Cognitive skills explain economic preferences, strategic behavior, and job attachment

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Economic analysis has so far ignored how an individual's cognitive skills (CS's) are related to the individual's preferences in different choice domains, such as risk-taking or saving, and how preferences in different domains are related to each other. Using a sample of 1,000 trainee truckers we report three findings.

First, we show a strong and significant relationship between an individual's cognitive skills and preferences, and between the preferences in different choice domains. The latter relationship may be the opposite of what intuition suggests: a patient individual, more inclined to save, is also more willing to take calculated risks. A second finding is that measures of cognitive skill predict social awareness and choices in a sequential Prisoner's Dilemma game. Subjects with higher CS's more accurately forecast others' behavior, and are more likely to play close to the equilibrium of the repeated game as second-movers. After controlling for investment motives, subjects with higher CS's also cooperate more as first movers. A third finding concerns on-the-job choices. Our subjects incur a significant financial debt for their training that is forgiven only after twelve months of service. Yet over half leave within the first year, and cognitive skills are also strong predictors of who exits too early, stronger than any other social, economic and personality measure in our data.

These results suggest that cognitive skills affect the economic lives of individuals, by systematically changing preferences and choices in a way that favors the economic success of individuals with higher cognitive skills.

Economic, financial, and real life decisions involve options that vary along several distinct dimensions, such as the probability of the outcomes, or in the times at which the outcomes will be delivered. These factors affect the choices of different individuals differently; for example, some people are more prudent in risk-taking, while others are more patient in their choices of saving versus consumption. Individuals also differ in their cognitive skills. Economic analysis has so far said little about the way the general cognitive skills of an individual might be related to that individual's economic preferences, and about whether and how the preferences of the same individual in different domains of choice, such as risk-taking or saving, might be related to each other (1-3). Psychologists have studied the relationship between various cognitive skills and job success, among other outcome variables, but without focusing on the link between cognitive skills and preferences (4). Similarly, little is known about how cognitive skills influence behavior in strategic interactions. But an understanding of the effects cognitive skills may have on preferences (5) and strategic behavior, and the relations that may exist among preferences, is of considerable potential importance in constructing theories of human decision-making and in selecting managerial and public policies.

We examine whether and how cognitive skills are related to attitudes towards risk, ambiguous probability, and inter-temporal choices, and how choices in these distinct domains are related to each other in a large sample (N=1066) of trainee tractor-trailer drivers at a sizable U.S. trucking company (see supporting online material (SM) and (6)). We also examine how cognitive skills are related to two types of behavior by these subjects: laboratory choices in a strategic game, and an important on-the-job outcome. In each case we are able to control for potentially confounding socio-economic and psychological factors. Our results are enabled by a comprehensive data collection design, which gives the opportunity to observe socio-economic, demographic, psychological, experiment-based, and employment-related outcome variables for the same subjects.

We collected three measures of cognitive skills (CS's): a non-verbal IQ test (Raven's matrices), a quantitative literacy (or "numeracy") test and a test of the ability to plan (referred to as the "Hit 15" task). To measure risk preferences we used an experiment in which subjects chose between various fixed payments and a lottery, and for ambiguity subjects faced the same choices as in the risk experiment, but were given incomplete information about the probability of outcomes (7). Time preferences are measured from an experiment in which subjects chose between earlier but smaller payments and later but larger ones. Our laboratory behavioral measure of strategic behavior is from a sequential form of the Prisoner's Dilemma: a first mover chooses whether to send $0 or $5 to a second mover, and the latter in turn decides how much to send back. In both instances the amount sent were doubled by the experimenter. Subjects stated their choices in both roles, and their beliefs about the moves of others.

Our on-the-job measure of behavior results from our access to internal human resource data maintained by the firm: in a high-turnover setting, we observe the length of time each subject remained with the company, and the reason for leaving.

We also collected a demographic and socio-economic profile and a standard personality questionnaire from each subject. Details of the experimental design and implementation are presented in the Methods section (see also SM and (6)).

Results

Choice Consistency and CS's

If choice requires information processing, then a simple hypothesis about cognitive skills and preferences is that those with higher cognitive skills should make fewer errors in translating their preferences into choices. This is confirmed by examining variations in choice consistency among our subjects: In our risky and ambiguous choices the lottery is fixed, so as the value of the certain amount increases in different choices, subjects who are transitive and prefer more money to less should switch at most once between the lottery and the certain amount. A very risk averse or risk seeking subject may never switch, but switching more than once shows inconsistency in choice. The same applies to choices over earlier versus later payment times: the future payment is fixed, so as the value of the early payment decreases, subjects should switch at most once.

The effect of CS's on consistency is large (Figure 1 A): a change from the lowest to the highest quartile in the IQ index increases the likelihood of being consistent by about 25% in risky choice, and by about 18% in ambiguous choices (9). In choices over time the probability of consistency increases by about 15%. The results are confirmed by a multivariate logit estimate (SM, 8, 9, 10).

CS's and Economic Preferences: Theory

We have seen that CS's affect the consistency of choices: they may directly affect the content of economic preferences. How might such an effect occur? Observe that one may think of perceived utility as noisy. One may model (10+) perception of utility as the observation of a random variable equal to the true utility plus noise. The more complex is the option, the larger is the noise. The utilities of simple options—such as a sure payment of $10—are perceived precisely. But a lottery—two possible outcomes with an expected value of $10—is complex. Its utility is harder to evaluate, and so is noisy. Similarly, $10 paid immediately is simple, and its utility is clear, whereas $10 to be paid in two weeks is complex—multiple factors could intervene—and its utility is noisy.

This difference in perception may systematically affect choices. If evaluating the overall utility of a complex option is harder for a subject, he may focus on some specific aspect of it, which could guide his choice: of the two outcomes of $2 and $10 in our lottery he may focus on the lower (if pessimistic), or on the higher (if optimistic). Subjects who find a more comprehensive evaluation easier will be more likely to focus on the average value. This systematic effect may have deep roots: an implication of several models of the decision process, such as the random walk model (11-13), is that, other things equal, an option which is perceived more noisily is less likely to be chosen than one perceived more precisely.

We hypothesize that higher cognitive skills are associated with less noise in the perception of the utility of complex options. If this is correct, we should observe a higher concentration of choices near the expected value from subjects with higher level of CS's, and among those with lower values we should observe the effects of pessimism or optimism, particularly in evaluating gains and losses, and of the simplification of options. In these cases, the effect of psychological traits, such as harm avoidance, becomes relevant.

CS's and Economic Preferences: Evidence

A measure of risk aversion is the coefficient of risk aversion in the Constant Relative Risk Aversion (CRRA) specification: a higher coefficient corresponds to higher risk aversion. This measure indicates that subjects with lower IQ are less willing to take risks when the outcomes are positive (Fig. 1B). This coefficient is on average around 0.8 for the lowest IQ quartile, and less than 0.4 for the highest one. Risk aversion depends on the stakes, and is stronger with higher stakes (14). The way in which risk aversion depends on stakes is also a function of cognitive skills: the decrease is smaller in subjects with higher CS's. The smaller distance is a form of consistency across choices in different ranges of outcomes, and again higher CS's imply higher consistency. The relationship between CS and attitude to risk changes qualitatively with losses: subjects with lower CS (who are more risk averse with gains) become more risk seeking than their counterpart with higher CS's with losses (Figure 2, C and D).

A possible confound is that cognitive skills may affect choices involving money indirectly, through affecting the income available to individuals. Our data permit us to statistically control for the effect of variables such as education, alternative income, and credit risk, and we find that the significance and importance of the effects of the IQ index and numeracy on risk-taking are robust to the inclusion of such controls. The same holds if we introduce psychological personality traits, such as harm avoidance (see SM).

Subjects in higher percentiles of the IQ index are more patient (Fig. 1, C and D). The increase in patience associated with increasing IQ is similar over the four choice sets, two of which include an immediate payment, and two do not. Impulsivity is likely to affect only the two choice sets in which today is an option. So the effect of CS's is significant even when none of the payments is immediate. This evidence cuts against the view that higher CS's increase patience through the control of impulsivity.

Broadly, for lotteries with positive outcomes the willingness to take calculated risks and patience both increase with the level of CS's. However, the relationship is not monotonic (Fig. 2, A and B). The IQ index reaches the highest average value in subjects just below risk neutrality, and then falls slightly. The same occurs for time preferences.

The effects of cognitive skill on preferences are substantial. The average IQ among those who always prefer the sure payment is one standard deviation below those who behave in a risk-neutral way. The implied premium someone in the bottom third in IQ would pay for full insurance (at our modest lottery stakes levels) is 7.5 per cent, as against 2.3 per cent for the top third. The bottom third requires an implicit interest rate between 20 and 37 percent higher to save than does the top third.

Relationships among Economic Preferences

Since willingness to take risks and patience both increase with cognitive skills, they should be positively correlated, and indeed the correlation coefficients for simple statistics of choice show that they are. We compute the correlation among the number of times the subject chooses the risky lottery (an indicator of risk propensity), the number of times the subject chooses the later payment (an indicator of patience), and the IQ index (see SM). The latter index has a strong and significant correlation with all the choices.

Cross correlations among preferences expressed through different choices in the same domain (for example choices over time for different time horizons) are strong and significant. Also choices under risk and over time are correlated, particularly among choices with positive outcomes and a short time horizon. The single important exception in this table is represented by the two lotteries with negative outcomes. For the lottery ($5,-$1) the pair-wise correlation with the IQ index is insignificant, and for the lottery ($1,-$5) it is significant and negative (15).

The study of the correlation between attitudes towards risk and ambiguity requires a careful separation of the two factors: a risk adverse individual who is not ambiguity averse would exhibit perfect correlation of choices in risk and ambiguity. The degree of risk aversion is measured by the way utility varies with different amounts of money, while that of ambiguity aversion is measured by how strongly the choice is influenced by the lack of precision in the probability of outcomes. When we separate the two factors, risk aversion and ambiguity aversion are strongly and significantly positively correlated (see SM).

CS's and Strategic Choices

Overall subjects with higher levels of cognitive skills are better able to anticipate the behavior of others in our sequential Prisoner's Dilemma game. 67% of the subjects chose to send $5 as first mover, while the average belief was 50.2%. Subjects with higher IQ more accurately predicted first mover behavior, with almost a 28% increase over the entire range of the index (16). The same holds for the prediction of return transfers by the second mover after a $5 transfer: an increase in the IQ index increases the value of the transfer predicted by the subject, and the distance between the true value and the predicted value decreases with higher IQ and numeracy scores (see SM). The exception is the prediction of the average amount returned after a $0 transfer. In this case, the distance between estimate and reality *increases* with IQ and numeracy scores because subjects with higher scores expect that the transfer back in response to a $0 first move will be lower than it is in reality.

The differences associated with CS scores extend from beliefs to behavior (Figure 3). Subjects with higher IQ transfer a higher amount after a transfer of $5, and a lower one after a transfer of $0 (17). The behavior of the first mover is also affected: subjects with higher cognitive skills are more likely to send $5. A potential confound is that subjects with higher CS's expect a higher return to sending $5, and are more inclined to take risks, so sending $5 might be more attractive them as a (purely) financial investment. After correcting for this factor, the IQ index is positively and systematically related to first mover sending, both as interacted with the expectation of a higher return, and also directly, controlling for the expectation difference (SM) (18).

Job Attachment

The previous results are based on abstract choices (e.g. lotteries) involving moderate amounts of money, made in a controlled laboratory environment, albeit a temporary one placed in a field setting. The external validity, i.e. the usefulness of such findings in predicting economic behavior outside the laboratory, is controversial. Our data permit us to test this relationship, and we find strong support for the external validity of our laboratory measures and experimental findings.

In large firms of the type we study, the American Trucking Associations consistently report that annual turnover rates exceed 100% (19). Most driver trainees, including our subjects, borrow the cost of training from their new employer, a debt which is forgiven after twelve months of post-training service, but which becomes payable in full upon earlier exit. Yet over half our subjects exit before twelve months, which makes predicting survival of considerable interest.

Figure 4 displays the survival curves for distinct values of a typical socio-economic variable (marital status), as well as for each quintile for the Hit 15 Index. The difference between married and un-married is small, while the difference among the quintiles in any of the cognitive skills scores is large. Marital status is typical of other socio-economic variables, such as credit score, number of dependents, prior job, and so on: these explain little of the variation in survival. The survival curves are similar for the IQ Index and the Numeracy. The difference between survivals at different scores is particularly large for the Hit 15 Index: the survival for the top scorers is twice as large as for the bottom ones.

These effects are robust to including various potentially confounding factors as statistical controls. A Cox proportional hazards regression including the three indices, several demographic and socio-economic variables (age, gender, previous experience, credit risk, etc.) and indices of preferences derived in the experimental session (e.g. indices of risk and ambiguity aversion, and time preferences) shows that the only variables with a significant and large effect are the variables measuring cognitive skill (see SM).

Considering different exit categories using the Cox proportional hazards model confirms that poor ability to plan is a key link between CS's and exits. Departing during initial training, but after the credit agreement can no longer be cancelled, is perhaps the strongest indication of a mismatch between the worker and the company that the student driver did not anticipate. The reduction of the risk of exit associated with a higher Hit15 Index is more than double for exits during initial training than it is for exits later, on the job (see SM).

There is a good reason for the size of the effect of cognitive skill factors, and especially Hit 15. This index measures the ability of the individual to effectively reason backwards from a goal about how to achieve it. Survival means trainees correctly anticipated their own performance in a new environment (the training school and the new job). But more specifically, truck driving for this type of firm requires the calculation each day of the current actions needed to achieve specific near-term goals under multiple and often conflicting constraints. In fact, drivers have to update the firm daily about this calculation over a satellite uplink in their truck (20). However, the value of this ability clearly applies beyond trucking, to any occupation requiring a significant amount of independent work.

In a multivariate analysis, controlling for the effect of cognitive skills on exit risk, economic preferences also predict exit risk. In particular, when we separate voluntary quits (75% of all exits) from discharges (25%), we find that choosing a higher number of future payments in the time preferences experiment predicts a lower likelihood of quitting (SM) (21).

Discussion

Cognitive skills might affect choices in the same way they affect the ability to produce the sum of two numbers: higher skill can reduce the number of errors. We do in fact find that higher error rates are associated with lower levels of cognitive skills. But if this were the only way in which cognitive skills affect preferences, we should observe only a larger variance in the choices made by those with lower cognitive skills, and no systematic effects, just as we do not see a systematic effect on the sum in addition problems.

We have found that the relationship is deeper, and it may offer an explanation of economic success of individuals. Preferences of individuals differ systematically with cognitive skills: higher cognitive skills are associated with a larger willingness to take calculated risks and higher patience. As a consequence, patience and willingness to take risks are positively correlated. Cognitive skills are also associated with higher social awareness and a greater tendency to be cooperative, so if they influence economic success, it is not by producing blind selfishness. The effect is substantial, and goes well beyond laboratory measures: we have seen how it can affect significantly job tenure.

Economic theory has so far considered cognitive skills as extremely important variables, but they have only been treated as endowments that increase the set of feasible options for an individual. These results show that cognitive skills do something else: cutting across all domains of choice, they introduce systematic effects in, and correlations among, economic preferences.

The novel relationships we find have potentially deep implications. For example, Gregory Clark recently suggested that the initial location of the industrial revolution in England may have been due to a ``survival of the richest'' selection process, that operated there from as early as 1250 C.E. (22). This selection may have been cultural, genetic, or both. He suggests that selection favored "capitalist" traits that include several of the ones (e.g. risk taking and saving propensity) we analyze herein. Were these traits independent, it is hard to imagine how a selection process could induce such a bundled concentration in the time frame suggested. But if these traits are correlated due to their linkage with cognitive skills, then a "selection of the richest" explanation, operating through selection for cognitive skills, becomes more plausible (23).

Our findings are relevant for the development of better theories of human decision making, and change the way we look at important policy issues. Decisions about retirement involve using cognitive skills to simultaneously apply attitudes towards risk and to the allocation over time of future payments. Numerical skills are already known to significantly affect such decisions (1, 5), and our results generalize this finding. The same holds for a variety of problems in the areas of health insurance, health care, and investments in education, and in the area of labor contracts and employment choices. The relationships we find between cognitive skills and economic preferences, and among economic preferences, should be taken into account in designing improved decision theories, labor contracts, insurance policies, and related public policies.

Methods

The Field Setting

Our data was collected in a temporary laboratory set up in a company-operated training school, so that the social framing of the economic experiments was provided by the economic context of interest: training with a new employer for a new occupation. Over the course of a year we ran extensive experiments (4 hours per session) with the participating subjects, in groups ranging from 20 to 30 at a time.

Measures of Cognitive Skills

We collected three different measures of cognitive skills (CS's) (24). The first was a licensed subset of Raven's Standard Progressive Matrices (SPM) (25). The SPM is a measure of non-verbal IQ consisting of a series of pattern matching tasks that do not require mathematical or verbal skill.

The second was a section of a standard paper-and-pencil test for adults of quantitative literacy, or "numeracy," from the Educational Testing Service. Subjects read and interpreted text and diagrams containing numerical information, and did arithmetic calculations, such as computing percentages, based on that information (26).

The third instrument was a simple game, called Hit 15, played against the computer. This required reasoning backwards from the game's goal, which was to reach 15 total points from a varying initial number less than 15, to which each player had to add between 1 and 3 points on each round (27).

Measures of Economic Preferences

In the experiment on risk preferences subjects made four sets of seven choices. The fixed payment increased in value with each choice, while the lottery was constant: a promise to pay the subject either a higher or a lower dollar amount, such as $10 or $2, depending on a random device which had a 50% probability for each outcome. Over the four sets of choices the amounts at stake varied between a gain of $10 and a loss of $5, so we could study the effects of stake size, and of losses as compared to gains. We identify preferences using the certainty equivalent method (28). The experiment on ambiguity was identical except that subjects knew less about the lotteries—only that each outcome had at least a 20% chance. Subjects were paid real money for one of the choices in each experiment, selected randomly.

In our experiment on time preferences subjects made four sets of six choices. The later payment was always $80, while the earlier one ranged from $75 to $45, in increments of $5. We offered time horizons from today to thirty days hence. The goal was to compare shorter time horizons to longer ones, plus capture any special features of immediacy. Subjects would be present at the field site at all the payment dates. Two subjects from each test group were randomly selected to receive payment on the date they had selected in one of the 24 choices, which was also selected at random.

Social Dilemma Experiment

Our version of the sequential Prisoner's Dilemma has a first mover and a second mover, and each subject chose actions both as a first and as a second mover. We randomly and anonymously paired subjects and randomly assigned their roles to determine payoffs.

Both the first and second mover were endowed with $5, and asked if they wanted to send money to the other player: what was kept would be theirs at the end, and what was sent would be doubled by the experimenters before reaching the other player. The first mover made an unconditional choice to send either none of the endowment ($0) or all of it ($5). The second mover made two choices about returning between $0 and $5 (in dollar increments) from his endowment, in case the first mover had sent $0, and separately in case the first mover had sent $5.

We also asked each subject what percentage of first movers would send $5, and also what the average amount sent by second movers responding to $0 and to $5 transfers would be. We paid subjects extra if their estimates matched the actual behavior.

Turnover in the firm

The length of job tenure is a key indicator of economic success for both firm and driver-trainee. The firm has at stake its investment in recruiting and training (between $5,000 and $10,000) and its reputation in the labor market. The trainee has at stake the debt for driver training (which is cancelled after 12 months of service, but becomes immediately payable in full upon earlier exit), his job record, and his credit history. To address external validity we examine what affects the survival curve, which is an estimate of the proportion of the initial trainee population remaining at each tenure-length that takes into account the inflow of trainees over time and the right-censoring of incomplete tenure spells (29).

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7. Subjects selected which color gave them the larger payment after the chips had been put into the bowl, so they knew that the composition of the chip reservoir could not be biased for or against them.

8. IQ and numeracy are both normalized to a [0,1] interval. Results in this paragraph exceed any conventional threshold of statistical significance. Numeracy: 26% Marginal Effect (ME), at significance level p = 0.0001; IQ: 23% ME at p = 0.012.

9. Numeracy: 18% ME at p = 0.0001; IQ: 18% ME, at p = 0.008.

10. Numeracy: 18% ME at p = 0.0001; IQ: 15% ME, at p = 0.006.

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15. The special role of the lotteries with negative outcomes is confirmed by the factor analysis of choices (see SM) which shows that lotteries with negative outcomes (especially ($1, -$5)), are in a cluster by themselves.

16. 27.8%, $p < 0.0001$.

17. Thus the beliefs that subjects have about the general population and their own choices tend to agree.

18. Possible motives include an efficiency concern (since sending increases the total earnings of the players), and a fairness concern. Another alternative is that the laboratory framing (at the workplace with co-workers, with whom repeated interactions might be expected) leads subjects to treat the experiment as if it were a repeated game in which there is cooperative equilibrium.

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20. The driver must deliver a load to a point many miles away by a target time, taking into account loading times, distances, speed limits, weather, traffic conditions, and especially, the government regulations governing allowable hours of service for drivers.

21. See SM tables 48 and 49. Personality factors also affect these outcomes in a natural way. This job pays piece rates, so that effort affects earnings on average, but there is significant variation outside the control of the driver. High values of Control make drivers more likely to quite, while high values of Achievement make them less likely to get fired.

22. Clark G (2007) *A Farewell to Alms: A Brief Economic History of the World* (Princeton University Press, Princeton, NJ).

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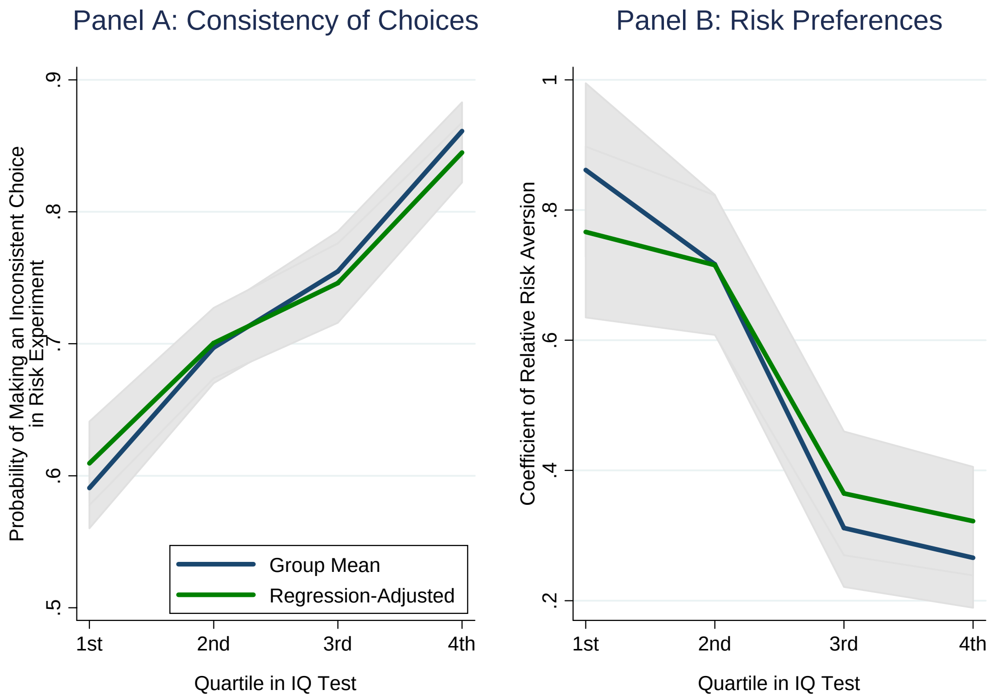
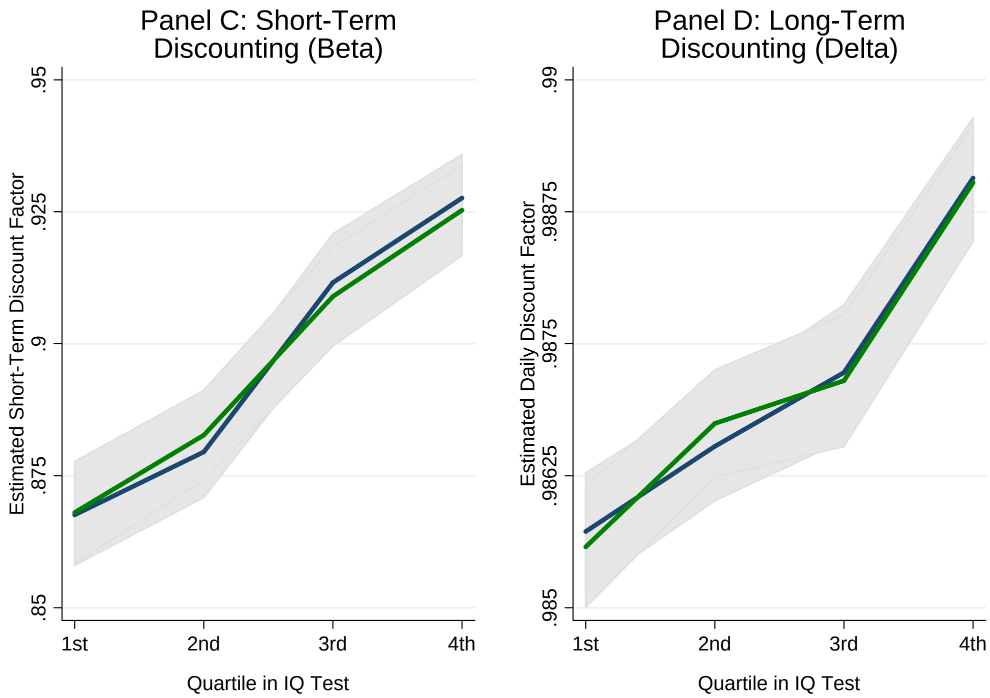
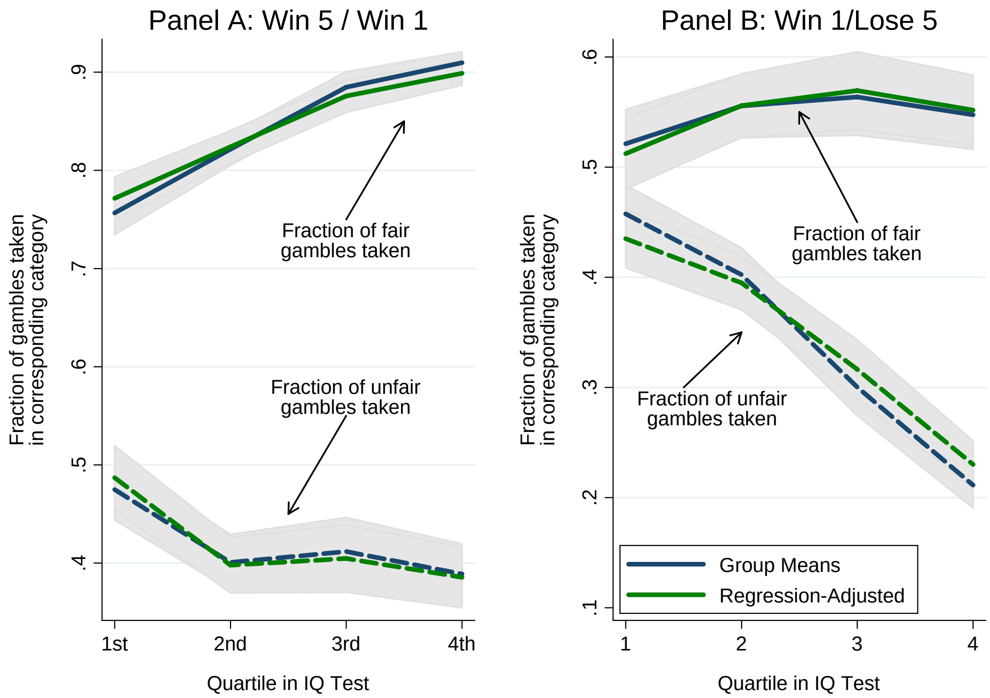


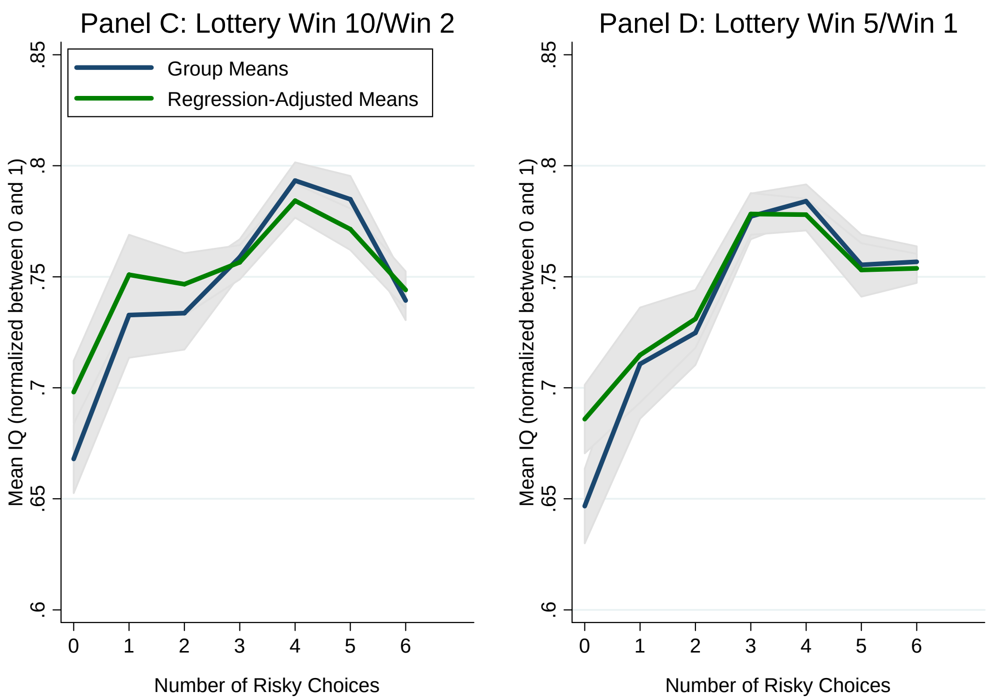
Panel A: Consistency of Choices
Probability of Making an Inconsistent Choice in Risk Experiment
.5
.6
.7
.8
.9
Group Mean
Regression-Adjusted
1st
2nd
3rd
4th
Quartile in IQ Test
Panel B: Risk Preferences
Coefficient of Relative Risk Aversion
.2
.4
.6
.8
1
1st
2nd
3rd
4th
Quartile in IQ Test

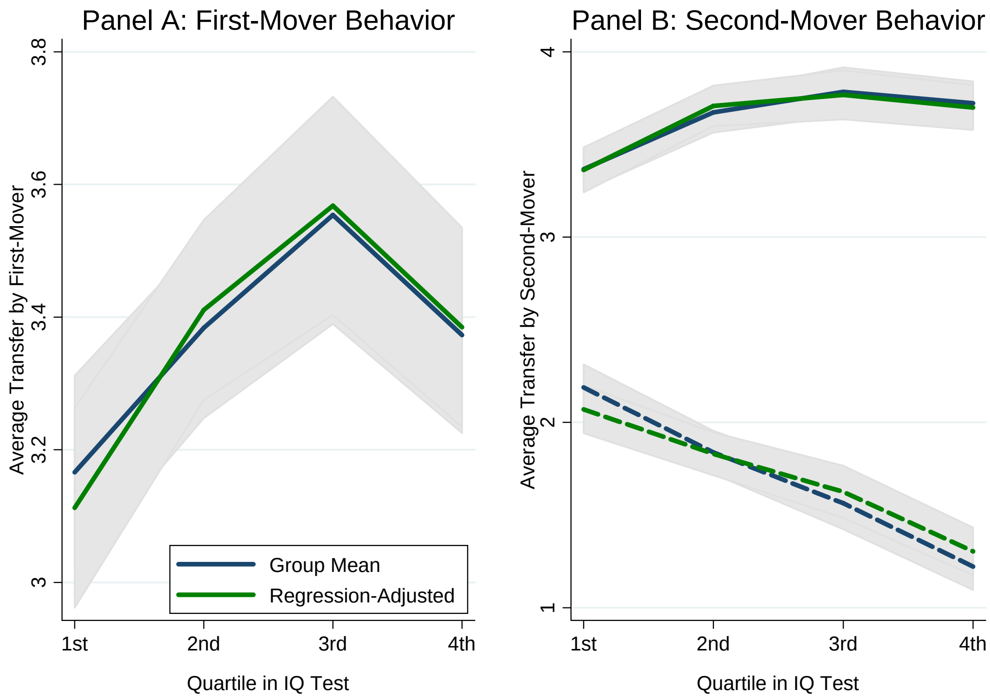


Panel C: Short-Term Discounting (Beta)
Estimated Short-Term Discount Factor
.85
.875
.9
.925
.95
1st
2nd
3rd
4th
Quartile in IQ Test
Panel D: Long-Term Discounting (Delta)
Estimated Daily Discount Factor
.985
.98625
.9875
.98875
.99
1st
2nd
3rd
4th
Quartile in IQ Test



Panel A: Win 5 / Win 1
Fraction of gambles taken in corresponding category
.4
.5
.6
.7
.8
.9
Fraction of fair gambles taken
Fraction of unfair gambles taken
1st
2nd
3rd
4th
Quartile in IQ Test
Panel B: Win 1/Lose 5
.1
.2
.3
.4
.5
.6
Fraction of fair gambles taken
Fraction of unfair gambles taken
Group Means
Regression-Adjusted
1
2
3
4
Quartile in IQ Test


Panel C: Lottery Win 10/Win 2
Group Means
Regression-Adjusted Means
Mean IQ (normalized between 0 and 1)
.6
.65
.7
.75
.8
.85
0
1
2
3
4
5
6
Number of Risky Choices
Panel D: Lottery Win 5/Win 1
Mean IQ (normalized between 0 and 1)
.6
.65
.7
.75
.8
.85
0
1
2
3
4
5
6
Number of Risky Choices


Panel A: First-Mover Behavior
Average Transfer by First-Mover
3.8
3.6
3.4
3.2
3
Group Mean
Regression-Adjusted
1st
2nd
3rd
4th
Quartile in IQ Test
Panel B: Second-Mover Behavior
Average Transfer by Second-Mover
4
3
2
1
1st
2nd
3rd
4th
Quartile in IQ Test

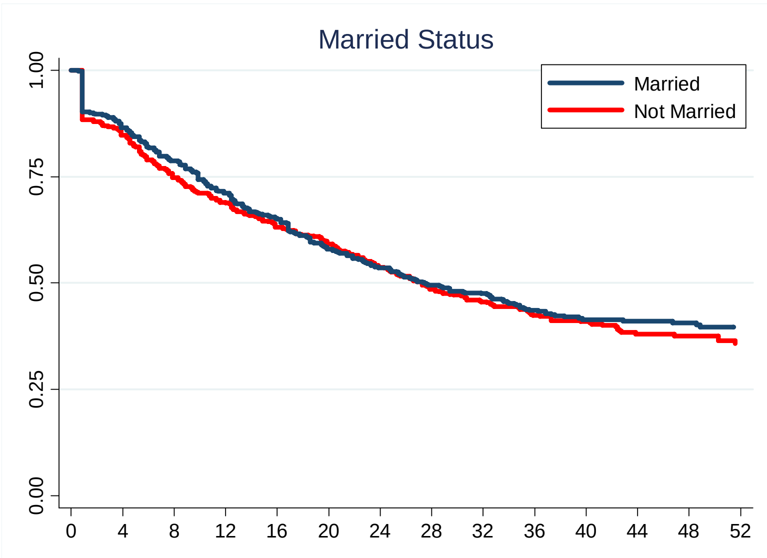


Figure 4, Panel A: Survival rate according to marital status

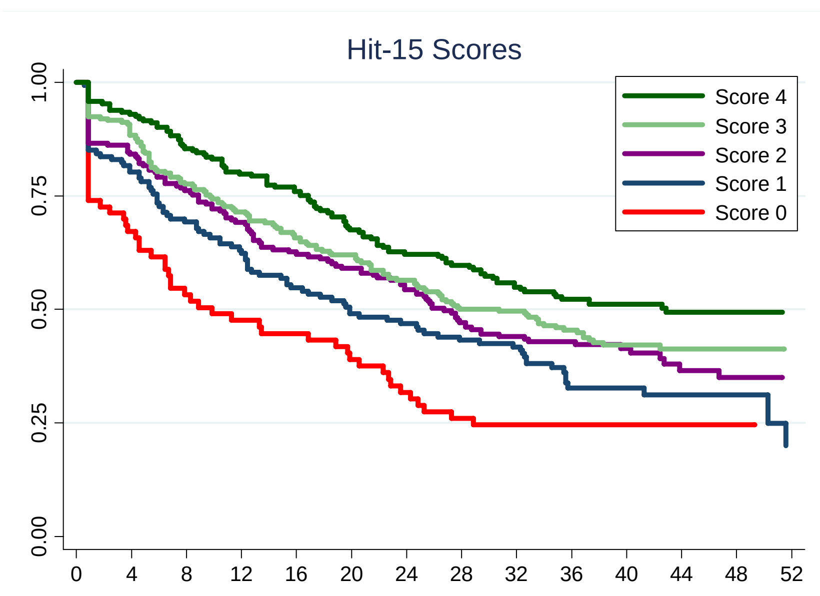


Figure 4, Panel B: Survival rate according to the Hit 15 Scores

Captions of the figures in the main text

Figure 1: IQ and economic preferences

Blue lines are unconditional averages by quartile of IQ. Green lines are regression-adjusted averages, controlling for demographics. Standard errors are adjusted for clustering on individuals where more than one observation is used.

Panel A: IQ and Consistency of choices

Panel B: IQ and coefficient of relative risk aversion

The coefficient is estimated under the assumption that the subject has a utility function on monetary payments equal to a power function (known as Constant relative Risk Aversion utility function). The reported coefficient is 1 minus this power: this coefficient is a measure of his risk aversion.

Panel C: IQ and short-run time preferences.

Panel D: IQ and long-run time preferences.

Short and long-run discount factors are estimated according to the beta-delta model. In this model, payments in the future are discounted in two ways. All future payments have a common discount beta compared to present (today) payments. This factor measures the loss for the individual of not receiving an immediate payment. All future payments are discounted by the factor delta to the power of the distance in the future of the payment: this factor measures the long run impatience.

Figure 2:

Panels A, B: Lower Cognitive Skills are associated with risk aversion in gains and risk seeking in losses

We say that a subject chooses a fair gamble if he chooses the lottery when the expected value of the lottery is larger than the certain amount. The certain amount is interpreted as the opportunity cost of the lottery, so the subject chooses a fair gamble if the expected net gain is positive. The figure reports the fraction of choice of fair and unfair gambles with the (win 5/win 1) lottery (gains) and the (win 1/ lose 5) lottery (losses). Blue lines and green lines are as in Figure 1.

Panels C, D: Cognitive Skills peak near risk neutrality

Each of the seven categories on the horizontal axis is given by the number of times the subject chooses the lottery instead of the certain amount. This is a measure of the willingness to take risks. The vertical axis reports the mean IQ for each category, normalized to lie between 0 and 1. Blue lines and green lines are as in Figure 1.

Figure 3: Behavior in the sequential prisoner’s dilemma game

Blue lines and green lines are as in Figure 1.

Panel A First mover behavior
The figure reports the mean transfer, by quartiles of IQ. The mean transfer of the first mover for the entire sample was 3.353 (SE 0.071). The difference in transfers between the two groups is significant, even after we control for the different beliefs that subjects have of the reciprocal transfer choices of the second mover, and different utility functions.
Panel B Second mover behavior
The figure reports the mean transfer of second movers, conditional on the transfer of the first mover, by IQ quartile. The bottom curve describes the response to a \$0 transfer, and the top one the response to the \$5 transfer.

Figure 4, Panels A and B: IQ and survival in the firm
The panels report the empirical estimate of the survival function (Kaplan-Meyer) for all types of exits from the job. The time unit is weeks of job tenure. The vertical axis reports the survival rate.