

Online Appendix

Happy Times: Measuring Happiness Using Response Times

Shuo Liu and Nick Netzer

September 2023

A Additional Tables and Figures

	Response Time		
	(1)	(2)	(3)
Follow-Up Response	-0.803 (0.1737)	-0.912 (0.1715)	-0.657 (0.2036)
R-squared	0.0045	0.0055	0.0052
Demographics & Treatment	NO	YES	NO
Individual FE	NO	NO	YES

Notes: All regressions include all observations from the binary survey and the observations with non-intermediate responses from the trinary survey. The dependent variable is each subject’s response time in the initial substantive question (not including the follow-up). Follow-Up Response is a dummy that takes the value one if the subject chose the extreme response (e.g. “very happy” or “very unhappy”) in the corresponding follow-up question. All regressions include question fixed effects. The demographic controls are gender, age, education, marital status, co-residence with children, and family income. Treatment is a dummy for the survey version (binary versus trinary). Column (3) is a fixed-effect model which controls for heterogeneity at the subject level. Robust standard errors are reported in parentheses, with the ones in columns (1) and (2) being clustered at the subject level. The R-squared value reported in column (3) indicates variation within subjects.

TABLE A1: Regression analysis of chronometric effects (raw data).

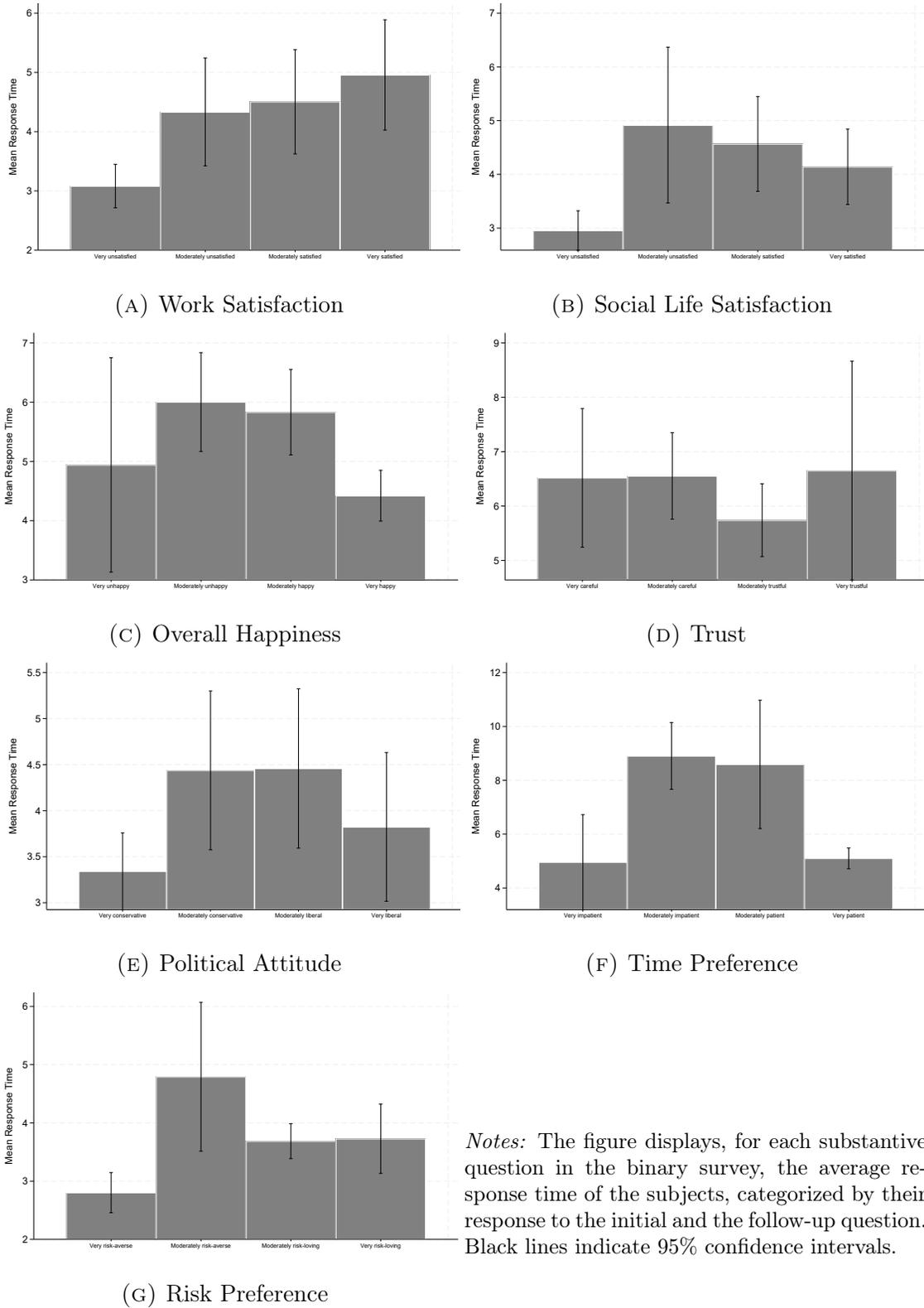


FIGURE A1: Chronometric effect by question in the binary survey (raw data).

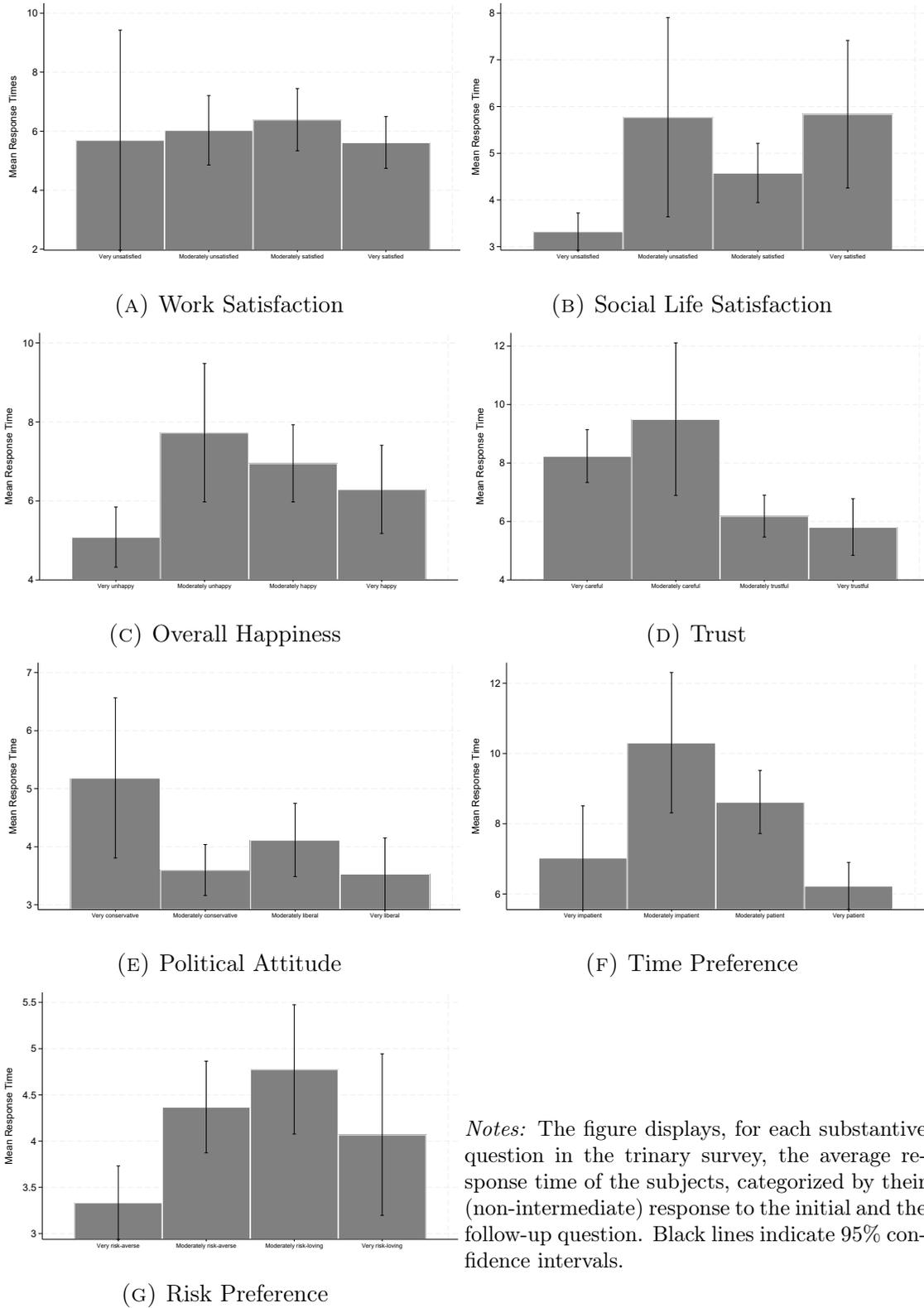


FIGURE A2: Chronometric effect by question in the trinary survey (raw data).

	Log Normalized RT Follow-Up		
	(1)	(2)	(3)
Log Normalized RT Initial	0.595 (0.0126)	0.589 (0.0130)	0.117 (0.0102)
R-squared	0.3782	0.3828	0.1250
Demographics & Treatment	NO	YES	NO
Individual FE	NO	NO	YES

Notes: All regressions include all observations with extreme responses to both the initial and the related follow-up question (e.g. “rather unhappy” followed by “very unhappy”) from the binary and the trinary survey. The dependent variable is each subject’s log normalized response time in the follow-up question. Log Normalized RT Initial is the subject’s log normalized response time in the initial question. All regressions include question fixed effects. The demographic controls are gender, age, education, marital status, co-residence with children, and family income. Treatment is a dummy for the survey version (binary versus trinary). Column (3) is a fixed-effect model which controls for heterogeneity at the subject level. Robust standard errors are reported in parentheses, with the ones in columns (1) and (2) being clustered at the subject level. The R-squared value reported in column (3) indicates variation within subjects.

TABLE A2: Response time correlation, extreme follow-up response.

	Log Normalized RT Follow-Up		
	(1)	(2)	(3)
Log Normalized RT Initial	0.523 (0.0153)	0.511 (0.0153)	0.071 (0.0117)
R-squared	0.4132	0.4224	0.4158
Demographics & Treatment	NO	YES	NO
Individual FE	NO	NO	YES

Notes: All regressions include all observations with an extreme response to the initial question and a moderate response to the related follow-up question (e.g. “rather unhappy” followed by “moderately unhappy”) from the binary and the trinary survey. The dependent variable is each subject’s log normalized response time in the follow-up question. Log Normalized RT Initial is the subject’s log normalized response time in the initial question. All regressions include question fixed effects. The demographic controls are gender, age, education, marital status, co-residence with children, and family income. Treatment is a dummy for the survey version (binary versus trinary). Column (3) is a fixed-effect model which controls for heterogeneity at the subject level. Robust standard errors are reported in parentheses, with the ones in columns (1) and (2) being clustered at the subject level. The R-squared value reported in column (3) indicates variation within subjects.

TABLE A3: Response time correlation, moderate follow-up response.

	Response Time Follow-Up		
	(1)	(2)	(3)
Response Time Initial	0.083 (0.0227)	0.083 (0.0227)	0.036 (0.0229)
R-squared	0.0136	0.0142	0.0094
Demographics & Treatment	NO	YES	NO
Individual FE	NO	NO	YES

Notes: All regressions include all observations with extreme responses to both the initial and the related follow-up question (e.g. “rather unhappy” followed by “very unhappy”) from the binary and the trinary survey. The dependent variable is each subject’s response time in the follow-up question. Response Time Initial is the subject’s response time in the initial question. All regressions include question fixed effects. The demographic controls are gender, age, education, marital status, co-residence with children, and family income. Treatment is a dummy for the survey version (binary versus trinary). Column (3) is a fixed-effect model which controls for heterogeneity at the subject level. Robust standard errors are reported in parentheses, with the ones in columns (1) and (2) being clustered at the subject level. The R-squared value reported in column (3) indicates variation within subjects.

TABLE A4: Response time correlation, extreme follow-up response (raw data).

	Response Time Follow-Up		
	(1)	(2)	(3)
Response Time Initial	0.038 (0.0134)	0.037 (0.0129)	0.003 (0.0082)
R-squared	0.0490	0.0520	0.0545
Demographics & Treatment	NO	YES	NO
Individual FE	NO	NO	YES

Notes: All regressions include all observations with an extreme response to the initial question and a moderate response to the related follow-up question (e.g. “rather unhappy” followed by “moderately unhappy”) from the binary and the trinary survey. The dependent variable is each subject’s response time in the follow-up question. Response Time Initial is the subject’s response time in the initial question. All regressions include question fixed effects. The demographic controls are gender, age, education, marital status, co-residence with children, and family income. Treatment is a dummy for the survey version (binary versus trinary). Column (3) is a fixed-effect model which controls for heterogeneity at the subject level. Robust standard errors are reported in parentheses, with the ones in columns (1) and (2) being clustered at the subject level. The R-squared value reported in column (3) indicates variation within subjects.

TABLE A5: Response time correlation, moderate follow-up response (raw data).

B Questionnaires

This appendix contains the exact phrasing of all questions and possible answers from our MTurk survey, in the order in which they appeared. A difference between the binary and the trinary version of the survey exists only for the substantive questions.

1. Welcome Screen

Welcome!

This survey is carried out for a research project at the University of Zurich, Switzerland. The survey is for scientific purposes only.

There are no known risks for you if you decide to participate in this survey, nor will you experience any costs when participating in the survey. This survey is anonymous. The information you provide will not be stored or used in any way that could reveal your personal identity.

For more information please contact descil@ethz.ch.

Answer possibilities:

- I have read and understood the consent form and agree to participate in this survey.

2. Socio-Demographic Question 1: Gender

What is your gender?

Answer possibilities:

- Female
- Male

3. Socio-Demographic Question 2: Age

What is your age?

Answer possibilities:

- younger than 20
- 20 – 29
- 30 – 39
- 40 – 49

- 50 – 59
- 60 – 69
- 70 or older

4. Socio-Demographic Question 3: Education

What is the highest level of education that you completed?

Answer possibilities:

- High school
- College degree or higher
- None of the above

5. Socio-Demographic Question 4: Marital Status

What is your current marital status?

Answer possibilities:

- Married
- Unmarried

6. Socio-Demographic Question 5: Children

Are there any children currently living in your household?

Answer possibilities:

- Yes
- No

7. Socio-Demographic Question 6: Income

In which of these groups did your total family income, from all sources, fall last year before taxes?

Answer possibilities:

- Under \$ 40,000
- \$ 40,000 to 69,999
- \$ 70,000 or over

8. Substantive Question 1: Work Satisfaction

How satisfied are you with the work you do?

Answer possibilities binary:

- Rather satisfied
- Rather unsatisfied

Answer possibilities trinary:

- Rather satisfied
- Neither satisfied nor unsatisfied
- Rather unsatisfied

Follow-up:

You have answered that you are rather satisfied with the work you do in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how satisfied you are with the work you do?

Answer possibilities:

- Very satisfied
- Moderately satisfied

You have answered that you are neither satisfied nor unsatisfied with the work you do in the previous question. We now want to follow up on that question and ask you for a more refined answer. Concerning how satisfied you are with the work you do, in which direction do you tend more?

Answer possibilities:

- Tend more toward satisfied
- Tend more toward unsatisfied

You have answered that you are rather unsatisfied with the work you do in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how unsatisfied you are with the work you do?

Answer possibilities:

- Very unsatisfied

- Moderately unsatisfied

9. Substantive Question 2: Social Life Satisfaction

How satisfied are you with your social life?

Answer possibilities binary:

- Rather satisfied
- Rather unsatisfied

Answer possibilities trinary:

- Rather satisfied
- Neither satisfied nor unsatisfied
- Rather unsatisfied

Follow-up:

You have answered that you are rather satisfied with your social life in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how satisfied you are with your social life?

Answer possibilities:

- Very satisfied
- Moderately satisfied

You have answered that you are neither satisfied nor unsatisfied with your social life in the previous question. We now want to follow up on that question and ask you for a more refined answer. Concerning how satisfied you are with your social life, in which direction do you tend more?

Answer possibilities:

- Tend more toward satisfied
- Tend more toward unsatisfied

You have answered that you are rather unsatisfied with your social life in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how satisfied you are with your social life?

Answer possibilities:

- Very unsatisfied
- Moderately unsatisfied

10. **Substantive Question 3: Overall Happiness**

Binary: Taken all together, how would you say things are these days? Would you say that you are rather happy or rather unhappy?

Trinary: Taken all together, how would you say things are these days? Would you say that you are rather happy, neither happy nor unhappy, or rather unhappy?

Answer possibilities binary:

- Rather happy
- Rather unhappy

Answer possibilities trinary:

- Rather happy
- Neither happy nor unhappy
- Rather unhappy

Follow-up:

You have answered that you are rather happy in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how you are these days, taken all together?

Answer possibilities:

- Very happy
- Moderately happy

You have answered that you are neither happy nor unhappy in the previous question. We now want to follow up on that question and ask you for a more refined answer. Concerning how you are these days, taken all together, in which direction do you tend more?

Answer possibilities:

- Tend more toward happy
- Tend more toward unhappy

You have answered that you are rather unhappy in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how you are these days, taken all together?

Answer possibilities:

- Very unhappy
- Moderately unhappy

11. Substantive Question 4: Trust

Binary: Generally speaking, would you say that people can be trusted or that you have to be careful in dealing with people?

Trinary: Generally speaking, would you say that people can be trusted or that you can't be too careful in dealing with people?

Answer possibilities binary:

- People can be trusted
- You have to be careful in dealing with people

Answer possibilities trinary:

- People can often be trusted
- People can sometimes be trusted
- You have to be careful in dealing with people

Follow-up:

You have answered that people can (trinary: often) be trusted in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how much you think people can be trusted?

Answer possibilities:

- Very much
- Moderately much

You have answered that people can sometimes be trusted in the previous question. We now want to follow up on that question and ask you for a more refined answer. Concerning how much you think people can be trusted, in which direction do you tend more?

Answer possibilities:

- Tend more toward trusting people
- Tend more toward being careful in dealing with people

You have answered that you have to be careful in dealing with people in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how careful you think you have to be in dealing with people?

Answer possibilities:

- Very careful
- Moderately careful

12. Substantive Question 5: Political Attitude

Binary: Would you say you are a rather liberal or a rather conservative person?

Trinary: Would you say you are a liberal, a moderate, or a conservative person?

Answer possibilities binary:

- Rather liberal
- Rather conservative

Answer possibilities trinary:

- Rather liberal
- Moderate
- Rather conservative

Follow-up:

You have answered that you are a (binary: rather) liberal person in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how liberal you are?

Answer possibilities:

- Very liberal
- Moderately liberal

You have answered that you are a moderate person in the previous question. We now want to follow up on that question and ask you for a more refined answer. In which direction do you tend more?

Answer possibilities:

- Tend more toward liberal
- Tend more toward conservative

You have answered that you are a (binary: rather) conservative person in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how conservative you are?

Answer possibilities:

- Very conservative
- Moderately conservative

13. **Substantive Question 6: Time Preference**

How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?

Answer possibilities binary:

- Rather willing
- Rather unwilling

Answer possibilities trinary:

- Rather willing
- Neither willing nor unwilling
- Rather unwilling

Follow-up:

You have answered that you are rather willing to give up something today for a future benefit in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how willing you are to give up something that is beneficial for you today in order to benefit more from that in the future?

Answer possibilities:

- Very willing
- Moderately willing

You have answered that you are neither willing nor unwilling to give up something today for a future benefit in the previous question. We now want to follow up on that question and ask you for a more refined answer. Concerning how willing you are to give up something that is beneficial for you today in order to benefit more from that in the future, in which direction do you tend more?

Answer possibilities:

- Tend more toward willing
- Tend more toward unwilling

You have answered that you are rather unwilling to give up something today for a future benefit in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how unwilling you are to give up something that is beneficial for you today in order to benefit more from that in the future?

Answer possibilities:

- Very unwilling
- Moderately unwilling

14. **Substantive Question 7: Risk Preference**

In general, how willing are you to take risks?

Answer possibilities binary:

- Rather willing
- Rather unwilling

Answer possibilities trinary:

- Rather willing
- Neither willing nor unwilling
- Rather unwilling

Follow-up:

You have answered that you are rather willing to take risks in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how willing you are to take risks?

Answer possibilities:

- Very willing
- Moderately willing

You have answered that you are neither willing nor unwilling to take risks. We now want to follow up on that question and ask you for a more refined answer. Concerning how willing you are to take risks, in which direction do you tend more?

Answer possibilities:

- Tend more toward willing
- Tend more toward unwilling

You have answered that you are rather unwilling to take risks in the previous question. We now want to follow up on that question and ask you for a more refined answer. What describes best how unwilling you are to take risks?

Answer possibilities:

- Very unwilling
- Moderately unwilling

15. Attention Check

What is 7 times 2?

Answer possibilities:

- 2
- 7
- 9
- 14
- 16
- 49

C Results for Restricted Sample

This appendix contains all main results of our empirical analysis when those subjects are excluded whose first three IP address blocks appeared more than once. Among the remaining subjects, 74 failed the attention check, and for 84 no click and time data were recorded.

	binary survey	trinary survey
# participants	2,350	2,278
female	52.72%	53.91%
male	47.28%	46.09%
age		
< 20	0.51%	0.75%
20 – 29	21.32%	24.41%
30 – 39	36.55%	33.63%
40 – 49	20.77%	20.81%
50 – 59	12.13%	11.85%
60 – 69	7.15%	7.16%
≥ 70	1.57%	1.40%
highest education		
high school	24.89%	25.64%
college or higher	74.60%	74.01%
none	0.51%	0.35%
married	51.02%	50.18%
unmarried	48.98%	49.82%
kids	46.43%	46.01%
no kids	53.57%	53.99%
income		
< \$40,000	31.36%	31.87%
\$40,000 – \$69,999	36.34%	36.83%
≥ \$70,000	32.30%	31.30%

TABLE C1: Summary of subject demographics (restricted sample).

Roughly 90% of the subjects completed the survey within 5 minutes. The median duration was 117s and the average duration was 153s.

	binary survey	trinary survey
complete survey	112	122
demographic questions		
gender	1.44	1.44
age	1.89	1.90
education	1.96	1.99
marital status	1.45	1.45
kids	1.65	1.67
income	2.31	2.31
substantive questions		
work satisfaction	2.70	3.45
social life satisfaction	2.69	3.05
overall happiness	3.51	4.25
trust	3.62	4.72
political attitude	2.22	2.32
time preference	5.16	5.72
risk preference	2.57	2.96

TABLE C2: Median response times in seconds (restricted sample).

	Log Normalized Response Time		
	(1)	(2)	(3)
Follow-Up Response	-0.296 (0.0151)	-0.275 (0.0140)	-0.125 (0.0084)
R-squared	0.0916	0.1225	0.1559
Demographics & Treatment	NO	YES	NO
Individual FE	NO	NO	YES

Notes: All regressions include all observations from the binary survey and the observations with non-intermediate responses from the trinary survey. The dependent variable is each subject’s log response time in the initial substantive question (not including the follow-up), normalized by subtracting the log response time in the marital status question. Follow-Up Response is a dummy that takes the value one if the subject chose the extreme response (e.g. “very happy” or “very unhappy”) in the corresponding follow-up question. All regressions include question fixed effects. The demographic controls are gender, age, education, marital status, co-residence with children, and family income. Treatment is a dummy for the survey version (binary versus trinary). Column (3) is a fixed-effect model which controls for heterogeneity at the subject level. Robust standard errors are reported in parentheses, with the ones in columns (1) and (2) being clustered at the subject level. The R-squared value reported in column (3) indicates variation within subjects.

TABLE C3: Regression analysis of chronometric effects (restricted sample).

As the following two figures show, the hump-shape in average response times exists for all substantive questions in both versions of the survey, and most of the relevant pairwise differences are statistically significant at the 1% level.¹

¹Among the 28 pairwise comparisons, 23 are significant at the 1% level according to a t-test (two-sided, unequal variances), with the exceptions being in the trinary survey: the pair “very unsatisfied” and “moderately unsatisfied” in the work satisfaction question ($p = 0.3000$), the pair “very unhappy” and “moderately unhappy” in the overall happiness question ($p = 0.0225$), the pair “very careful” and “moderately careful” in the trust question ($p = 0.7079$), the pair “very conservative” and “moderately conservative” in the political attitude question ($p = 0.0233$), and the pair “very impatient” and “moderately impatient” in the time preference question ($p = 0.1512$). Using the non-normalized, raw response times, only 1 out of the 28 pairwise comparisons is significant at 1%, but 9 are at 5%, and all of them in the direction implied by the chronometric effect.

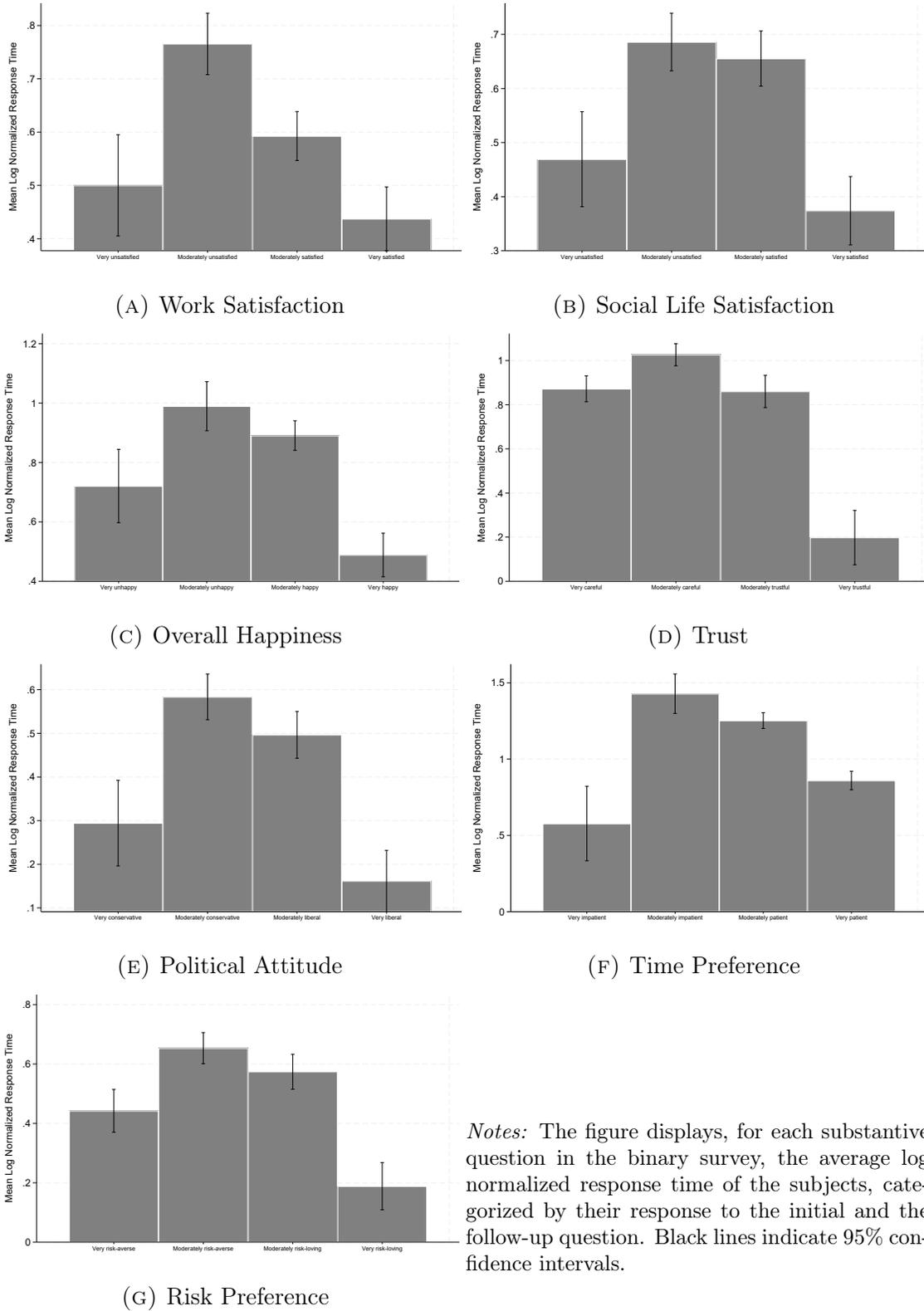


FIGURE C1: Chronometric effect by question in the binary survey (restricted sample).

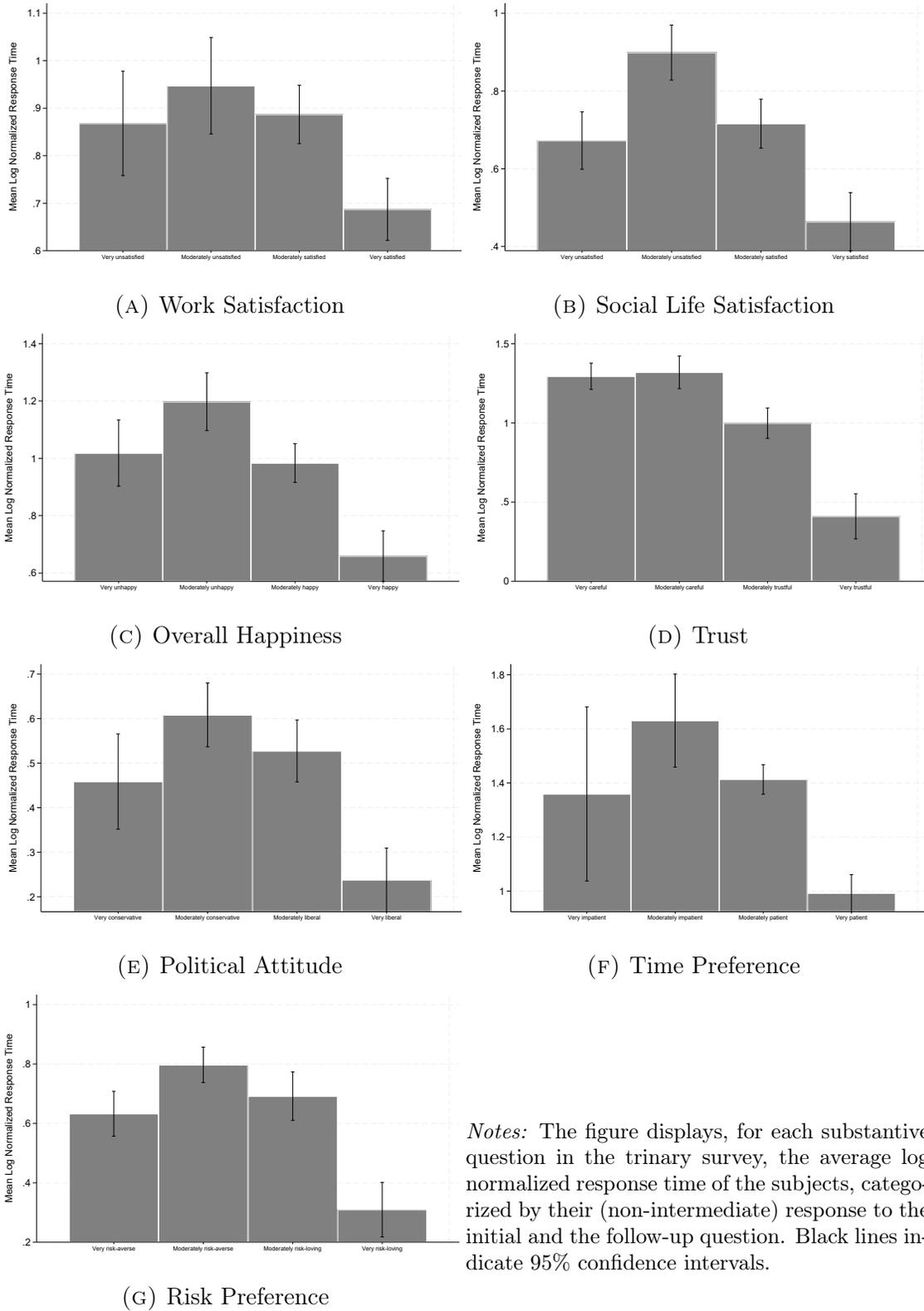


FIGURE C2: Chronometric effect by question in the trinary survey (restricted sample).

	work satisfac.	social satisfac.	overall happiness	trust	liberal- ism	patience	risk- taking
0: female	-0.044	0.022	-0.001	0.142	-0.127	0.007	0.397
1: male	(0.0553)	(0.0533)	(0.0559)	(0.0526)	(0.0525)	(0.0682)	(0.0523)
0: young	0.197	0.078	0.168	0.101	-0.285	-0.068	-0.273
1: middle-age	(0.0608)	(0.0582)	(0.0613)	(0.0572)	(0.0571)	(0.0739)	(0.0566)
0: middle-age	0.191	-0.018	0.148	0.142	0.004	-0.032	-0.267
1: old	(0.1130)	(0.1018)	(0.1126)	(0.0988)	(0.0988)	(0.1262)	(0.1000)
0: none	0.218	-0.248	-0.042	-0.187	-0.027	0.477	0.084
1: high-school	(0.3659)	(0.3782)	(0.3784)	(0.3787)	(0.3687)	(0.3993)	(0.3687)
0: high-school	0.534	0.283	0.347	0.443	0.126	0.084	0.285
1: college	(0.0619)	(0.0607)	(0.0627)	(0.0632)	(0.0604)	(0.0775)	(0.0601)
0: unmarried	0.688	0.602	0.674	0.397	-0.304	0.303	0.213
1: married	(0.0572)	(0.0543)	(0.0578)	(0.0530)	(0.0527)	(0.0691)	(0.0519)
0: no kids	0.587	0.540	0.514	0.298	-0.153	0.213	0.322
1: kids	(0.0575)	(0.0546)	(0.0577)	(0.0527)	(0.0526)	(0.0694)	(0.0522)
0: poor	0.674	0.432	0.552	0.454	-0.003	0.333	0.211
1: middle-income	(0.0674)	(0.0646)	(0.0673)	(0.0649)	(0.0642)	(0.0799)	(0.0632)
0: middle-income	0.009	0.055	0.077	-0.187	-0.106	0.200	-0.124
1: rich	(0.0713)	(0.0661)	(0.0716)	(0.0630)	(0.0633)	(0.0904)	(0.0628)

TABLE C4: Ordered probit analysis of the binary survey (restricted sample). Each cell corresponds to a regression of the question in the column on a dummy for membership to the group in the row. Coefficients are reported along with their robust standard errors in parentheses.

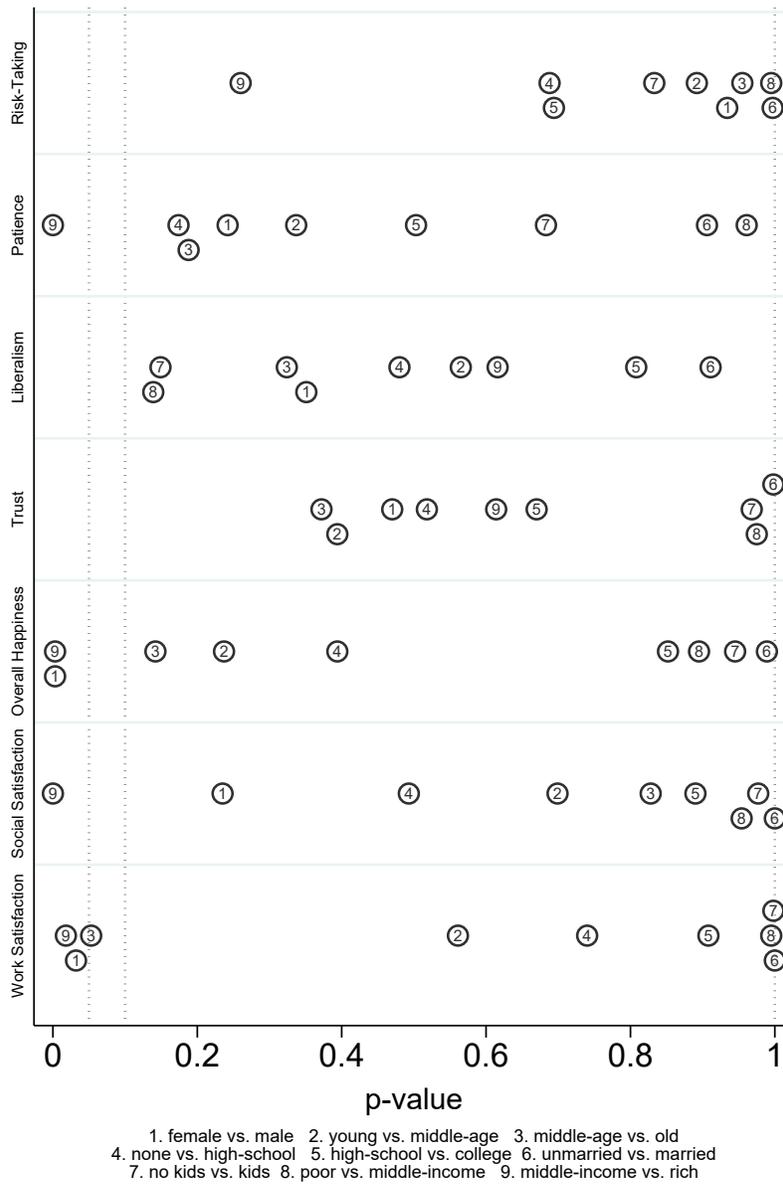


FIGURE C3: FOSD test in binary survey (restricted sample).

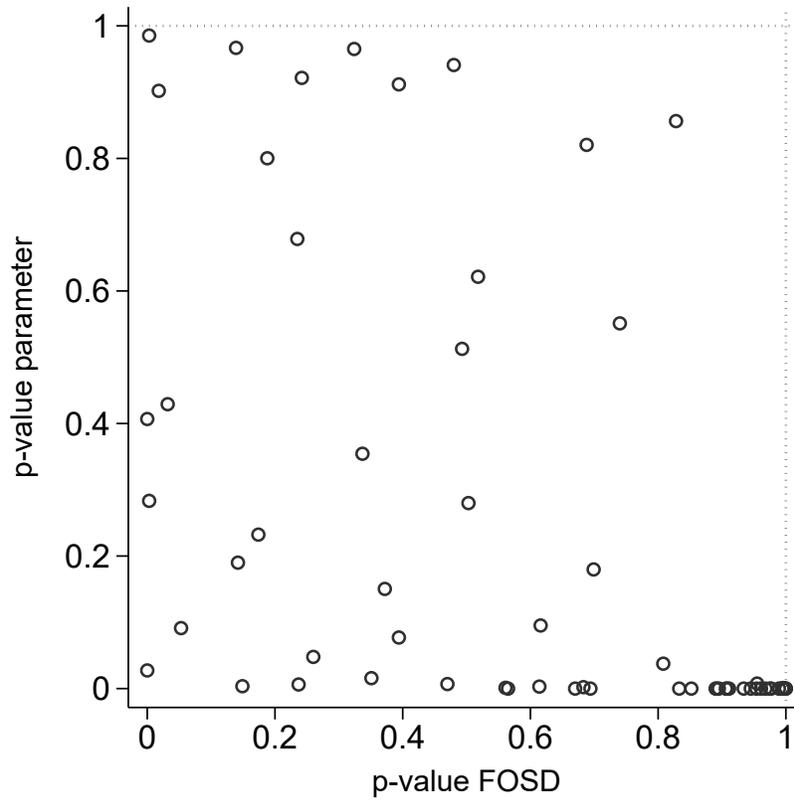


FIGURE C4: p -values in binary survey (restricted sample).

The correlation between the p -values in the scatter plot is $\rho = -0.5180$.

	work satisfac.	social satisfac.	overall happiness	trust	liberal- ism	patience	risk- taking
0: female	-0.029	0.142	0.034	0.101	-0.073	0.028	0.317
1: male	(0.0490)	(0.0488)	(0.0496)	(0.0469)	(0.0473)	(0.0540)	(0.0477)
0: young	0.095	0.017	-0.021	-0.023	-0.131	-0.049	-0.361
1: middle-age	(0.0531)	(0.0528)	(0.0543)	(0.0513)	(0.0517)	(0.0592)	(0.0524)
0: middle-age	0.052	-0.048	0.198	0.289	-0.019	-0.052	-0.044
1: old	(0.0904)	(0.0966)	(0.0962)	(0.0934)	(0.0960)	(0.1045)	(0.0939)
0: none	0.109	-0.741	0.481	0.482	0.215	0.606	-0.099
1: high-school	(0.2932)	(0.3280)	(0.3681)	(0.3335)	(0.3546)	(0.3275)	(0.3188)
0: high-school	0.427	0.351	0.369	0.349	0.095	0.166	0.217
1: college	(0.0547)	(0.0567)	(0.0565)	(0.0552)	(0.0536)	(0.0623)	(0.0544)
0: unmarried	0.538	0.537	0.594	0.348	-0.358	0.109	0.200
1: married	(0.0497)	(0.0490)	(0.0502)	(0.0470)	(0.0474)	(0.0538)	(0.0476)
0: no kids	0.452	0.358	0.438	0.192	-0.347	0.136	0.339
1: kids	(0.0498)	(0.0492)	(0.0502)	(0.0468)	(0.0475)	(0.0538)	(0.0478)
0: poor	0.448	0.297	0.385	0.336	-0.132	0.251	0.252
1: middle-income	(0.0589)	(0.0589)	(0.0590)	(0.0568)	(0.0572)	(0.0643)	(0.0578)
0: middle-income	0.063	0.056	0.179	-0.061	-0.098	0.058	-0.180
1: rich	(0.0607)	(0.0596)	(0.0621)	(0.0565)	(0.0573)	(0.0673)	(0.0577)

TABLE C5: Ordered probit analysis of the trinary survey (restricted sample). Each cell corresponds to a regression of the question in the column on a dummy for membership to the group in the row. Coefficients are reported along with their robust standard errors in parentheses.

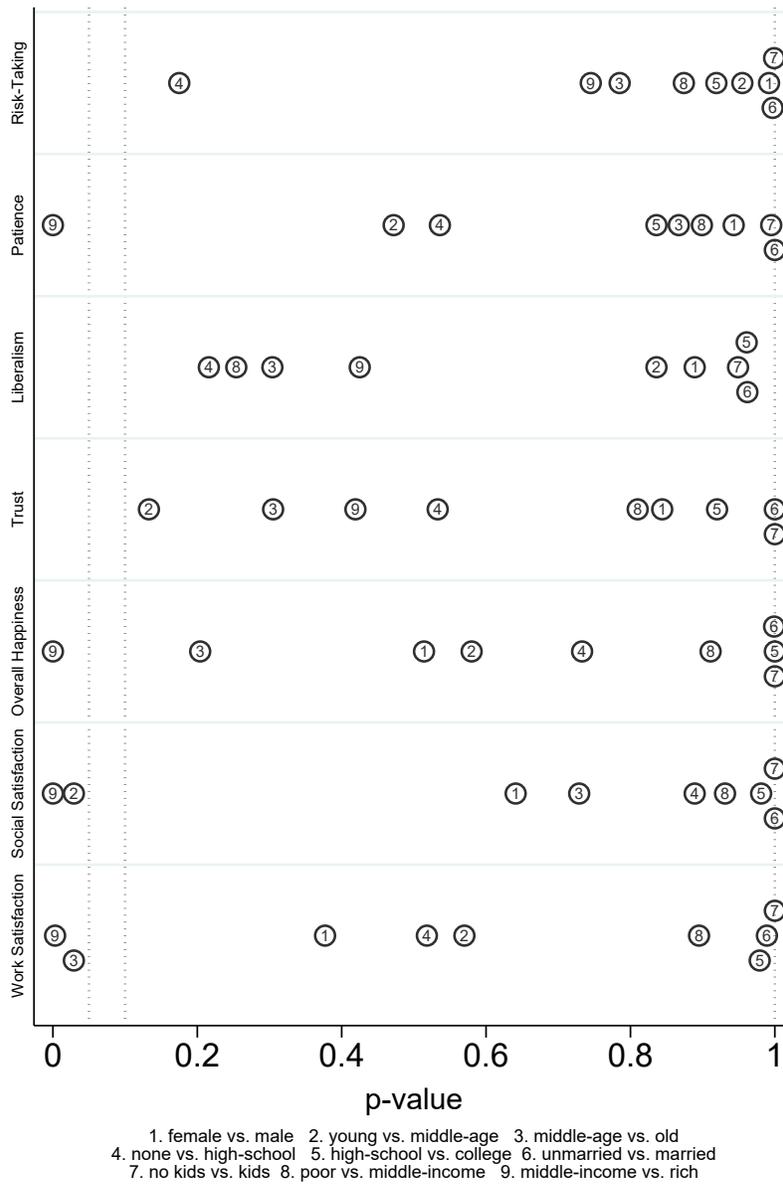


FIGURE C5: FOSD test in trinary survey (restricted sample).

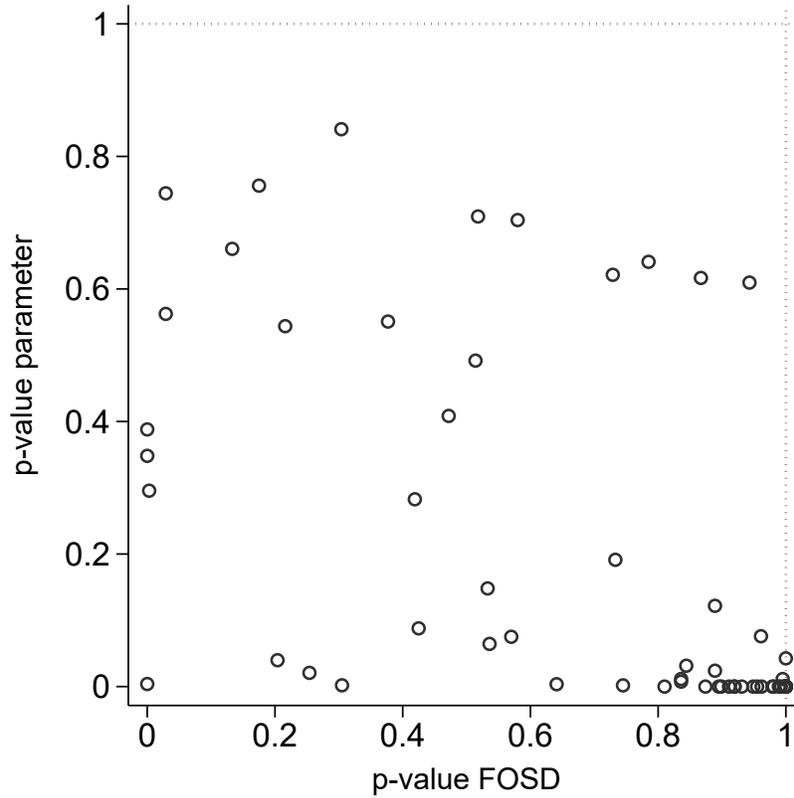


FIGURE C6: p -values in trinary survey (restricted sample).

The correlation between the p -values in the scatter plot is $\rho = -0.5599$.

The p -values of our FOSD tests are positively correlated between the binary and the trinary survey also in the restricted sample ($\rho = 0.6968$), and those in the trinary survey tend to be weakly larger (in 43 out of 63 cases).