Too smart to be selfish? Measures of intelligence, social preferences, and consistency

Chia-Ching Chen and I-Ming Chiu and John Smith and Tetsuji Yamada

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Chia-Ching Chen† I-Ming Chiu‡ John Smith§ Tetsuji Yamada¶

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Abstract

Although there is an increasing interest in examining the relationship between cognitive ability and economic behavior, less is known about the relationship between cognitive ability and social preferences. We investigate the relationship between strongly incentivized measures of intelligence and measures of social preferences. We have data on a series of small-stakes dictator-type decisions, known as Social Value Orientation (SVO), in addition to choices in a larger-stakes dictator game. We also have access to the grade point averages (GPA) and Scholastic Aptitude Test (SAT) outcomes of our subjects. We find that subjects who perform better on the math portion of the SAT are more generous in both the dictator game and the SVO measure. By contrast we find that subjects with a higher GPA are more selfish in the dictator game and more generous according to the SVO. We also find that the consistency of the subjects is related to GPA but we do not find evidence that it is related to either portion of the SAT.

Keywords: Dictator Game, Social Value Orientation, Altruism, Cognitive Ability
JEL: C91, D64

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†New York Medical College

‡Rutgers University, The State University of New Jersey, Camden Campus

§Corresponding Author, Rutgers University, The State University of New Jersey, Camden Campus, Department of Economics, 311 N. 5th Street, Camden, New Jersey, 08102 United States, Email: smithj@camden.rutgers.edu

¶Rutgers University, The State University of New Jersey, Camden Campus

1 Introduction

Researchers have made improvements in understanding behavior by conceptualizing choice as originating from a brain which is heterogenous across subjects and influenced by external factors. For instance, these successes include cognitive hierarchy models (Camerer et al., 2004), the discovery of a relationship between play in games and the working memory capacity of the subject (Devetag and Warglien, 2003), the finding that subjects apply similar strategies across fundamentally different games which are played in parallel (Bednar et al., 2011) and a relationship between strategic sophistication and access to sleep (Dickinson and McElroy, 2010).

Experiments in economics tend to exhibit a great deal of subject-specific heterogeneity. In other words, it is often the case that the range of responses varies greatly among subjects. One possible explanation of this heterogeneity is that the subjects differ in their cognitive ability.[1] As a consequence, researchers have sought to identify a relationship between measures of intelligence and outcomes in the laboratory. Specifically, experiments have found that measures of intelligence are related to performance on a dynamic savings problem (Ballinger et al., 2011), learning optimal behavior in a decision problem (Palacios-Huerta, 2003), mistakes on a forecasting task (Rydval, 2007), the complexity of the strategies implemented in the repeated prisoner's dilemma game (Jones, 2011), outcomes in the repeated prisoner's dilemma (Jones, 2008) and choice in a beauty contest game (Burnham et al., 2009).[2]

While these papers examine the relationship between intelligence and outcomes in economics experiments, less is known about the relationship between cognitive ability and social preferences. Clarifying the relationship between intelligence and social preferences would seem to be useful in the interpretation of these experiments. Here we hope to shed new light on the relationship by analyzing dictator-type allocations decisions and strongly incentivized measures of intelligence. Our measures of intelligence include data on grade point averages (hereafter GPA) and the national rank on the Scholastic Aptitude Test (hereafter SAT). In

[1] For instance, see Camerer and Hogarth (1999).

[2] We should note that not each such study has turned up such a relationship. For instance, Georganas et al. (2010) find that measures of intelligence are poorly related to the strategic sophistication in games. Also see Bajo et al. (2011), Bayer and Renou (2011), and Chen et al. (2011).

particular, our subjects make a choice in a dictator game in which it is possible to keep $10. Our subjects also complete a nine item Social Value Orientation (hereafter SVO) measure for smaller monetary stakes.

We find that higher GPA subjects are more selfish in the dictator game than are lower GPA subjects. We also find that subjects who performed better on the Math portion of the SAT are more generous than students who performed worse. We do not find a relationship between the Verbal portion of the SAT and choice in the dictator game. There is also evidence of a positive relationship generosity in the SVO and both GPA and Math SAT scores.

Each of the nine items contained in the SVO are nearly identical.[3] As such, the coherence of the choices on these items allows a measure of the consistency of a subject. We find evidence that GPA is related to the consistency of SVO choices. However, we do not find evidence of a relationship between consistency and either portion of the SAT. Additionally, we find some evidence that GPA is related to the consistency between the SVO and dictator game choices. Again however, we do not find evidence that consistency between SVO and dictator game choices are related to either portion of the SAT.

1.1 Related Literature

There exists a literature which examines the relationship between measures of intelligence and economic preferences. However, much of the literature focuses on a different set of preferences, such as time preferences or preferences toward risk. For instance, Frederick (2005) reports that subjects which perform better on an IQ-type test exhibit more patience with respect to payments over time and exhibit less risk aversion over small-stakes gambles.[4] By contrast, we examine the link between social preferences and measures of intelligence.

There is also a literature which examines the relationship between the consistency of answers and measures of intelligence. For instance, Berks et al. (2009) finds that the results on an IQ-type test is related to the consistency of choices made on questions involving time or risk preferences. Eckel (1999) finds that grade point average of the students is related to

[3] See Appendix C for the SVO items.

[4] Also, found by Benjamin et al. (2006), Burks et al. (2009), and Dohmen et al. (2010). Yang and Lester (2008) examine the causes of irrationality, including intelligence.

the consistency of choices made on questions involving risk preferences. We perform a similar exercise and find some evidence that GPA is related to consistency, however we do not find a relationship between SAT outcomes and consistency.

Researchers have sought to understand the relationship between different personality features and social preferences. For instance, Van Lange et al. (1997) find that age, childhood experiences, and family structure are all related to social preferences. Also, Swope et al. (2008) find a weak relationship between between the personality traits of United States Naval Academy students and behavior in the dictator game, ultimatum game, trust game, and prisoner's dilemma game.

To our knowledge, there are only a few other papers which examine the relationship between measures of intelligence and social preferences.[5] Brandstätter and Güth (2002) report a significant negative relationship between giving in a dictator game and performance on cognitive tests. Ben-Ner et al. (2004) find a significant negative relationship between giving in a dictator game and performance on the Wonderlic test of intelligence. Further, this relationship is stronger for women than for men. On the other hand, Millet and Dewitte (2007), find a positive relationship between their measures of intelligence and altruistic behavior.

Whereas we also find a relationship between our measures of intelligence and social preferences, our findings are not as as straightforward. We find that the outcome on the math portion of the SAT is associated with generosity on both measures of social preferences. We find that the GPA is related to generosity on the SVO measure but with selfishness in the dictator game. Finally, we do not find a relationship between the outcome on the verbal portion of the SAT and social preferences. We also differ from these above studies in that we have data on GPA and SAT outcomes, which are highly incentivized to the extent that the outcomes of these variables can have significant implications for future of the subjects. By contrast, the studies mentioned above employ measures of intelligence which are not as highly incentivized.

[5] Thöni et al. (2009) find no relationship between educational attainment and behavior in a public goods game.

2 Data and Methodology

The choices on social preferences were obtained in connection with Smith (2011). Each subject was asked for a choice in one of two forms of a dictator game. In one treatment, the subjects were given a standard $10 dictator game. This dictator game was presented to the subjects in $0.25 increments. The subjects were directed to indicate which of the 41 dictator game allocations they most preferred.[6] A total of 96 students enrolled in economics classes at Rutgers University-Camden made a choice in this game. The data for this game was collected in 5 classes of 16, 21, 39, 12 and 8 subjects.

In the other dictator game treatment, the subjects were asked for their choice in a non-standard dictator game in which the relative allocation *price* is 1 to 3. In other words, the most selfish allocation is $10 to self and $0 to other and the most generous allocation is $0 to self and $30 to other. The subject's own payoffs were listed in $0.50 increments and the other subject's payoffs were listed in $1.50 increments. The subjects were directed to indicate which of the 21 dictator game allocations they most preferred.[7] A total of 90 students in economics classes at Rutgers University-Camden made a choice in this nonstandard dictator game. The data for this game was collected in 4 classes of 21, 42, 16 and 11 subjects.

We also measured the Social Value Orientation (SVO) of the subjects. Our specification of SVO was adapted from Van Lange et al. (1997). The subjects were given the 9 SVO items such that three items were three pages. In Van Lange et al., the subjects decide on an allocation of points which carry no financial implications. By contrast, in our experiment subjects were offered a conversion rate of points to money, whereby the subject is effectively deciding on an allocation of a very small amount of money. Across all 9 SVO items, the subject could keep as little as $0.94 and as much as $1.06. Also across the SVO items, the subject could send as little as $0.19 and send as much as $0.94. The subjects were not told these amounts, however they could be calculated with relative ease. The exchange rate between the Van Lange et al. numbers and the monetary payment was designed to provide only a small monetary incentive.

[6] See Appendix A for this standard dictator game.

[7] See Appendix B for this nonstandard dictator game.

Each of the nine items has an *individualistic* response, a *prosocial* response and a *competitive* response. The individualistic response is the one in which the material payoffs accruing to oneself are the largest. In other words, selecting the individualistic choice suggests that the subject neither positively nor negatively values material payoffs accruing to the other subject. The prosocial response is the one in which the sum of the material payoffs accruing to both the subject and the other subject are the largest. In other words, selecting the prosocial response suggests that the subject positively values the material payoffs accruing to the other subject. The competitive response is the one in which the difference between the material payoffs accruing to the subject and the other subject are the largest. In other words, selecting the competitive choice suggests that the subject negatively values material payoffs accruing to the other subject. The exact items and the conversion from points to money in the SVO measure is given in Appendix C. Following Van Lange et al., we would classify a subject as prosocial, individualistic or competitive if the subject answered six of the nine items in a particular fashion.

As was the point of Smith (2011), within each dictator treatment, we also varied the order of the dictator game and the SVO measurement. Roughly half of each class made a choice in the dictator game then SVO items and half answered the SVO items then made a choice in the dictator game.

The responses for the SVO and the dictator game were entered on paper. These choices were incentivized to the extent that one out of every four subjects within each class were paid the actual amounts obtained. In this experiment, we employed a triadic design. The subjects were told to make their allocation decisions involving themselves ("You") and another subject ("Other1"). Another subject ("Other2") was to make allocations involving Other2 and You. Therefore, the amount accruing to each subject was what was kept in the You-Other1 allocation decisions plus what Other2 did not keep in the Other2-You allocation decisions. In both the measurement of SVO and the choice in the dictator game, the status of You, Other1 and Other2 remained fixed. This description of the triadic design was provided verbally by the same male experimenter and in written form given to each subject.

The data on measures of intelligence were obtained from the Office of the Registrar of Rutgers University-Camden. The registrar could locate data on cumulative GPA for 185 of the 186 subjects. Data on SAT scores could only be located for 85 of the 186 subjects. The SAT scores were only available for students who were admitted as freshmen. In other words, the SAT scores for transfer students were not available.

3 Results

3.1 Overview

We now present an overview of the variables which we use in the analysis. The variable SVO First obtains a value of 1 if the SVO was administered first, and a 0 otherwise. The Standard Dictator variable obtains a 1 if the standard dictator was used and a 0 otherwise. We use two measures of the amount kept in the dictator game: Dictator Kept and Dictator Fraction Kept. The variable Dictator Kept is simply the amount kept in the dictator game. In the case of both the standard version and the nonstandard version, this can range from 0 to 10. The variable Dictator Fraction Kept normalizes the amount of money kept in the dictator game by the total amount of money given to both players. Obviously this amount ranges from 0 to 1.

The variable GPA is the cumulative GPA of the student as of Fall 2009. Math SAT and Verbal SAT express the percentiles of the results on these portions of the SAT. The variable Female takes a value of 1 if the subject is female and 0 otherwise. The registrar also provided the birthdays of the subjects. From this we calculate Age which is the number of years old as of January 1, 2010. The variable Class indicates the last two digits of the expected year of graduation. For instance, a student expected to graduate in 2011 would obtain a value of 11. The Prosocial variable takes a value of 1 if the subject was categorized as having ProSocial preferences according to the SVO and a 0 otherwise. The Classification variable obtains a value of 1 if the SVO classifies the subject as either prosocial, individualistic or competitive. We provide the summary statistics for these variables in Table 1.

Table 1-Summary of the variables

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
SVO First	185	0.502	0.501	0	1
Standard Dictator	185	0.514	0.501	0	1
Dictator Kept	185	6.631	2.792	0	10
Dictator Fraction Kept	185	0.583	0.277	0	1
GPA	185	3.045	0.597	0.323	4.00
Math SAT	86	48.686	19.653	4.0	74.0
Verbal SAT	86	47.116	15.681	5.0	75.0
Female	185	0.357	0.480	0	1
Age	184	22.08	5.27	17.04	60.62
Class	185	10.37	0.805	9	13
Prosocial	185	0.405	0.492	0	1
Classification	185	0.848	0.359	0	1

We note that, although we conduct the experiment in a college setting, there are several students who are older than a typical college student.[8] We considered dropping these subjects as outliers however, it was not obvious precisely which students should be excluded and the variable is not central to the study. We note that there are no significant differences in the Dictator Kept, Dictator Fraction Kept, GPA or Prosocial variables of the subjects who have SAT data available and those who do not. We also note that there are no significant differences between the Dictator Kept, Dictator Fraction Kept, GPA, Prosocial or SAT variables of the subjects in each of the 9 experimental sessions.[9]

3.2 Measures of Intelligence and Behavior in the Dictator Game

We now examine the relationship between our measures of intelligence and choice made in the dictator game. We perform the following regressions with a dependent variable of Dictator Kept. Regression (1) employs only our measures of intelligence: GPA and SAT outcomes. Regressions (2) and (3) consider only the GPA and SAT outcomes, respectively, along with the details of the treatment: the order of the experiment, the type of dictator game and the interaction. Regression (4) considers all three intelligence measures and the details of the treatment. Finally, regression (5) considers all three measures of intelligence, the details of

[8] The subjects with ages over 30 include: 60, 52, 42, 38, 37, 33, 32, and three of 31.

[9] These are available from the corresponding author upon request.

the treatment, and background details for the subjects. We summarize the results in Table 2.

Table 2-Relationship between Dictator Kept and Measures of Intelligence

	(1)	(2)	(3)	(4)	(5)
GPA	1.236**	0.403	–	1.103**	1.208**
	(0.517)	(0.347)		(0.510)	(0.548)
Math SAT	−0.0300*	–	−0.0370**	−0.0395***	−0.0402**
	(0.0152)		(0.0151)	(0.0149)	(0.0155)
Verbal SAT	0.0152	–	0.0149	0.0107	0.00623
	(0.0192)		(0.0188)	(0.0185)	(0.0191)
SVO First	–	−0.881	−2.751***	−2.593***	−2.639***
		(0.580)	(0.853)	(0.837)	(0.849)
Standard Dictator	–	−1.388**	−2.084**	−1.863**	−1.5317*
		(0.574)	(0.791)	(0.780)	(0.840)
SVO First*Standard Dictator	–	0.812	3.277***	3.340***	3.319***
		(0.807)	(1.182)	(1.157)	(1.181)
Female	–	–	–	–	−0.112
					(0.671)
Age	–	–	–	–	0.118
					(0.114)
Class	–	–	–	–	−0.182
					(0.453)
R^2	0.11	0.06	0.17	0.22	0.24
Observations	86	185	86	86	86

Result of regressions where *** indicates significance at $p < 0.01$, ** indicates significance at $p < 0.05$ and * indicates significance at $p < 0.10$.

We find a relationship between the amount kept in the dictator game and GPA. In regressions (1), (4), and (5) we find that higher GPA subjects keep more in the dictator game, than do lower GPA subjects. We also find a negative relationship between the amount kept in the dictator game and Math SAT. In regressions (1), (3), (4), and (5) we find that higher Math SAT subjects keep less in the dictator game than do lower Math SAT subjects. Finally, note that we do not find a relationship between the amount kept in the dictator game and Verbal SAT.

We note the significant relationships which are related to the details of the experiment. As does Smith (2011), we find that the order of the presentation of the experimental material

is related to choice. In particular, we find that subjects who first responded to the SVO were more generous in the dictator game than subjects who responded first to the dictator game. We also note that the coefficient involving the specification of the dictator game is significant in regressions (2)-(5). Further, the interaction between the order and the form of the game is significant in regressions (3), (4), and (5).

While we are encouraged by the results summarized in Table 2, it is potentially problematic that the term involving the form of the dictator game is significant. In order to account for this feature, we perform the analogous analysis as above, with the exception that the dependent variable is the fraction kept in the dictator game. We summarize the results in Table 3.

Table 3-Relationship between Dictator Fraction Kept and Measures of Intelligence

	(1)	(2)	(3)	(4)	(5)
GPA	0.114**	0.0531	–	0.130**	0.138**
	(0.0518)	(0.0348)		(0.0497)	(0.0531)
Math SAT	−0.00263*	–	−0.00323**	−0.00353**	−0.00388**
	(0.00152)		(0.00149)	(0.00145)	(0.00150)
Verbal SAT	0.00164	–	0.00159	0.00111	0.000563
	(0.00192)		(0.00185)	(0.00180)	(0.00185)
SVO First	–	−0.0823	−0.263***	−0.245***	−0.247***
		(0.0582)	(0.0841)	(0.0815)	(0.0823)
Standard Dictator	–	0.0291	−0.0378	−0.0118	0.0309
		(0.0576)	(0.0780)	(0.0759)	(0.0815)
SVO First*Standard Dictator	–	0.0776	0.315***	0.322***	0.301**
		(0.0809)	(0.117)	0.113	(0.115)
Female	–	–	–	–	−0.0693
					(0.0651)
Age	–	–	–	–	0.007101
					(0.0111)
Class	–	–	–	–	−0.0326
					(0.0439)
R^2	0.10	0.04	0.18	0.25	0.27
Observations	86	185	86	86	86

Result of regressions where *** indicates significance at $p < 0.01$, ** indicates significance at $p < 0.05$ and * indicates significance at $p < 0.10$.

Despite the differences in the dependent variables, the qualitative results presented in Table 2 remain largely unchanged here. In particular, we note a positive relationship between the amount kept in the dictator game and GPA, as seen in regressions (1), (4), and (5). We also see a negative relationship between the amount kept in the dictator game and Math SAT, as

seen in regressions (1), (3)-(5). Finally, we do not observe a significant relationship between Verbal SAT and the amount kept in the dictator game.

Also similar to the results of Table 2, here we find that the SVO First and the interaction terms are significant in regressions (3)-(5). However, unlike the previous analysis, here we find that the form of the dictator game is not significant. In our view this suggests that the use of the fraction of money kept is capturing the differences in behavior due to the different forms of the dictator games.

In summary, we observe a positive relationship between intelligence, as measured by GPA and selfishness in the dictator game. We also observe a negative relationship between intelligence, as measured by Math SAT, and selfishness in the dictator game. Finally, we do not observe a significant relationship between intelligence, as measured by Verbal SAT, and selfishness in the dictator game.

3.3 Measures of Intelligence and SVO

We now turn our attention to the relationship between the SVO classification and our measures of intelligence. In particular, we examine the relationship between the classification for generosity according to the SVO measure and intelligence. As such, we employ Prosocial as the dependent variable. Recall that this variable takes a value of 1 if the subject was classified as prosocial by SVO and a 0 otherwise. Similar to our previous analysis, we seek to isolate the relationship between social preferences and intelligence. In regression (1) we include all three measures of intelligence and the order treatment. Regressions (2) and (3) includes only the GPA measure or the SAT measures respectively, in addition to the order treatment. In regression (4) we include all three measures of intelligence, the order treatment, and characteristics of the subjects. Table 4 presents the summary of this analysis.

Table 4-The Prosocial variable and Measures of Intelligence.

	(1)	(2)	(3)	(4)
GPA	0.962**	0.484*	–	0.883*
	(0.455)	(0.269)		(0.484)
Math SAT	0.0275**	–	0.0291**	0.0312**
	(0.0138)		(0.0141)	(0.014)
Verbal SAT	0.0254	–	0.0259	0.0249
	(0.0179)		(0.0174)	(0.0186)
SVO First	0.969*	−0.165	0.738	1.1251**
	(0.518)	(0.306)	(0.483)	(0.5504)
Female	–	–	–	0.545
				(0.580)
Age	–	–	–	−0.00219
				(0.0904)
Class	–	–	–	−0.297
				(0.383)
-2 log L	100.18	245.77	105.05	98.48
LR χ^2	13.36***	4.03	8.48**	15.05**
Observations	86	185	86	86

Result of logistic regressions where *** indicates significance at $p < 0.01$, ** indicates significance at $p < 0.05$ and * indicates significance at $p < 0.10$.

First, we find some evidence of a positive relationship between GPA and the prosocial classification. This relationship is significant at the 0.05 level in regression (1) and significant at the 0.10 level in regressions (2) and (4). In other words, higher GPA subjects are more likely to be categorized as being generous by SVO. We also find a positive relationship between Math SAT scores and the prosocial classification. This relationship is significant at the 0.05 level in regressions (1), (3) and (4). In other words, higher Math SAT subjects are more likely to be categorized as being generous by SVO. Again we do not find such a relationship involving Verbal SAT.

We also note that the SVO First coefficient is significant at the 0.1 level in regression (1) and at the 0.05 level in regression (4). Unlike the analysis summarized in Tables 2 and 3, we do not include the indicating the specification of the dictator game and the type-order interaction. However, when we do include these variables, neither of the variables are significant.[10]

[10] These results are available from the corresponding author upon request.

3.4 Measures of Intelligence and Consistency

Finally, we turn our attention to the relationship between the consistency of choices and our measures of intelligence. Recall that the SVO measure consists of nine nearly identical items. If the subject answers six of the nine items in the same manner then the SVO will classify the subject as one of three types. It seems reasonable to use the condition of being classified as a measure of consistency. Therefore, as a dependent variable we use Classification, which assigns a 1 to a subject who is classified according to their choices of SVO and 0 otherwise. Table 5 summarizes our analysis.

Table 5-The Classification Variable and Measures of Intelligence

	(1)	(2)	(3)	(4)
GPA	0.9279*	0.871***	–	0.742
	(0.4751)	(0.337)		(0.499)
Math SAT	0.0145	–	0.0153	0.0179
	(0.0133)		(0.0126)	(0.0142)
Verbal SAT	0.0168	–	0.0192	0.0145
	(0.0163)		(0.0157)	(0.0169)
SVO First	0.6019	0.351	0.428	0.698
	(0.5576)	(0.426)	(0.536)	(0.589)
Female	–	–	–	0.174
				(0.645)
Age	–	–	–	−0.0737
				(0.0922)
Class	–	–	–	−0.549
				(0.398)
-2 log L	86.339	150.26	90.32	84.40
LR χ^2	6.95	7.01**	2.97	8.88
Observations	86	185	86	86

Result of logistic regressions where *** indicates significance at $p < 0.01$, ** indicates significance at $p < 0.05$ and * indicates significance at $p < 0.10$.

Here we find some evidence that GPA is related to consistency. Specifically, in regression (1) we find that GPA is related to consistency at the 0.1 level, and it is significant at the 0.01 level in regression (3). However, we note that GPA is not significantly related to consistency in regression (4). Surprisingly, the results of the SAT, in particular the Math portion of the SAT, are not related to consistency. In none of the regressions above are either Math or

Verbal SAT results related to consistency.

We also consider another notion of consistency: the agreement between the choices on the SVO and that made in the dictator game. To accomplish this, we first run two sets of regressions. The first set is with Dictator Fraction Kept as the dependent variable and Prosocial as an independent variable. The second set of regressions uses the squared residuals obtained in the first set, with measures of intelligence as the independent variables. In this way we can determine if these measures of intelligence are related to the agreement between the choices on the SVO and the choice made in the dictator game.

In both regressions (1) and (2) below we use the responses on the SVO as an independent variable and the fraction of money kept in the dictator game as dependent variable. In regression (1) we also include the SVO First as an independent variable. In regression (2) we also include the Standard Dictator and SVO First- Standard Dictator interaction. Table 6 summarizes these results.

Table 6-Relationship between Dictator Fraction Kept and SVO

	(1)	(2)
Prosocial	-0.222^{***}	-0.217^{***}
	(0.0382)	(0.0389)
SVO First	-0.0628^{*}	-0.0946^{*}
	(0.0375)	(0.0539)
Standard Dictator	–	-0.00829
		(0.0535)
SVO First*Standard Dictator	–	0.0612
		(0.0752)
R^2	0.16	0.17
Observations	185	185

Result of regressions where *** indicates significance at $p < 0.01$, and * indicates significance at $p < 0.10$.

Now we use the squared residuals obtained in the regressions summarized in Table 6 as dependent variables in the regressions summarized below. In each of the regressions below, we use the measures of intelligence as independent variables in order to determine if the agreement between SVO and dictator choices is related to our measures of intelligence. In regressions (1.1), (1.2) and (1.3) below, we use the squared residuals obtained in regression

(1) as summarized in Table 7 as the dependent variable. In regressions (2.1), (2.2) and (2.3) below, we used the squared residuals obtained in regression (2) as summarized in Table 7 as the dependent variable.

Table 7-Relationship Between Consistency and Measures of Intelligence

	(1.1)	(1.2)	(1.3)	(2.1)	(2.2)	(2.3)
GPA	−.0245**	−	−0.0259	−0.0234*	−	−0.0251
	(0.0120)		(0.0185)	(0.0119)		(0.0177)
Math SAT	−	0.000225	0.000294	−	0.000174	0.000240
		(0.000546)	(0.000545)		(0.000524)	(0.000523)
Verbal SAT	−	−0.000992	−0.000875	−	−0.000964	−0.000851
		(0.000685)	(0.000686)		(0.000656)	(0.000657)
R^2	0.02	0.03	0.05	0.02	0.03	0.05
Observations	185	86	86	185	86	86

The dependent variable of regressions (1.1), (1.2) and (1.3) is the squared residuals of regression (1) as summarized in Table 6. The dependent variable of regressions (2.1), (2.2) and (2.3) is the squared residuals of regression (2) as summarized in Table 6. Further, ** indicates significance at $p < 0.05$ and * indicates significance at $p < 0.10$.

Similar to the analysis summarized in Table 5, we find some evidence that GPA is related to consistency. In both regressions (1.1) and (2.1) we find that GPA is related to consistency as measured by the agreement between SVO and dictator game choices. However, this relationship is not robust to changes in the model. In particular, when we include the outcomes on the SAT, GPA is no longer significant. Also similar to the results summarized in Table 5, here we also do not find a relationship between the squared residuals and either portion of the SAT. Finally, we note that the above analysis, conducted with the absolute value of the residuals rather than the squared residuals, yields even weaker evidence of a relationship. In particular, the GPA coefficient in Regression (1.1) is only significant at the 0.1 level and Regression (2.1) is not significant.

4 Discussion and Conclusions

Increasingly in economics, researchers are becoming interested in examining the role of cognitive ability in economic behavior. However, before researchers can make accurate inferences of strategic choices give measures of intelligence, we must have a better understanding of other relevant correlates of cognitive ability. As such, in this paper we examine the relationship between measures of intelligence and social preferences.

We find that our incentivized measures of intelligence are related to social preferences. In particular, we find evidence of a negative relationship between performance on the Math portion of the SAT and selfishness in both the dictator game and the SVO measure. By contrast, we find a positive relationship between GPA and selfishness in the dictator game, but a negative relationship between GPA and selfishness on the SVO measure. Finally, we only find some evidence of a relationship between GPA and consistency of choices. We do not find such evidence for either portion of the SAT.

While it is obvious that the GPA and SAT measures are different, we are surprised by the qualitative differences found above. Therefore, we find evidence of a relationship between our measures of intelligence and social preferences, however it seems that each measure of intelligence is capturing a different aspect of intelligence. We also note that there are no systematic differences in the social preferences in the basis of gender. Previous work has found a relationship between gender and generosity,[11] however our data does not support such a relationship.

While we are encouraged by our results, there is more to be explored. For instance, additional data is needed in order to better identify the relative merits of the measures of intelligence which we use. We are also aware of the limitations of the measures of social preferences which we use. One way to remedy this would be to conduct a thorough investigation of social preferences, ala Charness and Rabin (2002), when considering incentivized measures of intelligence.

[11] For instance, see Eckel and Grossman (1998) and Andreoni and Vesterlund (2001).

Appendix A

Standard Dictator Game

You: $10.00 Other1: $0.00	You: $9.75 Other1: $0.25	You: $9.50 Other1: $0.50	You: $9.25 Other1: $0.75
You: $9.00 Other1: $1.00	You: $8.75 Other1: $1.25	You: $8.50 Other1: $1.50	You: $8.25 Other1: $1.75
You: $8.00 Other1: $2.00	You: $7.75 Other1: $2.25	You: $7.50 Other1: $2.50	You: $7.25 Other1: $2.75
You: $7.00 Other1: $3.00	You: $6.75 Other1: $3.25	You: $6.50 Other1: $3.50	You: $6.25 Other1: $3.75
You: $6.00 Other1: $4.00	You: $5.75 Other1: $4.25	You: $5.50 Other1: $4.50	You: $5.25 Other1: $4.75
You: $5.00 Other1: $5.00	You: $4.75 Other1: $5.25	You: $4.50 Other1: $5.50	You: $4.25 Other1: $5.75
You: $4.00 Other1: $6.00	You: $3.75 Other1: $6.25	You: $3.50 Other1: $6.50	You: $3.25 Other1: $6.75
You: $3.00 Other1: $7.00	You: $2.75 Other1: $7.25	You: $2.50 Other1: $7.50	You: $2.25 Other1: $7.75
You: $2.00 Other1: $8.00	You: $1.75 Other1: $8.25	You: $1.50 Other1: $8.50	You: $1.25 Other1: $8.75
You: $1.00 Other1: $9.00	You: $0.75 Other1: $9.25	You: $0.50 Other1: $9.50	You: $0.25 Other1: $9.75

You: $0 and Other1: $10.00

Appendix B

Nonstandard Dictator Game

You: $10.00 Other1: $0.00	You: $9.50 Other1: $1.50	You: $9.00 Other1: $3.00	You: $8.50 Other1: $4.50
You: $8.00 Other1: $6.00	You: $7.50 Other1: $7.50	You: $7.00 Other1: $9.00	You: $6.50 Other1: $10.50
You: $6.00 Other1: $12.00	You: $5.50 Other1: $13.50	You: $5.00 Other1: $15.00	You: $4.50 Other1: $16.50
You: $4.00 Other1: $18.00	You: $3.50 Other1: $19.50	You: $3.00 Other1: $21.00	You: $2.50 Other1: $22.50
You: $2.00 Other1: $24.00	You: $1.50 Other1: $25.50	You: $1.00 Other1: $27.00	You: $0.50 Other1: $28.50
You: $0.00 Other1: $30.00			

Appendix C

Social Value Orientation (SVO)

We asked the following 9 items (from Van Lange et al., 1997) in order to measure the SVO of the subjects. Each of the 9 items has a prosocial answer, a individualistic answer and a competitive answer. Each item is stated in terms of points where 100 points corresponded to \$0.02103.

Question 1	A	B	C
You:	480 points	540 points	480 points
Other1:	80 points	280 points	480 points

Question 2	A	B	C
You:	560 points	500 points	500 points
Other1:	300 points	500 points	100 points

Question 3	A	B	C
You:	520 points	520 points	580 points
Other1:	520 points	120 points	320 points

Question 4	A	B	C
You:	500 points	560 points	490 points
Other1:	100 points	300 points	490 points

Question 5	A	B	C
You:	560 points	500 points	490 points
Other1:	300 points	500 points	90 points

Question 6	A	B	C
You:	500 points	500 points	570 points
Other1:	500 points	100 points	300 points

Question 7	A	B	C
You:	510 points	560 points	510 points
Other1:	510 points	300 points	110 points

Question 8	A	B	C
You:	550 points	500 points	500 points
Other1:	300 points	100 points	500 points

Question 9	A	B	C
You:	480 points	490 points	540 points
Other1:	100 points	490 points	300 points

The individualistic answers are: 1B, 2A, 3C, 4B, 5A, 6C, 7B, 8A and 9C. The prosocial answers are: 1C, 2B, 3A, 4C, 5B, 6A, 7A, 8C and 9B. The competitive answers are: 1A, 2C, 3B, 4A, 5C, 6B, 7C, 8B and 9A. Van Lange et al. classifies a subject according to the above labels if six or more items are selected in a similar fashion.

References

Andreoni, James and Vesterlund, Lise (2001): "Which is the Fair Sex? Gender Differences in Altruism," *Quarterly Journal of Economics*, 116(1): 293-312.

Bajo, María T., Brañas-Garza, Pablo, Georgantzís, Nikolaos, Morales, Julia, and Parravano, Melanie (2011): "Cognitive underpinnings of behavior in the Traveler's Dilemma: Treasures and Contradictions revisited," working paper University of Granada.

Ballinger, T. Parker, Hudson, Eric, Karkoviata, Leonie, and Wilcox, Nathaniel T. (2011): "Saving behavior and cognitive abilities," *Experimental Economics*, 14: 349-374.

Bayer, Ralph and Renou, Ludovic (2011): "Cognitive abilities and behavior in strategic-form games," working paper University of Leicester.

Bednar, Jenna, Chen, Yan, Liu, Tracy Xiao, and Page, Scott (2011): "Behavioral Spillovers and Cognitive Load in Multiple Games: An Experimental Study," *Games and Economic Behavior*, forthcoming.

Benjamin, Daniel J., Brown, Sebastian A., and Shapiro, Jesse M. (2006): "Who is 'Behavioral'? Cognitive Ability and Anomalous Preferences," Working Paper.

Ben-Ner, Avner, Kong, Fanmin and Putterman, Louis (2004): "Share and share alike? Gender-pairing, personality, and cognitive ability as determinants of giving," *Journal of Economic Psychology*, 25: 581-589.

Brandstätter, Hernann and Güth, Werner (2002): "Personality in Dictator and Ultimatum Games," *Central European Journal of Operations Research*, 10(3), 191-215.

Burks, Stephen V., Carpenter, Jeffrey P., Götte, Lorenz and Rustichini, Aldo (2009): "Cognitive Skills Explain Economic Preferences, Strategic Behavior, and Job Attachment," *Proceedings of the National Academy of Sciences*, 106(19): 7745-7750.

Burnham, Terence C., Cesarini, David, Johannesson, Magnus, Lichtenstein, Paul and Wallace, Björn (2009): "Higher cognitive ability is associated with lower entries in a p-beauty contest," *Journal of Economic Behavior and Organization*, 72: 171-175.

Camerer, Colin F., Ho, Teck-Hua, and Chong, Juin Kuan (2004): "A Cognitive Hierarchy Model of Games," *Quarterly Journal of Economics*, 119(3): 861-898.

Camerer, Colin F., and Hogarth, Robin M. (1999): " The effects of financial incentives in experiments: a review and capital-labor-production framework," *Journal of Risk and Uncertainty*, 19(1-3): 7-42.

Charness, Gary and Rabin, Matthew (2002): "Understanding Social Preferences with Simple Tests," *Quarterly Journal of Economics*, 117(3): 817-869.

Chen, Shu-Heng, Yang, Lee-Xieng, and Du, Ye-Rong (2011): "Intelligence and Level-k Reasoning in Beauty-Contest Experiments: An Integrated Analysis," working paper National Chengchi University.

Devetag, Giovanna and Warglien, Massimo (2003): "Games and phone numbers: Do short-term memory bounds affect strategic behavior?" *Journal of Economic Psychology*, 24: 189-202.

Dickinson, David L., and McElroy, Todd (2010): "Rationality around the clock: Sleep and time-of-day effects on guessing game responses," *Economics Letters*, 108: 245-248.

Dohmen, Thomas, Falk, Armin, Huffman, David, and Sunde, Uwe (2010): "Are Risk Aversion and Impatience Related to Cognitive Ability?" *American Economic Review*, 100(3): 1238-1260.

Eckel, Catherine (1999): "Commentary on 'The Effects of Financial Incentives in Experiments: A Review and Capital-Labor-Production Framework'," *Journal of Risk and Uncertainty*, 19, 47-48.

Eckel, Catherine and Grossman, Philip (1998): "Are Women Less Selfish Than Men? Evidence from Dictator Experiments," *Economic Journal,* 108(448), 726-735.

Frederick, Shane (2005): "Cognitive Reflection and Decision Making," *Journal of Economic Perspectives*, 19(4), 25-42.

Georganas, Sotiris, Healy, Paul J., and Weber, Roberto A. (2010): "On the Persistence of Strategic Sophistication," working paper Ohio State and Carnegie Mellon University.

Jones, Garett (2008): "Are smarter groups more cooperative? Evidence from prisoner's dilemma experiments, 1959-2003," *Journal of Economic Behavior and Organization*, 68: 489-497.

Jones, Matthew T. (2011): "Strategic Complexity and Cooperation: An Experimental Study," working paper, Ohio State University.

Millet, Kobe and Dewitte, Siegfried (2007): "Altruistic Behavior as a Costly Signal of General Intelligence," *Journal of Research in Personality*, 41, 316-326.

Palacios-Huerta, Ignacio (2003) "Learning to Open Monty Hall's Doors," *Experimental Economics*, 6(3): 235-251.

Rydval, Ondrej (2007): "Financial Incentives and Cognitive Abilities: Evidence from a Forecasting Task with Varying Cognitive Load," working paper Max Planck Institute.

Smith, John (2011): "The Endogenous Nature of the Measurement of Social Preferences," working paper Rutgers University-Camden.

Swope, Kurtis J., Cadigan, John, Schmitt, Pamela M., and Shupp, Robert (2008): "Personality preferences in laboratory economics experiments," *Journal of Socio-Economics*, 37: 998-1009.

Thöni, Christian , Tyran, Jean-Robert and Wengström, Erik (2009): "Microfoundations of Social Capital," Working paper University of Copenhagen.

Van Lange, Paul A.M., Otten, Wilma, De Bruin, Ellen M.N. and Joireman, Jeffrey (1997): "Development of Prosocial, Individualistic, and Competitive Orientations: Theory and Preliminary Evidence," *Journal of Personality and Social Psychology*, 73(4), 733-746.

Yang, Bijou and Lester, David (2008): "Reflections on rational choice: The existence of systematic irrationality," *Journal of Socio-Economics*, 37: 1218-1233.