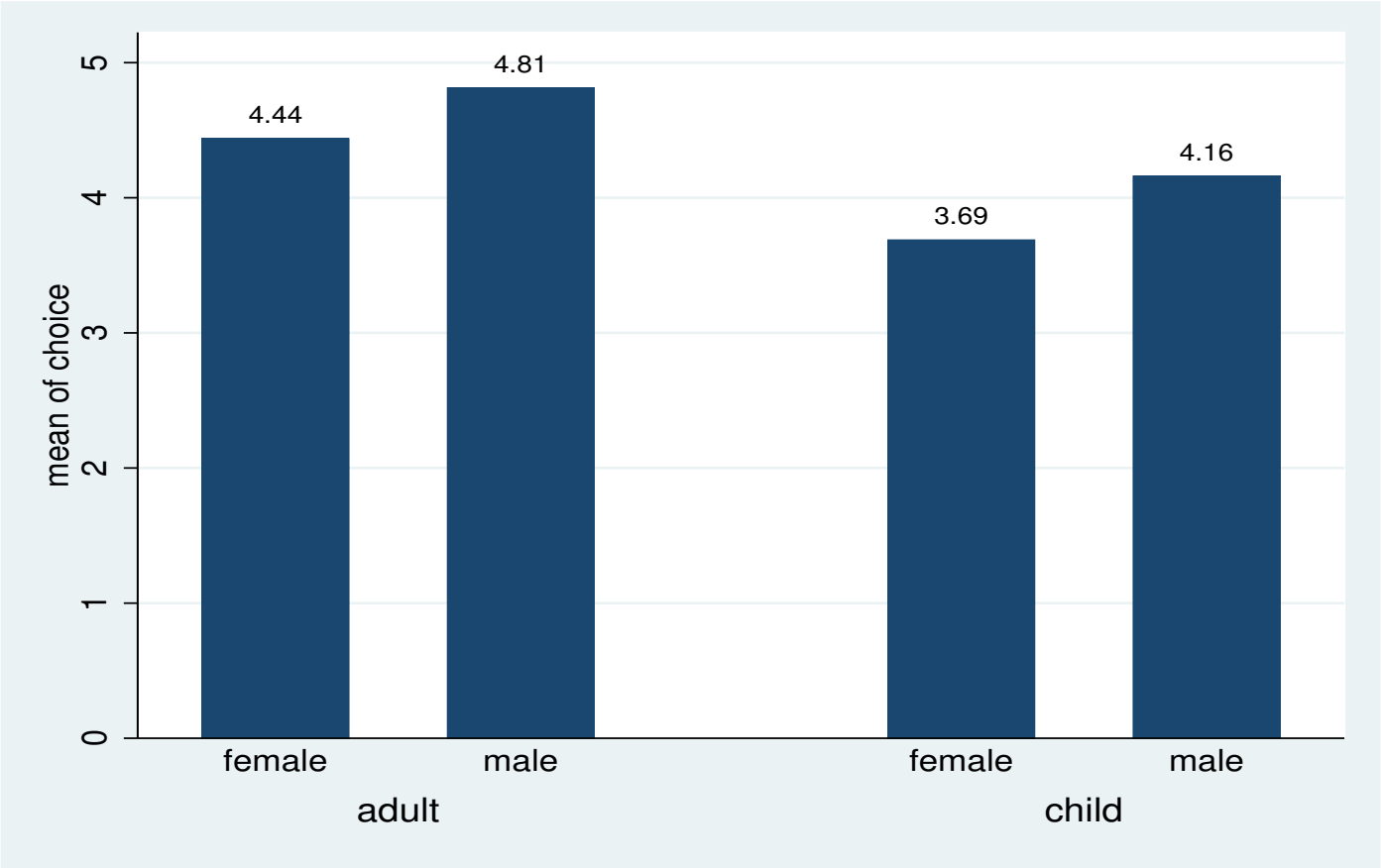
- Free choice task of one of the 8 sectors, to repeat 5 times. Ss have to mark each target with circled numbered spot, and outcome with number.
- Child: Moscow kindergardens, 43 children aged 3-8, female 52%. Rewards: fruits (grapes) by number of successful attempt
- Adult: Students from Moscow all Russia (various samples), overall 107 people aged 18-23, female 59%. Rewards: fruits (grapes), grade point scores, unmotivated points, money (10 RuR x number of successful sector).
- Conducted with the participation of the same experimenter.
- Excluding observations from subjects who did not properly completed the task (10 adults).
- Compared with conventional measures (self-reported risk and Hold-Laury MPL).

# General statistics



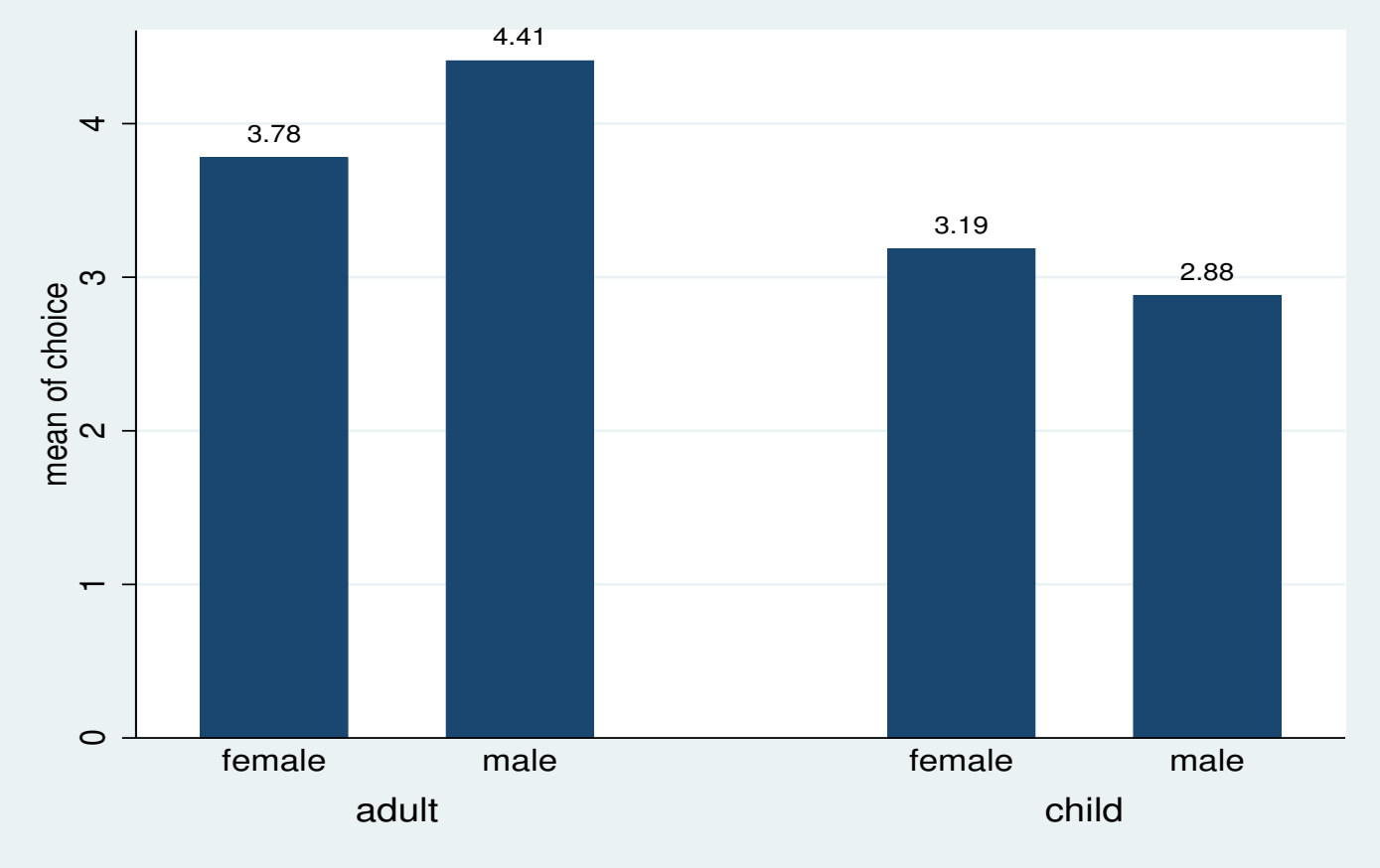

On aggregate, unimodal choices, and slightly declining success rates. Average shares of successful hits are all in the range 51-57%, except for girls (38%).

# Result I: no difference by gender in mean choices



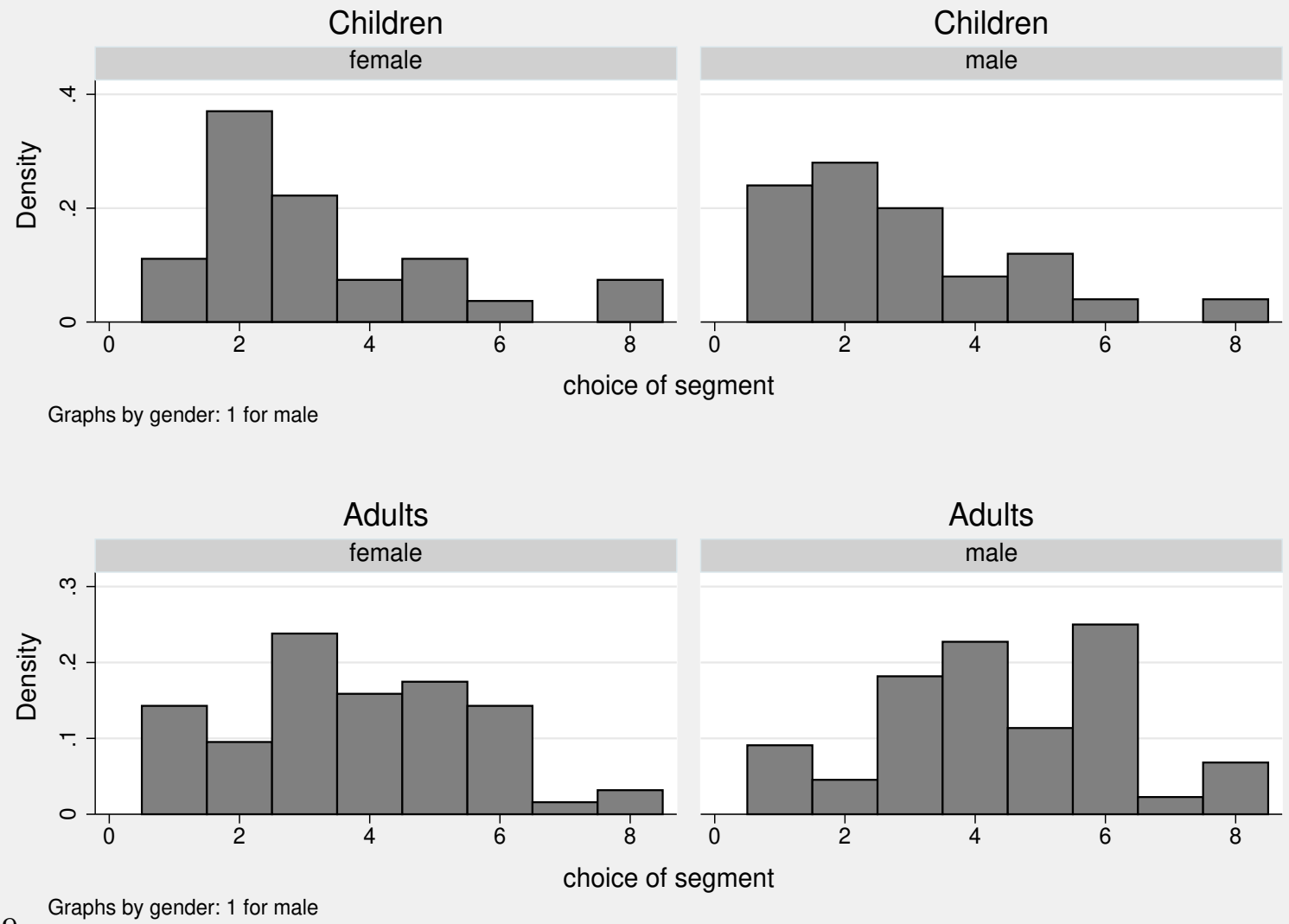

Adults are more risky, but no significant difference between boys and girls (Wilcoxon-Mann-Whitney for mean category $z = 1.97, p < 0.047$) and adult males and females (WMW $z = 2.29, p < 0.021$).

# Result II: difference in first trial




Expected, but not very strong difference between adult males and females (WMW $z = 1.83, p < 0.083$), no difference between boys and girls (WMW $z = 0.64, p < 0.51$).

# Result II: distributions of first trials



# Result III: strategies conditional on past outcomes

Frequencies of strategy changes after Success

| | Bet Up | | | | Bet Down | | | |
|---|---|---|---|---|---|---|---|---|
| | Adult | | Children | | Adult | | Children | |
| statistics | female | male | female | male | female | male | female | male |
| freq.of change | 0.61* | 0.49* | 0.51 | 0.62 | 0.19 | 0.17 | 0.26 | 0.27 |
| st.dev. | 0.48 | 0.50 | 0.50 | 0.48 | 0.39 | 0.38 | 0.44 | 0.45 |
| median | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |

* $\chi^2 = 3.26, \mathrm{p} < 0.071$

Frequencies of strategy changes after Failure

| | Bet Up | | | | Bet Down | | | |
|---|---|---|---|---|---|---|---|---|
| | Adult | | Children | | Adult | | Children | |
| statistics | female | male | female | male | female | male | female | male |
| freq.of change | 0.32* | 0.18* | 0.42 | 0.55 | 0.33 | 0.31 | 0.36 | 0.24 |
| st.dev. | 0.46 | 0.39 | 0.49 | 0.50 | 0.47 | 0.46 | 0.48 | 0.43 |
| median | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

* $\chi^2 = 4.15, \mathrm{p} < 0.041$

Women are more reactive to outcomes than men; no difference for children.

# Result III: strategies conditional on past outcomes

Frequencies of keeping the same strategy

| | after Success | | | | after Failure | | | |
|---|---|---|---|---|---|---|---|---|
| | Adult | | Children | | Adult | | Children | |
| statistics | female | male | female | male | female | male | female | male |
| freq.of same | 0.19 | 0.33 | 0.22 | 0.09 | 0.34 | 0.50 | 0.21 | 0.20 |
| st.dev. | 0.39 | 0.47 | 0.42 | 0.30 | 0.47 | 0.50 | 0.40 | 0.40 |
| $\chi^2$ | $5.67^{***}$ | | $2.79^{*}$ | | $4.51^{**}$ | | 0.000 | |

after Success: women adjust their strategies significantly more often than men. Girls do it somewhat more often than boys, but this is only marginally significant.

after Failure: women adjust their strategies significantly more often than men (measure of risk aversion!). Girls and boys do so at the same frequency.

# Discussion

- In general, adult women are more dynamic in adjusting to success-failure than adult males; children behave similarly.
- Comparison to conventional measures (Holt-Laury MPL task) — positive correlation, but Cronbach's alpha only 0.44.
- Important explanation to these observations is aspiration level (Hoppe, 1930): at first attempt, subjects do not know their skills in the task $\Rightarrow$ this attempt is a good proxy for aspiration.
- This calls for measures of proper risk aversion, i.e. risky decisions cleaned of aspiration and of material interest (also referred as to gain-free risk, or risk for the sake of adrenaline).
- This is estimated by means of a structural model that would disentangle these two factors (in progress).

# Conclusion

- Hypothesis 1 is confirmed at a disaggregate level: first decision of adults and reactions to past outcomes differs across gender for adults, for children, this is not observed.
- Hypothesis 2: work in progress.
- Reaction to success-failure of females is different to that of males.
- Need to disentangle different factors which enter the common notion of risk preferences.

Thank you – Comments and suggestions are much welcomed!