Research Module in Management and Applied Economics

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Relationship between Personality Traits, Economic Preferences, and Cognition

Cognition and Personality Traits

Fundamental Identification Problem

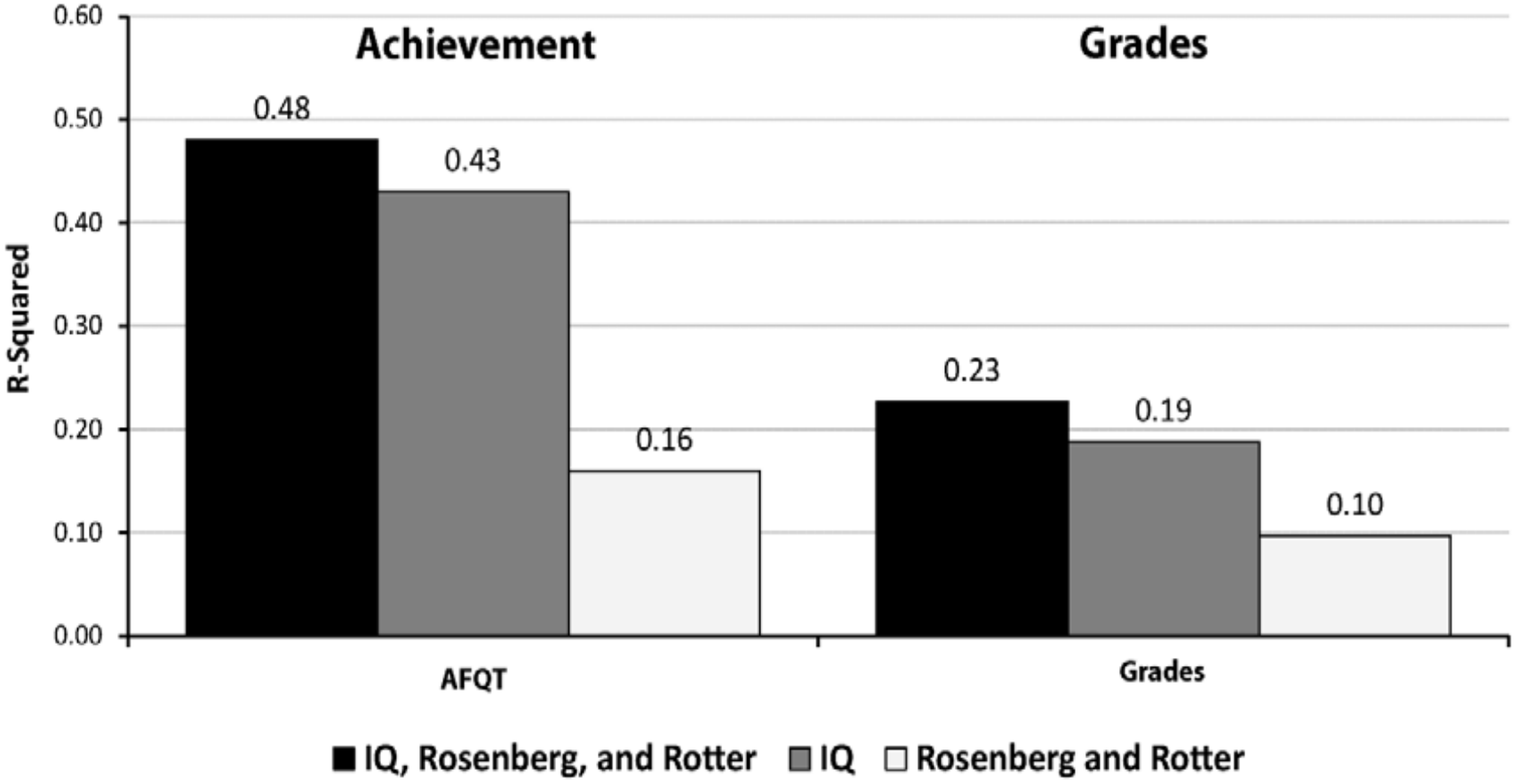
- A distinction between personality and cognition is not easy to make.
- Consider “quasi-cognitive” traits.
  - Include creativity, emotional intelligence, cognitive style, typical intellectual engagement, and practical intelligence.
- We typically infer cognition, character skills (e.g. personality) and preferences from observed performance of tasks.
  - Tasks performance likely depends on a whole set of skills

Example

- Analysis of executive function:
  - Sometimes described as cognitive functioning
  - Sometimes described as a function that regulates emotions and decision-making
  - →no clear conceptual distinction between cognitive traits and personality traits.
- Many measures of executive function do not correlate reliably with IQ.
- However, measures of one aspect of execution function - working memory capacity - correlate very highly with measures of fluid intelligence.

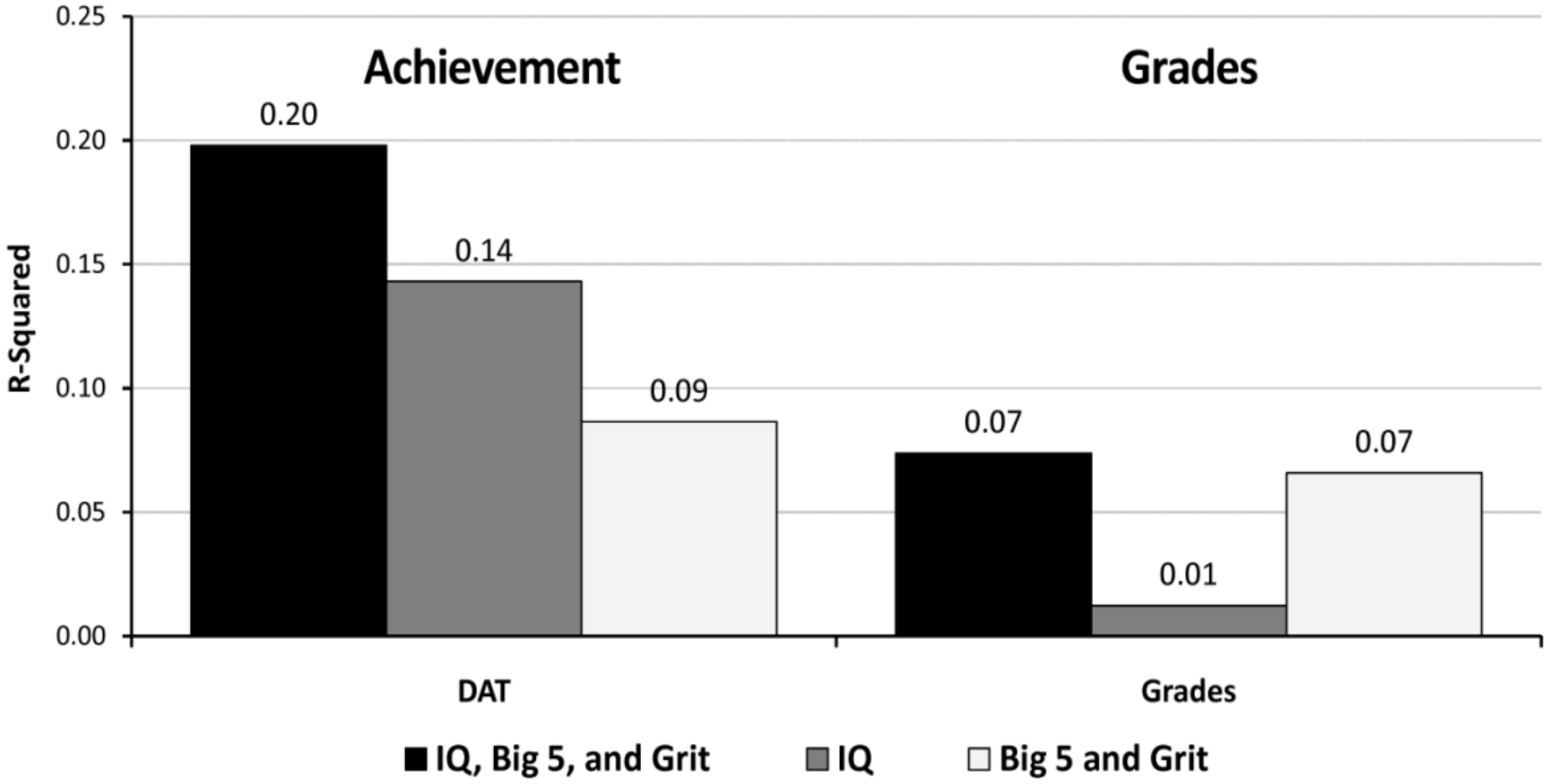
Achievement, Personality and IQ

Decomposing Achievement Tests and Grades into IQ and Personality



Source: Borghans, Golsteyn, Heckman, Humphries, ROA-RM 2011/4

Decomposing Achievement Tests and Grades into IQ and Personality



Source: Borghans, Golsteyn, Heckman, Humphries, ROA-RM 2011/4

Implications for Measurement of IQ

Interpretation of IQ Scores

- Intelligence is one aspect of personality.
- Isolating a pure measure of intelligence is difficult.
- IQ is a measure on how well a person responds to (performs on) intelligence tests.
- Performance on intelligence tests depends in part on personality traits.
  - Example: Test anxiety can impair performance
- It also depends on incentives, and on the interaction between incentives, personality and motivation.

Incentives, Personality and Performance on IQ Tests

- Borghans, Meijers and ter Weel (2008) show that students of Maastricht University spend more time answering IQ questions when rewards are high,
- but this effects is less strong for those who score high on Big Five traits Emotional Stability and Conscientiousness.

Table Incentives and Performance on Intelligence Tests

Study	Sample and Study Design	Experimental Group	Effect Size of Incentive (in Standard Deviations)	Summary
Edlund (1972)	Between subjects study. 11 matched pairs of low-SES children; children were about one standard deviation below average in IQ at baseline	M&M candies given for each right answer	Experimental group scored 12 points higher than control group during a second testing on an alternative form of the Stanford–Binet (about 0.8 standard deviations)	"… a carefully chosen consequence, candy, given contingent on each occurrence of correct responses to an IQ test, can result in a significantly higher IQ score." (p. 319)

Source: Table 1.5 in Almlund et al. (2011)

Table Incentives and Performance on Intelligence Tests

Study	Sample and Study Design	Experimental Group	Effect Size of Incentive (in Standard Deviations)	Summary
Ayllon and Kelly (1972) Sample 1	Within subjects study. 12 mentally retarded children (avg IQ, 46.8)	Tokens given in experimental condition for right answers exchangeable for prizes	6.25 points out of a possible 51 points on Metropolitan Readiness Test. *t* = 4.03	"… test scores often reflect poor academic skills, but they may also reflect lack of motivation to do well in the criterion test … These results, obtained from both a population typically limited in skills and ability, as well as from a group of
Ayllon and Kelly (1972) Sample 2	Within subjects study. 34 urban fourth graders (avg IQ = 92.8)	Tokens given in experimental condition for right answers exchangeable for prizes	*t* = 5.9	

Source: Table 1.5 in Almlund et al. (2011)

Table Incentives and Performance on Intelligence Tests

Study	Sample and Study Design	Experimental Group	Effect Size of Incentive (in Standard Deviations)	Summary
Ayllon and Kelly (1972) Sample 3	Within subjects study of 12 matched pairs of mentally retarded children	Six weeks of token reinforcement for good academic performance	Experimental group scored 3.67 points higher out of possible 51 points on a posttest given under standard conditions higher than at baseline; control group dropped 2.75 points. On a second posttest with incentives, expand control groups increased 7.17 and 6.25 points	normal children (Experiment II), demonstrate that the use of rein-forcement procedures applied to a behavior that is tacitly regarded as “at its peak” can significantly alter the level of performance of that behavior.” (p. 483)

Source: Table 1.5 in Almlund et al. (2011)

Table Incentives and Performance on Intelligence Tests

Study	Sample and Study Design	Experimental Group	Effect Size of Incentive (in Standard Deviations)	Summary
Klingman and Fowler (1976)	Within subjects of 72 first- and second-graders assigned randomly to contingent reward, noncontingent reward, or no reward conditions	M&Ms given for right answers in contingent cdtn; M&Ms given regardless of correctness in noncontingent condition	Only among low-IQ (<100) subjects was there an effect of the incentive. Contingent reward group scored about .33 standard deviations higher on the Peabody Picture vocabulary test than did no reward group.	"… contingent candy increased the I.Q. scores of only the 'low I.Q.' children. This result suggests, that the high and medium result groups were already functioning at a higher motivational level than children in the low I.Q. group."

Source: Table 1.5 in Almlund et al. (2011)

Table Incentives and Performance on Intelligence Tests

Study	Sample and Study Design	Experimental Group	Effect Size of Incentive (in Standard Deviations)
Ziegler and Butterfield (1968)	Within and between subjects study of 40 low SES who did or did not attend nursery school Were tested at the beginning and the end of the year on Stanford-Binet Intelligence Test on either optimized or standard conditions.	Motivation was optimized without giving test-relevant information. Gentle encou-ragement, easier items after items were missed, and so on.	At baseline (in the fall), there was a full standard deviation difference (10.6 and SD was about 9.5 in this sample) between scores of children in the optimized vs standard conditions. The nursery improved their scores, but only in the standard condition.

Summary

"… performance on an intelligence test is best conceptualized by reflecting three different factors: (a) formal cognitive processes; (b) informational achievements which reflect the content rather than the formal properties of cognition, and (c) motivational factors which involve a wide range of personality variables." (p. 2)

"… the significant difference in improvement in standard IQ performance found between the nursery and the non-nursery was attributable solely to the motivational factors…" (p. 10)

Source: Table 1.5 in Almlund et al. (2011)

Table Incentives and Performance on Intelligence Tests

Study	Sample and Study Design	Experimental Group	Effect Size of Incentive (in Standard Deviations)
Ziegler and Butterfield (1968)	Within and between subjects study of 485 *special education* high school students all took IQ tests, then were randomly assigned to control or incentive groups to retake tests. Subjects were below average in IQ.	Incentives such as record albums, radios (<25$) given for improvement in test performance.	Scores increased by about 17 points. Results were consistent across the Otis-Lennon, WISC-R and Lorge-Thorndike tests.

Summary

"In summary the promise of individualized incentives on an increase in IQ test performance (as compared with pretest performance) resulted in an approximate 17-point increase in IQ test scores. These increases were equally spread across subtests. The incentive condition effects were much less pronounced for have pretest IQs between 98 and 120 and did not occur for students having pretest IQs between 121 and 140." (p. 225)

Source: Table 1.5 in Almlund et al. (2011)

Table Incentives and Performance on Intelligence Tests

Study	Sample and Study Design	Experimental Group	Effect Size of Incentive (in Standard Deviations)
Holt and Hobbes (1979)	Between and within subjects study of 80 delinquent boys randomly assigned to three experimental groups and one control group. Each exp group received a standard and modified administration of the WISC-verbal section.	Exp 1: Token reinforcement for correct responses Exp 2: Tokens forfeited for in-correct respon-ses (punishment Exp 3: feedback on correct/incor-rect responses	1.06 standard deviation difference between the token reinforcement and control groups (inferred from t=3.31 for 39 degrees of freedom.

Summary

"Knowledge of results does not appear to be a sufficient incentive to significantly improve test performance among below-average IQ subjects … Immediate reward or response cost may be more effective with below-average IQ subjects while other conditions may be more effective with average or below-average subjects." (p. 83)

Source: Table 1.5 in Almlund et al. (2011)

Table Incentives and Performance on Intelligence Tests

Study	Sample and Study Design	Experimental Group	Effect Size of Incentive (in Standard Deviations)
Larson, Saccuzzo, and Brown (1994)	Between subjects study of 109 San Diego State University psychology students.	Up to $20 for improvement over baseline performance on cognitive speed tests.	"While both groups improved with practice, the incentive group improved slightly more." (p.34) $F(1,93) = 2.76$, $p < 0.05$.

Summary

Two reasons why incentive did not produce dramatic increase: few or no unmotivated subjects among college volunteers;

information processing tasks are too simple for "trying harder" to matter.

Source: Table 1.5 in Almlund et al. (2011)

Table Incentives and Performance on Intelligence Tests

Study	Sample and Study Design	Experimental Group	Effect Size of Incentive (in Standard Deviations)
Duckworth (2007)	Within subjects study of 61 urban low-achieving highschool students tested with a group-administered Otis-Lennon IQ test during their freshman year, then again two years later with a one-on-one (WASI) test.	Standard directions for encouraging effort were followed for the WASI brief test. Performance was expected to be higher because of the one-on-one environment.	Performance on the WASI as juniors was about 16 points higher than on the group-administered test as freshmen. Notably, on the WASI, this population looks almost "average" in IQ, whereas by Otis-Lennon standards they are low IQ. $t(60) = 10.67$, $p < 0.001$.

Summary

The increase in IQ scores could be attributed to any combination of the following: an increase in *g* due to schooling at an intensive charter school; an increase in knowledge or crystallized intelligence; an increase in motivation due to the change in IQ test format; and/or an increase in motivation due to experience at high-performing school.

Source: Table 1.5 in Almlund et al. (2011)

The link between preferences and personality/IQ

Are Risk Aversion and Impatience Related to Cognitive Ability?

- Based on Thomas Dohmen, Armin Falk, David Huffman, Uwe Sunde, (2010). Are Risk Aversion and Impatience Related to Cognitive Ability?, *American Economic Review*, 120(54): 256-271.

Motivation

- Cognitive ability and risk/time preference are assumed to be crucial determinants of economic behavior.
- This is confirmed empirically:
  - Measures of risk aversion/ impatience predict a wide range of important economic behaviors.
  - Cognitive ability matters for wages and other labor market outcomes.
- Risk aversion and impatience are also typically assumed to be independent of cognitive ability.
- This assumption, however, has received relatively little attention in the empirical literature.

Previous Evidence from Psychology

- Various studies in psychology suggest that higher cognitive ability is associated with greater patience.
  - Usually raw correlations without controls.
  - Measures have often not been incentive compatible.
  - Small samples of young children, or students, as subjects.

- Little evidence from psychology on cognitive ability and risk taking.

Contribution of this Study

- First evidence from a large, representative sample of adults.
- Risk aversion and impatience measured in paid choice experiments using relatively high stakes.
- Two different measures of cognitive ability, based on sub-modules of one of the most widely used IQ tests.
- Robustness checks to rule out confounds that could affect our results or results from previous studies.
- Specifically: we use a representative sample of 1,000 adults living in Germany.
  - Roughly half of the respondents participate in experiments measuring risk aversion.
  - The others participate in experiments measuring impatience over an annual time horizon.

Importance

- Relevant for the specification of econometric models that include both cognitive ability and preferences.
  - E.g., Heckman et al. (2006) are unusual in allowing the discount rate to be related to cognitive ability.
  - Our findings support this flexible approach and suggest direction of correlation.
- Interpretation of reduced form models with cognitive ability on right-hand side but not risk aversion or impatience.
  - Impact of cognitive ability may partly reflect positive correlation with patience.
  - E.g., wealth is related to IQ until add discount rate.

Importance

- Important for understanding intergenerational transmission of preferences and socio-economic status.
  - IQ known to be transmitted from parents to children.
  - Risk aversion and patience are strongly correlated between parents and children.
    - Dohmen et al. (2012), Knowles and Postlewaite (2005).
  - Could transmission of IQ be a mechanism behind similar choices over time or under uncertainty?
- Cognitive ability and inequality
  - If lower cognitive ability is associated with greater impatience and risk aversion, could reinforce inequality.

Data

Design

- Our sample was drawn so as to be representative of the adult population living in Germany.
  - We used the same company that conducts the surveys for the German Socio-Economic Panel (SOEP).
  - Interviews conducted in subjects' homes.

- 1,012 individuals.

Design

- The interview had two parts:
  - First, subjects answered a questionnaire, including two cognitive ability tests.
  - Second, subjects were asked to participate in either a lottery experiment or inter-temporal choice experiment.

- Answers were typed into a laptop computer.
  - A random device in CAPI software determined whether the subject was asked to participate in a lottery experiment or an inter-temporal choice experiment.

Cognitive Ability Measures

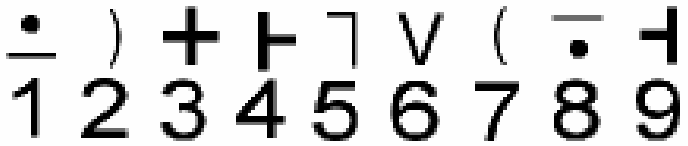
- Each corresponds to a different sub-module of the Wechsler Adult Intelligence Scale (German version).
  - The WAIS is one of the most widely used IQ tests, with several verbal and several non-verbal sub-modules.
  - One sub-module involves matching numbers and symbols with a 90 second time limit.
  - Another sub-module involves a timed vocabulary test.
- Our two tests correspond to these two sub-modules.
  - Previous research shows that our tests correlate well with the corresponding WAIS sub-modules, other WAIS modules, and other prominent IQ measures
    - (Lang et al., 2003 and 2007)

Symbol Correspondence Test

- Subjects were posed with 9 unfamiliar symbols, each paired with one of the digits 1 to 9.
- After brief instructions, subjects saw a new screen:
  - Mapping from numbers to symbols at the top.
  - In the center of the screen, one of the symbols, and a box underneath in which the subject could type a number.
  - After a subject entered a number, a new screen would appear, with another symbol.
- Subjects had 90 seconds to match as many as possible.
- 105 declined to participate, and procedural problems arose in a couple of cases, leaving 905 subjects with non-missing scores

Speed Recognition (Symbol Correspondence Test)

Welche Zahl gehört zu dem Zeichen?



Zeichen: V

Zahl?

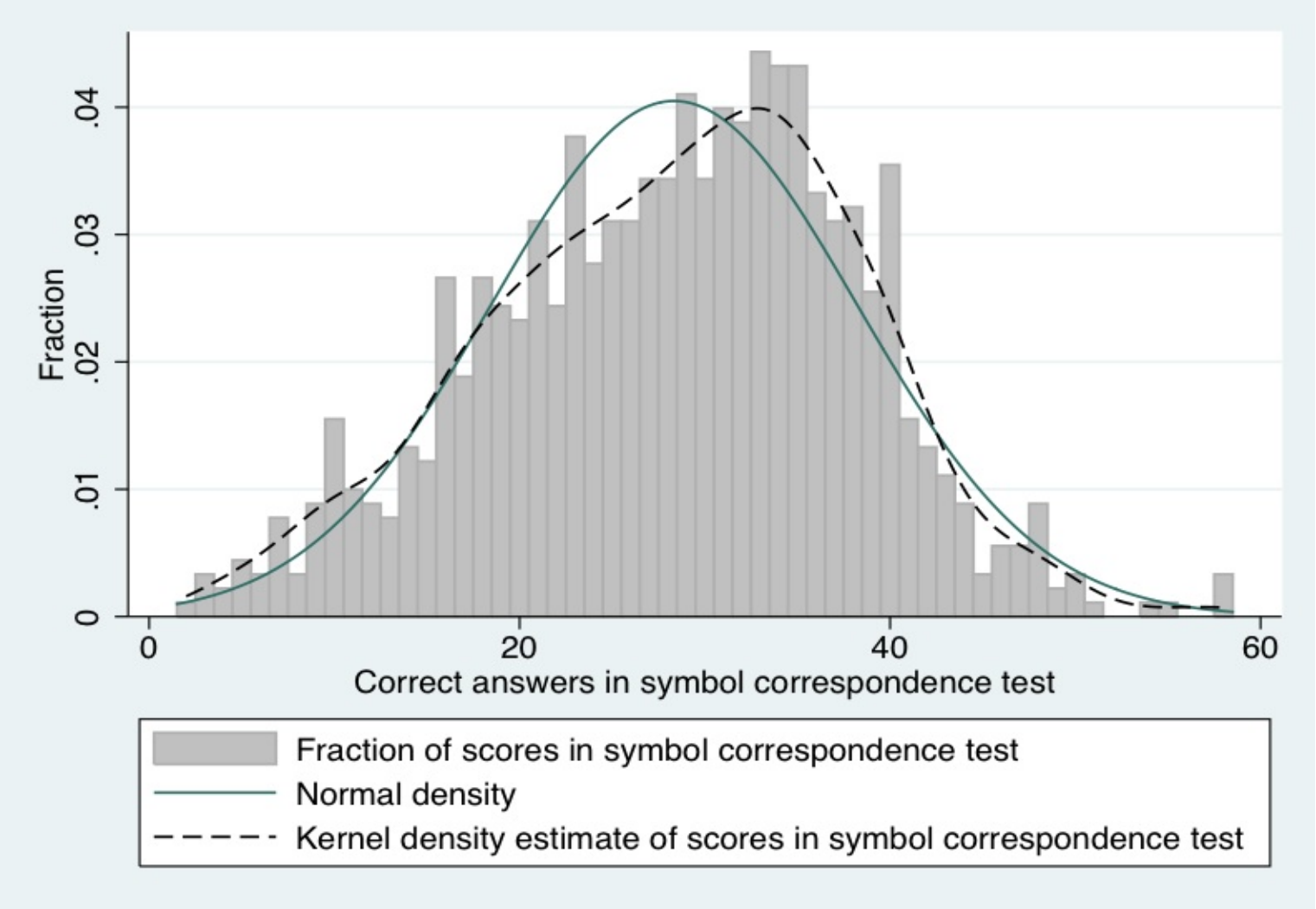
–> Zahl eingeben und zügig zur nächsten Seite!

Word Fluency Test

- Subjects named as many animal names as they could in 90 seconds.
- After each naming, the experimenter pressed a key indicating:
  - Correct name
  - Repeated name
  - Incorrect name.
- Pilots with taped interviews indicate that experimenter error rates are relatively low.

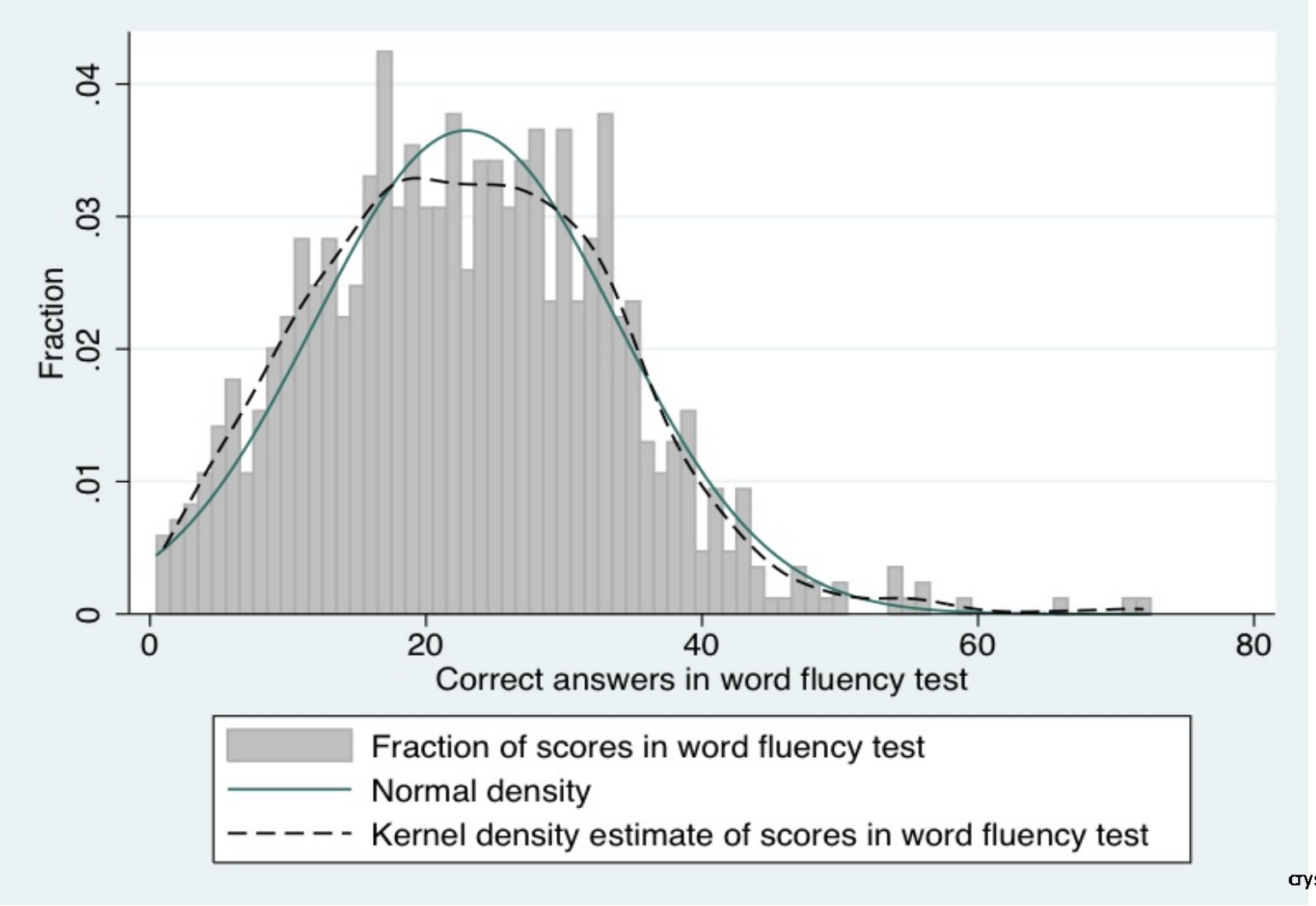
- 87 declined to participate, a few more started and then decided to stop. Procedural problems arose in some cases, leaving 848 subjects with non-missing scores.

Distribution of Symbol Correspondence Scores



fluid IQ

Distribution of Word Fluency Scores

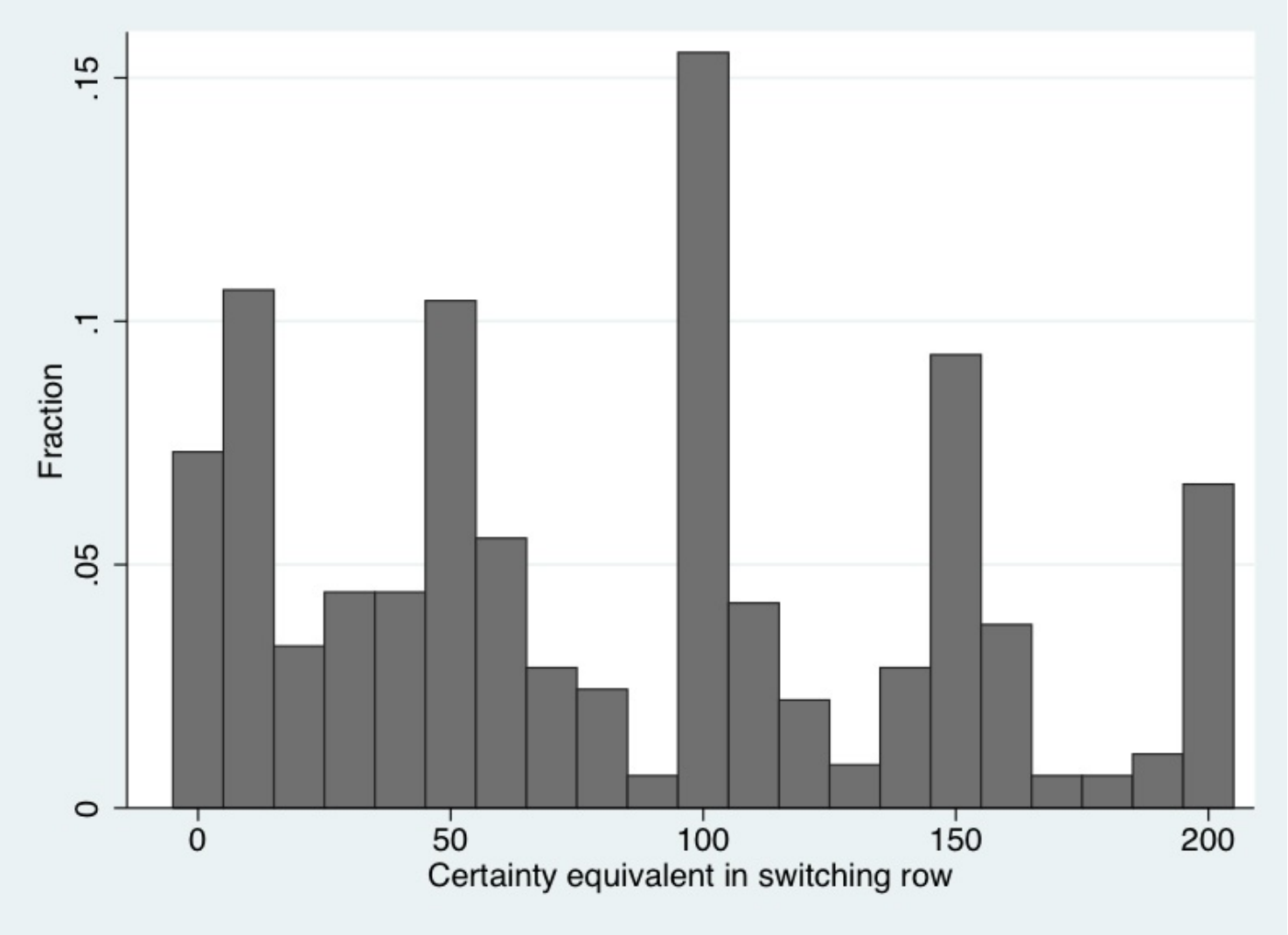


crystallized IQ

Lottery Experiment

- Subjects made 20 choices in a choice table.
- The choice in each row was between a lottery and a safe option.
  - Lottery: 300 or 0 Euros with equal probability.
  - Safe option: X Euros, where X varies across 20 choices.
- Subjects knew that at the end, one row would be randomly selected, choice in that row implemented.
- Switching row in the choice table is an incentive compatible measure of certainty equivalent.
- Switching later in the table indicates a greater willingness to take risks.

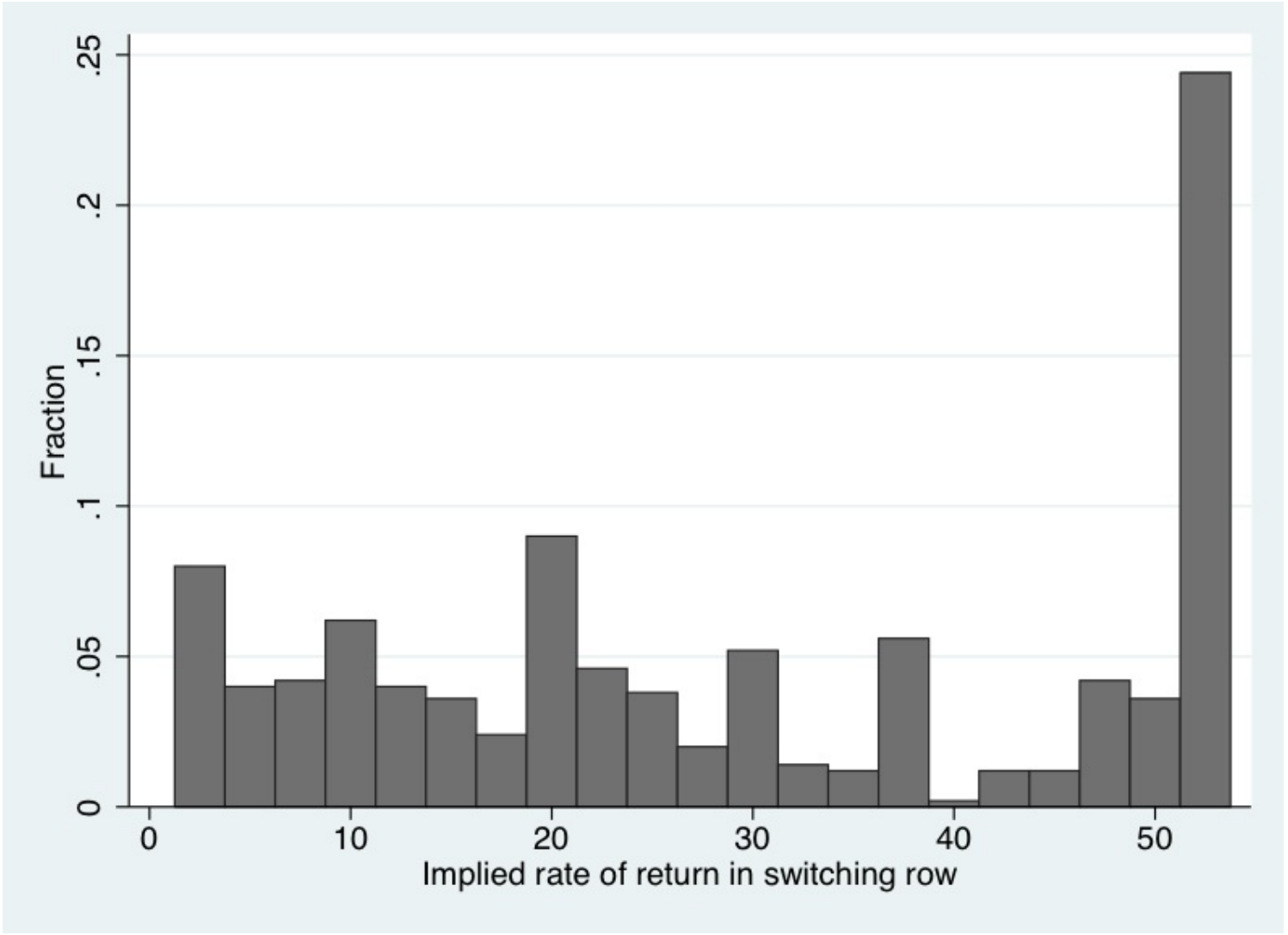
Choices in the Lottery Experiment



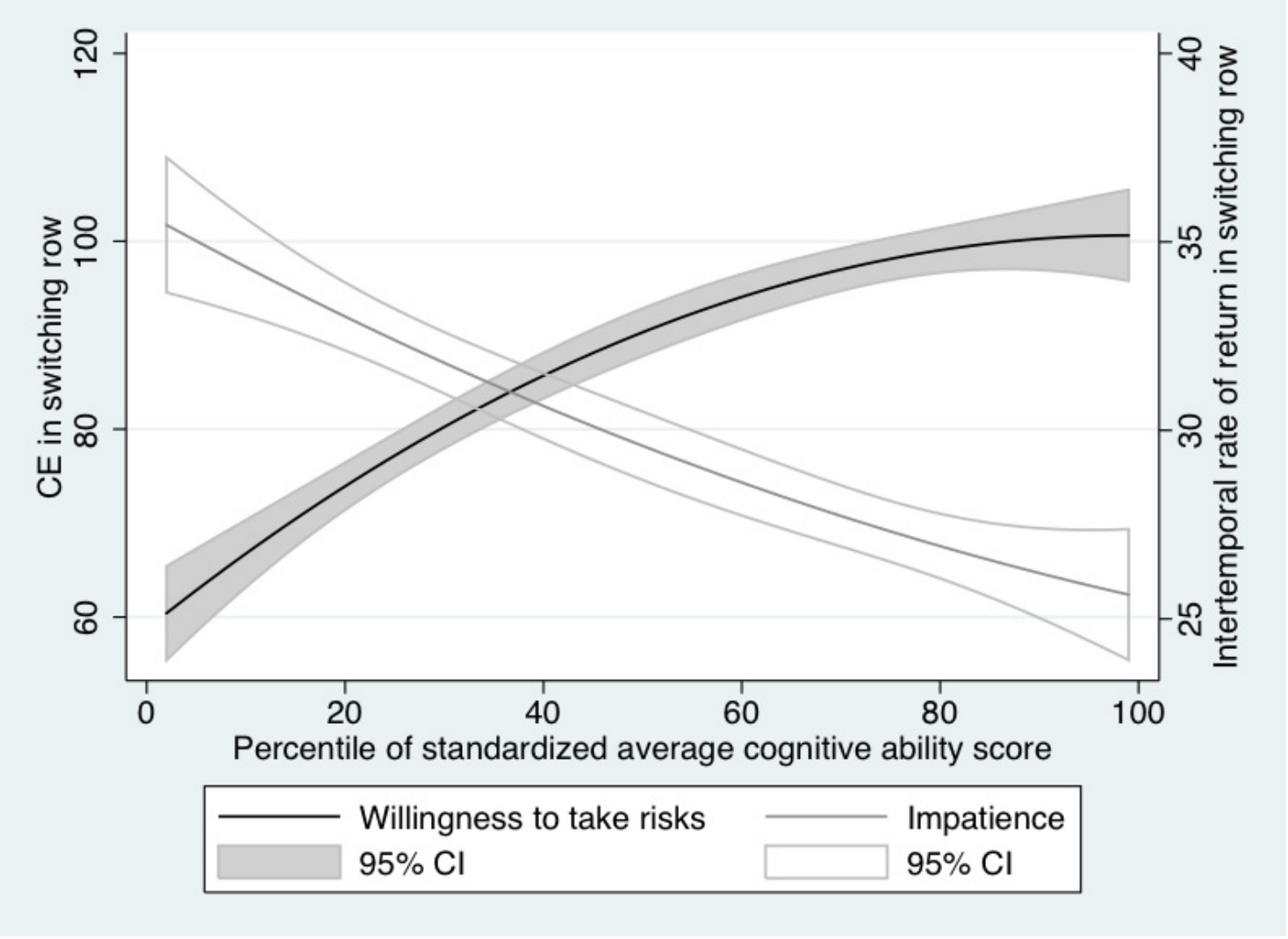
Inter-Temporal Choice Experiment

- Subjects made 20 choices in a choice table.
- The choice was always between a payment available “Today” and a larger amount available in one year.
  - Early payment: 100 Euros.
  - Delayed payment: 100+X Euros, where X varies across 20 choices.
- Subjects knew that at the end one row would be randomly selected, choice in that row implemented.
- The payment would arrive in the mail as a check, cashable either immediately or in one year.
- Switching row in the table measures impatience: the rate of return needed to induce waiting one year.
- Switching later indicates greater impatience.

Choices in the Inter-Temporal Choice Experiment



Results


CE in switching row
120
100
80
60
Intertemporal rate of return in switching row
40
35
30
25
0
20
40
60
80
100
Percentile of standardized average cognitive ability score
Willingness to take risks
95% CI
Impatience
95% CI

The Link Between Cognitive Ability, Risk Aversion, and Impatience

Dependent Variable:	Willingness to take risks (Experimental Measure)			Impatience (Experimental Measure)		
	(1)	(2)	(3)	(4)	(5)	(6)
Standardized symbol digit correspondence score	1.038***			-1.300***		
	[0.294]			[0.450]		
Standardized word fluency score		1.175***			-1.095**	
		[0.307]			[0.472]	
Standardized average cognitive ability score			1.225***			-1.545***
			[0.294]			[0.476]
Constant	9.033***	9.063***	9.104***	12.064***	12.008***	12.011***
	[0.322]	[0.326]	[0.329]	[0.482]	[0.488]	[0.498]
log Pseudo-Likelihood	-1251	-1167	-1139	-1304	-1248	-1185
Observations	414	385	376	457	437	415

TABLE 2—THE LINK BETWEEN COGNITIVE ABILITY, RISK AVERSION, AND IMPATIENCE

Dependent variable	Willingness to take risks (experimental measure)				Impatience (experimental measure)			
	Age ≤ 45 (1)	Age > 45 (2)	Male (3)	Female (4)	Age ≤ 45 (5)	Age > 45 (6)	Male (7)	Female (8)
Standardized average cognitive ability score	1.000** [0.438]	1.118** [0.497]	1.573*** [0.424]	0.857** [0.402]	−1.109* [0.612]	−2.331** [0.927]	−1.700*** [0.594]	−1.154 [0.780]
Constant	9.550*** [0.503]	8.713*** [0.535]	9.087*** [0.468]	9.165*** [0.462]	11.838*** [0.667]	11.822*** [0.876]	10.530*** [0.694]	13.309*** [0.696]
log pseudo-likelihood	−572	−565	−535	−603	−682	−502	−552	−629
Observations	190	186	178	198	234	181	191	224

Notes: Dependent variable in columns 1 to 4 is the switching row in the lottery experiment. Dependent variable in columns 5 to 8 is the switching row in the intertemporal choice experiment. The combined cognitive ability measure is the standardized average score on the standardized symbol-digit correspondence and word fluency tests. Coefficients are marginal effects, estimated using interval regressions to correct for the fact that dependent variables are elicited in intervals. Robust standard errors in brackets.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Robustness

Education

- Cognitive ability is associated with achievement of more advanced schooling degrees.
- Education, in turn, might affect risk aversion or impatience.
- Does cognitive ability have a direct effect, or does it only work indirectly through education?
- Another issue arises because education could affect cognitive ability (e.g., Hansen, Heckman, and Mullen, 2004; Cascio and Lewis, 2006).
- Is cognitive ability simply a proxy for education in the baseline results?

Income and Credit Constraints

- Cognitive ability is associated with higher income.
- Income could have an impact on risk-taking behavior, or potentially patience.
  - In the lottery experiment, income cushions the impact of losing a lottery.
  - In the inter-temporal choice experiment, low income could imply credit constraints, making the choice100 Euros today a necessity.
- It is interesting to see whether cognitive ability only works through the indirect channel of income.
- Also, we use a survey measure of credit constraints:
  - “If you suddenly encountered an unforeseen situation, and had to pay an expense of 1,000 Euros in the next two weeks, would you be able to borrow the money?”

Confusion about Incentives?

- One potential confound could arise if low cognitive ability caused people to be confused about incentives.
  - This would be a problem if confusion lead to behavior that happened to look like, e.g., greater risk aversion.
- For risk attitudes we have a way to address this issue explicitly.
- We use a very simple survey measure that asks about willingness to take risks:
  - “In general, are you a person who is fully prepared to take risks, or do you try to avoid taking risks?”
  - Respondents answer on a scale for 0 to 10, where 0 indicates “completely unwilling” and 10 “completely willing”

Robustness check: Adding Controls

Dependent Variable:	Willingness to take risks (Experimental Measure)				Impatience (Experimental Measure)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standardized average cognitive ability score	0.788**	0.623*	0.566*	0.589*	-1.349***	-1.260***	-1.134**	-0.974*
	[0.331]	[0.351]	[0.342]	[0.345]	[0.519]	[0.548]	[0.566]	[0.574]
Female	0.908	0.869	0.989	0.772	2.892**	2.918**	3.262**	2.985**
	[0.825]	[0.816]	[0.799]	[0.828]	[1.277]	[1.284]	[1.336]	[1.347]
Age	0.302***	0.319***	0.258**	0.256**	-0.172	-0.129	-0.003	-0.04
	[0.090]	[0.103]	[0.106]	[0.107]	[0.138]	[0.150]	[0.160]	[0.163]
Age squared	-0.003***	-0.003***	-0.003***	-0.003***	0.002	0.002	0.001	0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]
Height	0.086*	0.076	0.064	0.053	0.005	0.018	0.049	0.041
	[0.048]	[0.047]	[0.046]	[0.048]	[0.071]	[0.072]	[0.073]	[0.075]
Ln(household income)			1.206*	1.102			-2.486**	-2.496**
			[0.710]	[0.728]			[0.998]	[1.026]
Liquidity constrained			-2.599***	-2.725***			1.824	1.743
			[0.793]	[0.797]			[1.308]	[1.333]
Constant	-11.72	-12.19	-15.66	-12.92	12.94	10.04	17.89	20.545
	[8.445]	[8.364]	[9.770]	[10.19]	[12.91]	[13.35]	[14.47]	[14.874]
Additional controls:								
Educational degree	NO	YES	YES	YES	NO	YES	YES	YES
Number of children in hh	NO	YES	YES	YES	NO	YES	YES	YES
Personality traits (Big5)	NO	NO	NO	YES	NO	NO	NO	YES
log Pseudo-Likelihood	-1,125	-1,121	-1,051	-1,03	-1,175	-1,171	-1,1	-1,08
Observations	375	375	355	349	413	413	391	384

Robustness Check: Survey Measure of Risk Aversion

Dependent Variable:	Willingness to take risks (Survey Measure)			
	(1)	(2)	(3)	(4)
Standardized average cognitive ability score	0.560***	0.418***	0.315***	0.226**
	[0.088]	[0.099]	[0.106]	[0.102]
Female		-0.327	-0.333	-0.389*
		[0.225]	[0.236]	[0.223]
Age		-0.052**	-0.061**	-0.074**
		[0.025]	[0.031]	[0.030]
Agesquared		0.000	0.001	0.001**
		[0.000]	[0.000]	[0.000]
Height		0.014	0.012	0.013
		[0.013]	[0.013]	[0.013]
Ln(household income)			0.294	0.259
			[0.190]	[0.186]
Liquidity constrained			-0.028	-0.055
			[0.249]	[0.246]
Constant	4.479***	3.816	1.438	2.104
	[0.088]	[2.359]	[2.887]	[2.804]
Additionalcontrols:				
Educational degree	NO	NO	YES	YES
Number of children in household	NO	NO	YES	YES
Personalitytraits(Big5)	NO	NO	NO	YES
log Pseudo-Likelihood	-1,833	-1,814	-1,704	-1,645
Observations	813	810	763	749

Other Robustness Checks

- Arbitrage between experiment and market rates of return.


Arbitrage

- Could Test Scores Proxy for Personality?


Personality

- Risk aversion, impatience, and test-taking strategy.


Test taking

- Time preference vs. concavity of utility (risk aversion) as determinants of impatient behavior.


Concavity of utility

Conclusions

- We find a significant and robust relationship between cognitive ability, risk aversion, and impatience.
  - People with higher cognitive ability are more patient, and more willing to take risks.

- Regardless of the precise mechanism, it is important to know that cognitive ability, risk aversion, and impatience are systematically related.
  - Implications for specifying econometric models.
  - Interpretation of reduced form models.
  - Intergenerational transmission.
  - Inequality and IQ.
  - Implications for policy interventions focused on improving child IQ.

Conclusions

- For future research: establishing underlying mechanisms.
  - Bounded rationality, in the sense of choice bracketing?
    - Cognitive ability could affect whether people bracket narrowly, making risky choices in isolation, or recognize that they form part of a larger portfolio.
    - Cognitive ability could also affect whether people integrate present and future considerations.
  - Two-system explanation?
    - Cognitive system in the brain can be overpowered by affective system; affective system is the source of urges for immediate consumption, fear of losses.
    - Cognitive ability could proxy for the resources an individual has to suppress emotional urges.

Conclusions

- Feedback from preferences to development of cognitive skills?
  - Although cognitive ability may affect risk aversion and impatience, there could also be important feedback effects.
  - E.g., patience conducive to developing cognitive skills.

- Evolution
  - Adaptive for low-cognitive ability to go with conservative strategies of risk aversion and grabbing immediate rewards?

The Relationship Between Economic Preferences and Psychological Personality Measures

Based on Anke Becker, Thomas Deckers, Thomas Dohmen, Fabian Kosse, Armin Falk (2012). The Relationship Between Economic Preferences and Psychological Personality Measures. *Annual Review of Economics*, Vol. 4, 2012, pp. 453-478. (working paper version, IZA DP 6470).

Table 1: Overview Experimental measures

Preference	Experiment	Measure
Time	Two lists of choices between an amount of money "today" and an amount of money "in 12 months".	Average switching point over both lists of choices from the early to the delayed amount.
Risk	Two lists of choices between a lottery and varying safe options.	Average switching point over both lists of choices from the lottery to the safe option.
Positive Reciprocity	Second mover behavior in two versions of the Trust Game (Strategy Method).	Average amount sent back in both Trust Games.
Negative Reciprocity	Investment into punishment after unilateral defection of the opponent in a Prisoner's Dilemma (Strategy Method).	Amount invested into punishment.
Trust	First mover behavior in two versions of the Trust Game.	Average amount sent as a first mover in both Trust Games.
Altruism	First mover behavior in a Dictator Game with a charitable organization as recipient.	Size of donation.

Table 2 Pearson correlation structure experimental data set

	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism	LoC
Time	0.0370	0.0057	−0.0084	0.1026**	−0.0518	0.0847
Risk	−0.0379	−0.0611	0.0762*	0.0202	−0.1201***	0.0434
Positive reciprocity	0.1724***	0.0140	0.0211	0.2042***	0.0361	0.0152
Negative reciprocity	−0.0885*	−0.0393	0.0943*	−0.1451***	−0.0136	−0.1418**
Trust	0.1232***	−0.1300***	0.0004	0.1665***	−0.0134	−0.0140
Altruism	0.1242**	−0.0979*	0.0249	0.1911***	0.0847*	0.0480

The asterisks indicate significance at the 10% (*), 5% (**), and 1% (***) levels. Correlations between economic preferences and the Big Five were calculated using 394–477 observations. Correlations between economic preferences and the locus of control (LoC) were calculated using 254–315 observations. All measures are standardized.

Table 3 Spearman correlation structure experimental data set

	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism	LoC
Time	0.0388	0.0162	−0.0114	0.1077**	−0.0684	0.1063*
Risk	0.0027	−0.0486	0.0726*	0.0206	−0.0995**	0.0485
Positive reciprocity	0.1606***	0.0078	0.0177	0.2029***	0.0152	0.0414
Negative reciprocity	−0.0967*	−0.0221	0.0462	−0.083*	−0.0165	−0.1376**
Trust	0.1354***	−0.1198***	0.002	−0.1696***	−0.002	−0.0648
Altruism	0.0969*	−0.0804	−0.0034	0.2000***	0.0879*	0.0418

The asterisks indicate significance at the 10% (*), 5% (**), and 1% (***) levels. Correlations between economic preferences and the Big Five were calculated using 394–477 observations. Correlations between economic preferences and the locus of control (LoC) were calculated using 254–315 observations. All measures are standardized.

Table 5 Pearson correlation structure representative experimental data

	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Time	−0.0080	−0.0682	−0.0655	−0.0830*	−0.0602
Risk	0.1356***	−0.0720	0.0757	−0.0941**	−0.0290

The asterisks indicate significance at the 10% (*), 5% (**), and 1% (***) levels. All measures are standardized.

Table 6 Spearman correlation structure representative experimental data

	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Time	−0.0199	−0.0737	−0.0764*	−0.0.829*	−0.0598
Risk	0.1315*	−0.0744	0.0661	−0.0.854*	−0.0261

The asterisks indicate significance at the 10% (*), 5% (**), and 1% (***) levels. All measures are standardized.

Table 7 Pearson correlation structure between personality measures and economic preferences from SOEP observations

	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism	LoC
Time	0.0183**	0.1122***	−0.0415***	0.3122***	−0.0584***	0.0681***
Risk	0.2793***	−0.0400***	0.2601***	−0.1454***	−0.0996***	0.1521***
Positive reciprocity	0.1814***	0.2520***	0.1473***	0.1842***	0.0872***	0.0954***
Negative reciprocity	−0.0522***	−0.1558***	−0.0264***	−0.3756***	0.0612***	−0.2154***
Trust	0.1272***	−0.0680***	0.0575***	0.0945***	−0.1919***	0.2094***
Altruism	0.1756***	0.1495***	0.1670***	0.2557***	0.0908***	0.0874***

The asterisks indicate significance at the 10% (*), 5% (**), and 1% (***) levels. Correlations are calculated using 14,243 observations. All measures are standardized. Abbreviation: LoC, locus of control.

Table 8 Spearman correlation structure between personality measures and economic preferences from SOEP observations

	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism	LoC
Time	0.0233	0.1192	−0.0342	0.3099	−0.0643	0.0709
Risk	0.2632	−0.0500	0.2452	−0.1496	−0.1049	0.1426
Positive reciprocity	0.1835	0.2622	0.1547	0.1947	0.0808	0.1041
Negative reciprocity	−0.0616	−0.1767	−0.0426	−0.3853	0.0572	−0.2257
Trust	0.1224	−0.0693	0.0523	0.0788	−0.1889	0.2012
Altruism	0.1693	0.1501	0.1602	0.2416	0.0860	0.0843

All correlations are significant at the 1% level and are calculated using 14,243 observations. All measures are standardized. Abbreviation: LoC, locus of control.

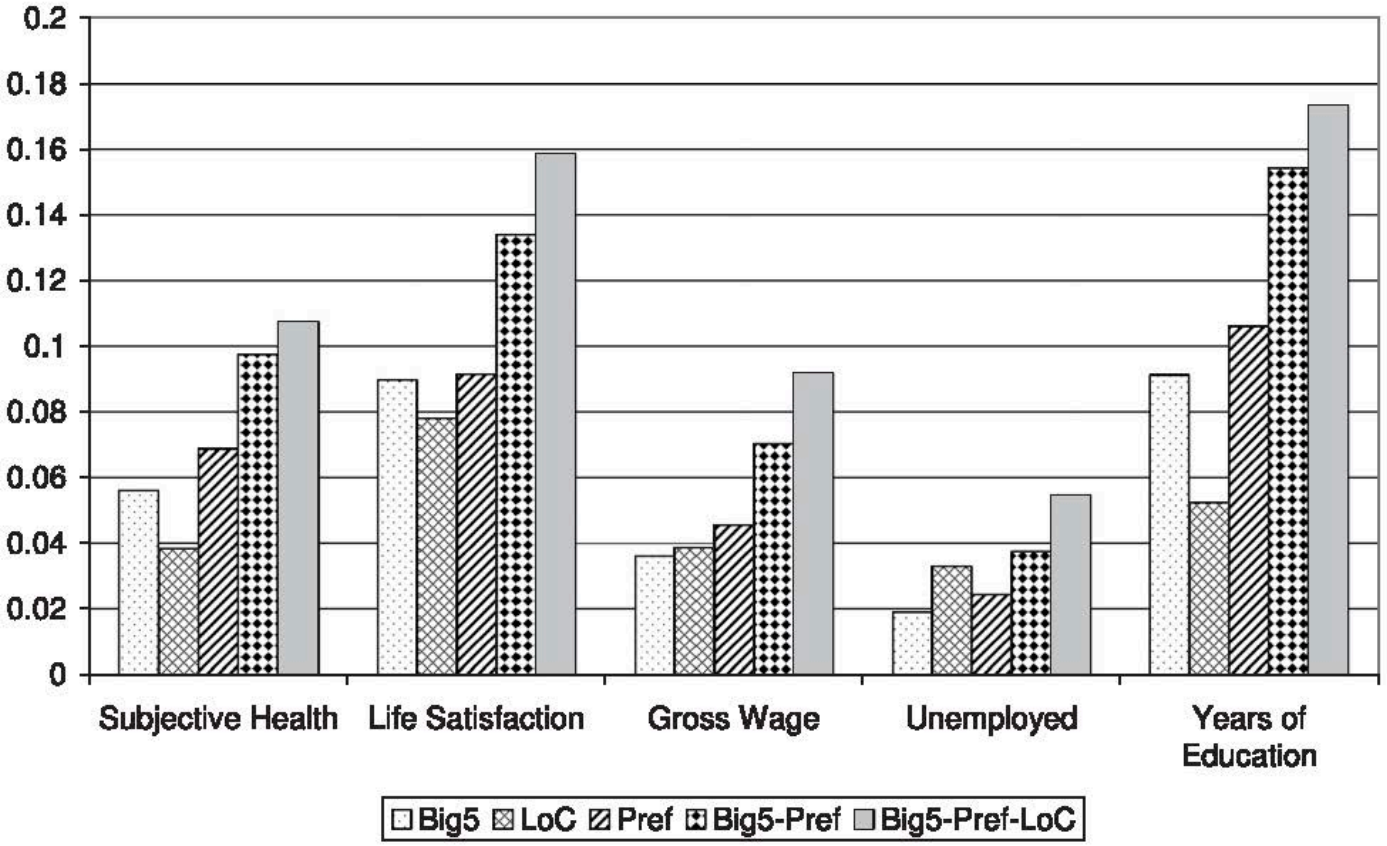


Figure 3

Adjusted R^2's for linear regressions for life outcomes. The number of observations available varies for the different life outcomes: subjective health (14,218), life satisfaction (14,214), gross wage (7,199), unemployed (9,095), and years of education (13,768). Gross wage measures the gross hourly wage. Abbreviation: LoC, locus of control.

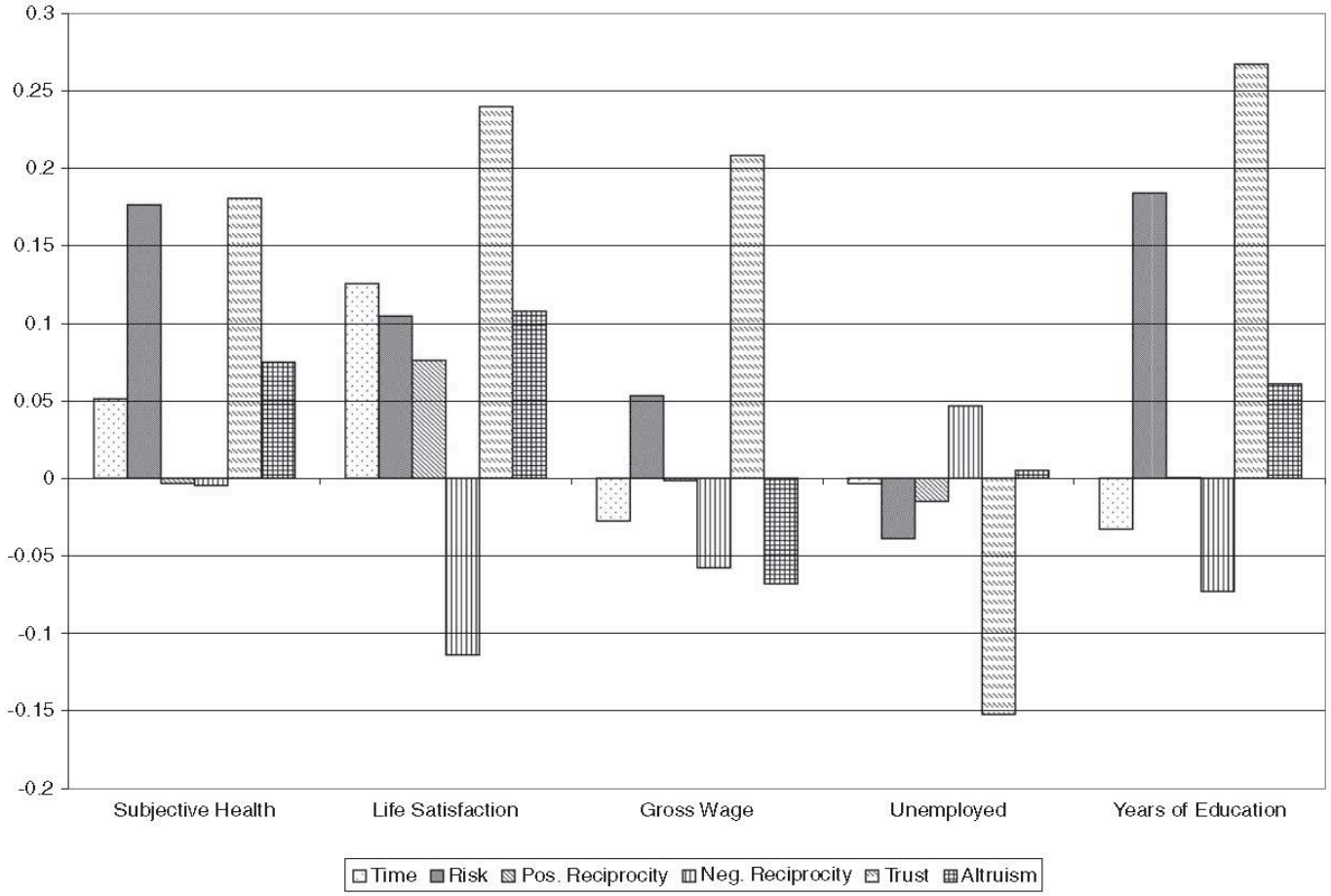


Figure 4

Pearson correlation coefficients between preference measures and life outcomes using SOEP data. Trust always shows the strongest association with life outcomes. More trust and a higher willingness to take risk are always related to better life outcomes (e.g., better health and greater life satisfaction), whereas negative reciprocity is associated with less life satisfaction and lower wages. The number of observations available varies for the different life outcomes: subjective health (14,218), life satisfaction (14,214), gross wage (7,199), unemployed (9,095), and years of education (13,768). Gross wage measures the gross hourly wage.

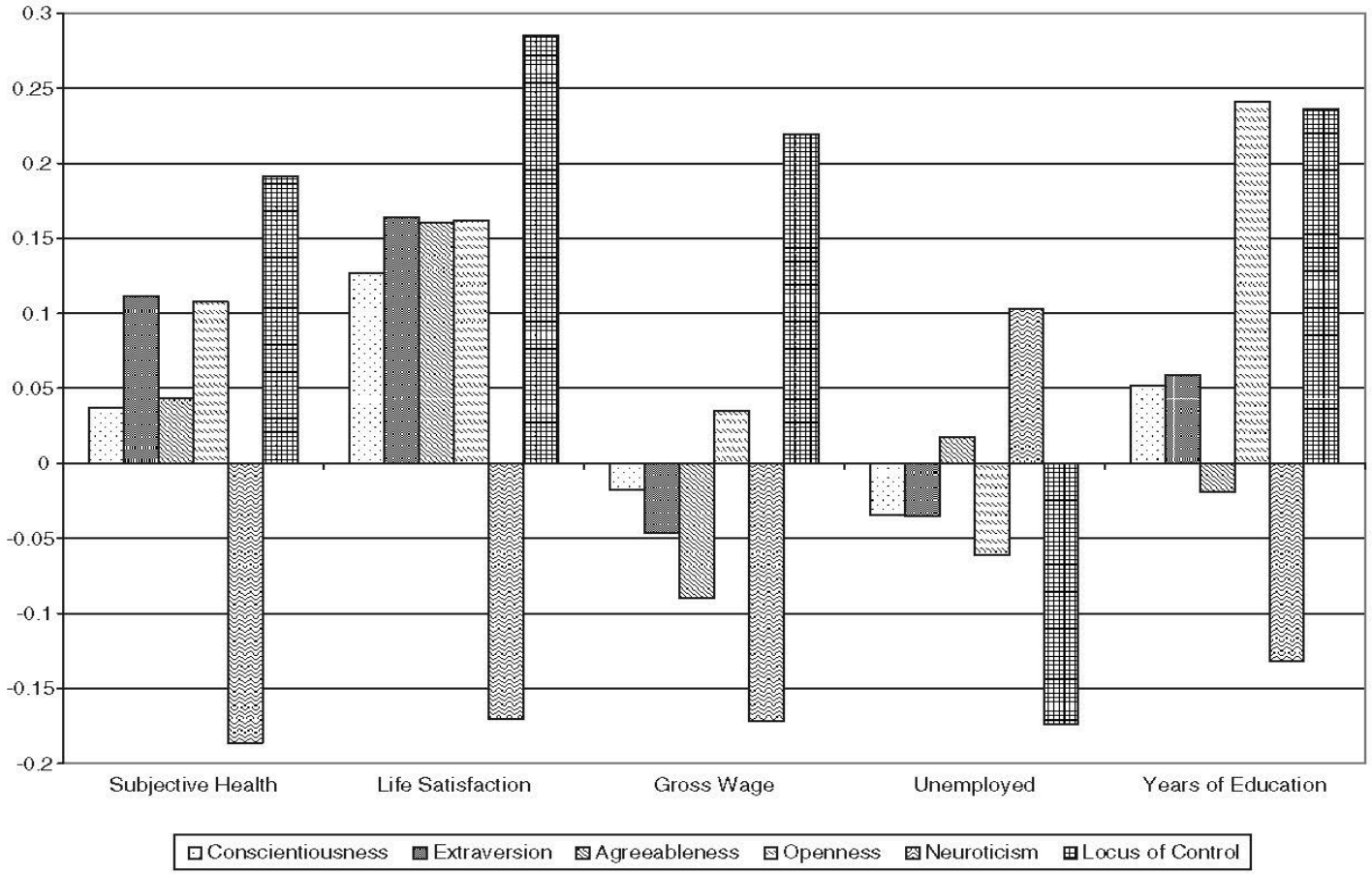


Figure 5

Pearson correlation coefficients between personality measures and life outcomes using SOEP data. The locus of control and neuroticism show the strongest associations with life outcomes. A more internal locus of control is always related to better outcomes (e.g., better health or more life satisfaction), whereas a higher degree of neuroticism is associated with lower wages or a higher probability of being unemployed. The number of observations available varies for the different life outcomes: subjective health (14,218), life satisfaction (14,214), gross wage (7,199), unemployed (9,095), and years of education (13,768). Gross wage measures the gross hourly wage.