than 64 have exhibit lower levels of economic rationality. Columns 3 and 4 replicate these estimates for the those (2,374) in the analysis sample that also completed the target task. The coefficients on the dummies for age 64 to 71 and age over 72 are qualitatively unchanged in this subsample. Given the smaller sample size, however, the standard errors associated with these estimates increase, and p-values rise a bit.

Columns 5 and 6 present the specifications of interest. Here we add both an indicator for whether the participant missed the target, and and a measure of the amount (in points) by which he or she missed the target. Column 5 presents the results for the CCEI and Column 6 for the MPI. There is some modest evidence that the amount by which participants missed the target is related to their level of rationality in the choice task. But in neither of these specifications does conditioning on the ability of participants to implement a particular choice using the experimental interface substantially alter the negative correlation between rationality and age.

These findings indicate that while older people are more likely to have trouble with the interface as evidenced by an inability to (or lack of willingness to) implement at particular allocation, this ability is not strongly correlated with violations of transitivity in the experiment. Thus, to the extent that difficulties with the experimental task interfered with implementation of preferred bundles, it was not evident in violations of GARP and it does not explain the lower levels of consistency among older people.

5.2 The Consequences of Normal Aging

An alternative source of the correlation between age and rationality is the cognitive decline associated with normal aging. In this view, age reduces in economic decisionmaking ability because age causes declines in cognitive abilities that influence economic choices. If so, then measures of cognitive ability should help explain the negative relationship between economic rationality and age.

To evaluate this hypothesis we asked participants to complete a 20-element Ravens' Matrix task. Each element of the task ask subjects to identify, from a list, the missing piece of a patterned geometric object. Success requires subjects to identify the pattern and the geometry of the object to see what is missing. The task is a classic test of intelligence and have been used by social scientists for decades. An important advantage of the test is that it does not require literacy, but just an understanding of what it means to "solve" each puzzle.

Again, not all of the analysis sample performed the task. In this case,

just 44% (1,810) completed the 20 questions. As expected, however, older people perform substantially worse on this task. Those younger than 23 solved an average of 10.7 matrices correctly. People age 51 to 63 solved 8.7, while those ages 64 and older solved an average of just 6.8 matrices correctly.

Given the sharp difference in cognitive ability by age, there is good reason to think that the Ravens' test score can explain an important amount of the correlation between age and economic rationality in the experiment. Table 5 shows, however, that this is not the case. For reference, the first two columns of Table 5 replicate the basic specification of Table 3 (columns 2 and 4). Columns 3 and 4 of Table 5 repeat these specifications but restrict attention to those who completed the Raven's matrices task. The coefficients on the older ages are smaller in this population, but still negative. Conditioning on the Raven's score (in columns 5 and 6) leaves the coefficient on the older age indicators virtually unchanged, however. The Raven's test score is positively correlated with rationality in the experiment, but not strongly so. Thus, we find no evidence that cognitive declines associated with normal aging are driving the negative relationship between economic rationality and age.

5.3 The Result of Declining Health

Finally, we consider the possibility that the lower average levels of economic rationality among older people is largely attributable to those who have had important health problems. This source of the negative correlation between rationality and age sees illnesses and conditions that disproportionately affect older people as the underlying cause of their lower decisionmaking quality.

To assess this possibility, we restrict attention to the 2,933 participants of the analysis sample about whom detailed health information is also nonmissing. For reference, Table 6, columns 1 and 2 reproduce the results of the baseline specification for the entire analysis sample. Columns 3 and 4 then replicate our basic specification for this subsample. The coefficients on the indicators for older ages are very similar to those for the entire sample.

Columns 5 and 6 of Table 6 add to the basic specification a rich set of controls for health. These include indicators for self-reported health being poor or good (relative to very good or excellent), the number of activities of daily living and instrumental activities of daily living with which the participant reports important difficulty, an indicator for having a chronic ailment or disability, and a self-reported measure of body mass index (BMI). Many of these measures of health have the expected sign in the regression (results available upon request), but their inclusion has virtually no effect on

the age coefficients. Even conditional on health, older people exhibit lower levels of consistency with economic rationality in the experiment.

6 Conclusion

Social science has documented that older people have lower levels of several cognitive skills. Some of these skills are likely important for making sound spending, saving, insurance, or health choices. Indeed, our prior work (Choi et al, 2014) showed that older people exhibit lower levels of economic rationality in a simple, incentivized choice experiment. In this way, we found evidence that older people are less able (or willing) to make choices consistent with any stable objective.

In this paper, we used a new dataset to investigate the sources of the correlation between age and economic rationality. In the new data, we replicate the qualitative relationship observed in the previous work. Older people have lower levels of economic rationality and these differences are both statistically and economically significant.

The findings suggest that the decline in economic rationality with age is a true age effect, not a cohort effect. We find no evidence that the lower levels of decisionmaking quality among older people are due to their disproportionate difficulties with the computer interface used in the experiment. In this way, the findings indicate that the relatively lower levels of decisionmaking quality among older people should be expected to persist.

Similarly, we find no evidence that the decline in economic rationality in the experiment is explained by more general forms of cognitive decline. Thus, the findings indicate that the lower decisionmaking quality among older people is not a simple consequence of declines in general forms of cognitive ability. Finally, we find no evidence that the lower average levels of cognitive ability in older people is concentrated among those who have experienced important declines in physical health. Certainly older people are in worse health, but we find no evidence that this explains why they exhibit lower levels of rationality in the experiment.

Taken together the results indicate that economic decisionmaking quality declines with normal aging and this is distinct phenomenon form other forms of cognitive decline with age. The evidence thus suggests that there is something distinct about financial decision making ability that declines in older ages. If older people make different choices from younger ones or from what a normative theory would suggest, it follows that additional scrutiny is justified. The evidence presented here suggests it is less likely to be ex-

clusively a matter of special tastes among the elderly. Instead, the results presented here suggest analysts should give more credence to the possibility that diminished capacities to understand and make effective economic tradeoffs are influencing choices in older population. It follows that policymakers and market participants that are concerned with the welfare of older people should focus more attention on assuring that products and markets are designed to that the elderly have same effective opportunities as younger populations.

References

[1] Abaluck, J. and Jonathan Gruber (2011) "Choice Inconsistencies among the Elderly: Evidence from Plan Choice in the Medicare Part D Program." *American Economic Review,* 101(4), 1180-1210.

[2] Afriat, S. (1967) "The Construction of a Utility Function from Expenditure Data." *Econometrica*, *6*, pp. 67-77.

[3] Afriat, S. (1972) "Efficiency Estimates of Production Functions." *International Economic Review*, *8*, pp. 568-598.

[4] Afriat, S. (2012) "Afriat's Theorem and the Index Number Problem." *The Economic Journal*, *122*, pp. 295-304.

[5] Agarwal, S., J. Driscoll, X. Gabaix and D. Laibson (2009) "The Age of Reason: Financial Decisions over the Life-Cycle with Implications for Regulation." *Brookings Papers on Economic Activity*, *2*, pp. 51-117.

[6] Ameriks, J., A. Caplin and J. Leahy (2003) "Wealth Accumulation and the Propensity to Plan." *Quarterly Journal of Economics*, *118*, pp. 1007-1047.

[7] Banks, J. (2010) "Cognitive Function, Financial Literacy and Financial Outcomes at Older Ages: Introduction." *Economic Journal*, *120*, pp. 357-362.

[8] Bernheim, D. and D. Garrett (2003) "The Effects of Financial Education in the Workplace: Evidence from a Survey of Households." *Journal of Public Economics*, *87*, pp. 1487-1519.

[9] Bernheim, D. and A. Rangel (2008) "Choice-Theoretic Foundations for Behavioral Welfare Economics." In *The Foundations of Positive and*

Normative Economics, ed. A. Caplin and A. Schotter. Oxford University Press.

[10] Bernheim, D. and A. Rangel (2009) "Beyond Revealed Preference: Theoretic Foundations for Behavioral Economics." *Quarterly Journal of Economics*, *124*, pp. 51-104.

[11] Camerer, C., S. Issacharoff, G. Loewenstein, T. O'Donoghue and M. Rabin (2003) "Regulation for Conservatives: Behavioral Economics and the Case for Asymmetric Paternalism." *University of Pennsylvania Law Review, 151*, pp. 1211-1254.

[12] Choi, J., D. Laibson and B. Madrian (2004) "Plan Design and 401(k) Savings Outcomes." *National Tax Journal*, *57*, pp. 275-298.

[13] Choi S., R. Fisman, D. Gale and S. Kariv (2007a) "Revealing Preferences Graphically: An Old Method Gets a New Tool Kit," *American Economic Review Papers & Proceedings*, *97*, pp. 153-158.

[14] Choi S., R. Fisman, D. Gale and S. Kariv (2007b) "Consistency and Heterogeneity of Individual Behavior under Uncertainty." *American Economic Review*, *97*, pp. 1921-1938.

[15] Choi S., S. Kariv, W. Müller and D. Silverman (2014) "Who Is (More) Rational?" *American Economic Review*, 104(6), 1518-50..

[16] Cole, S. and G. Shastry (2009) "Smart Money: The Effect of Education, Cognitive Ability, and Financial Literacy on Financial Market Participation." Harvard Business School Finance Working Paper No. 09-071.

[17] Diewert, W (2012) "Afriat's Theorem and some Extensions to Choice under Uncertainty." *The Economic Journal*, *122*, pp. 305-331.

[18] Dohmen, T., A. Falk, D. Huffman and U. Sunde (2010) "Are Risk Aversion and Impatience Related to Cognitive Ability?" *American Economic Review*, *100*, pp. 1238-1260.

[19] Duflo, E. and E. Saez (2003) "The Role of Information and Social Interactions in Retirement Plan Decisions: Evidence From a Randomized Experiment." *Quarterly Journal of Economics*, *118*, pp. 815-842.

[20] Echenique, F., S. Lee and M. Shum (2011) "The Money Pump as a Measure of Revealed Preference Violations." *Journal of Political Economy 119*, pp. 1201-1223.

[21] Fang, H., M. Keane and D. Silverman (2008) "Sources of Advantageous Selection: Evidence from the Medigap Insurance Market." Journal of Political Economy, 116(2), pp. 303-350.

[22] Fisman R., S. Kariv and D. Markovits, (2007) "Individual Preferences for Giving." *American Economic Review*, *97*, pp. 1858-1876.

[23] Hadar, J. and W. Russell (1969) "Rules for Ordering Uncertain Prospects." *American Economic Review*, *59*, pp. 25-34.

[24] Heiss, F., D. McFadden and J. Winter (2010) "Mind the Gap! Consumer Perceptions and Choices of Medicare Part D Prescription Drug Plans," in David A. Wise (ed.) *Research Findings in the Economics of Aging*, NBER, University of Chicago Press, pages 413 - 481.

[25] Houtman, M. and J. Maks (1985) "Determining all Maximial Data Subsets Consistent with Revealed Preference." *Kwantitatieve Methoden*, *19*, pp. 89-104.

[26] Levitt, S. and J. List (2007) "What do Laboratory Experiments Tell Us About the Real World?" *Journal of Economic Perspectives*, *21*, pp. 153-174.

[27] Loewenstein, G. and E. Haisley (2008) "The Economist as Therapist: Methodological Ramifications of "Light" Paternalism." In *The Foundations of Positive and Normative Economics*, ed. A. Caplin and A. Schotter. Oxford University Press.

[28] Lusardi, A. and O. Mitchell (2007) "Baby Boomer Retirement Security: The Roles of Planning, Financial Literacy, and Housing Wealth." *Journal of Monetary Economics*, *54*, pp. 205-224.

[29] Madrian, B. and D. Shea (2001) "The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior." *Quarterly Journal of Economics*, *116*, pp. 1149-1525.

[30] Manski, C. (1995) "Identifcation Problems in the Social Sciences." Cambridge: Harvard University Press.

[31] McArdle, John J.; Ferrer-Caja, Emilio; Hamagami, Fumiaki; Woodcock, Richard W. (2002). *Developmental Psychology*, Vol 38(1), Jan, 115-142.

[32] McFadden, D., J. Winter and F. Heiss (2008) "Consumer-Directed Health Care: Can Consumers Look After Themselves?" Swiss Journal of Economics and Statistics, 144(III), pp. 285-307.

[33] Rohwedder, Susann, and Robert J. Willis (2010). "Mental Retirement" *Journal of Economic Perspectives*, 24(1): 119-38.

[34] Samuelson, P. (1947) *Foundations of Economic Analysis*. Cambridge: Harvard University Press.

[35] Smith, J., J. McArdle and R. Willis (2010) "Financial Decision Making and Cognition in a Family Context." *Economic Journal*, *120*, pp. 363-380.

[36] Thaler, R. and S. Benartzi (2004) "Save More Tomorrow: Using Behavioral Economics to Increase Employee Savings." J*ournal of Political Economy*, *112*, pp. 164-187.

[37] Thaler, R. and C. Sunstein (2003) "Libertarian Paternalism." *American Economic Review*, Papers & Proceedings, *93*, pp. 175-179.

[38] Varian, H. (1982) "The Nonparametric Approach to Demand Analysis." *Econometrica*, *50*, pp. 945-972.

[39] Varian, H. (1983) "Non-Parametric Tests of Consumer Behaviour." *Review of Economic Studies*, *50*, pp. 99-110.

[40] Varian, H. (1990) "Goodness-of-Fit in Optimizing Models." *Journal of Econometrics*, *46*, pp. 125-140.

[41] Varian, H. (1991) "Goodness-of-Fit for Revealed Preference Tests." Mimeo.

[42] Varian, H. (2012) "Revealed Preference and its Applications." *The Economic Journal*, *122*, pp. 332-338.

[43] Vermeulen, F. (2012) "Foundations of Revealed Preference: Introduction." *The Economic Journal*, *122*, pp. 287-294.

[44] Willis, R. J. (2007) "Cognitive Economics and Human Capital." Presidential Address to the Society of Labor Economists. Chicago, IL.

7 Figures and Tables

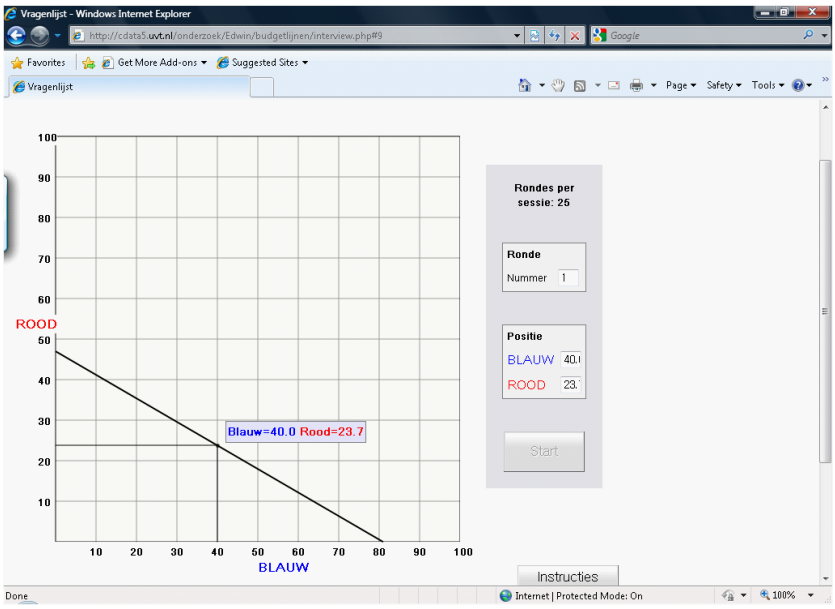

Figure 1: Example of the Experimental Interface

Table 1. Socio•demographic information

	Percent
Female	53.20
Age	
16-23	11.71
24-35	17.09
36-50	25.53
51-63	23.37
64-71	13.37
72+	8.94
Education	
Primary school	8.82
Intermediate vocational ed.	23.77
Intermediate secondary ed.	22.36
Higher vocational ed.	22.48
Higher secondary ed.	12.45
University degree	10.12
Individual gross monthly income	
€ 0-900	25.35
€ 901-1805	24.60
€ 1806-2835	25.12
€ 2835+	24.94
Occupation	
Paid work	51.54
House work	7.04
Disabled	4.04
Retired	18.03
Others	19.35
Household composition	
Partner	70.50
# of kids	0.84
# of obs.	4160

Table 2A. CCEI scores

			Percentiles					
	Mean	Sd	10	25	50	75	90	# of obs.
All	0.870	0.142	0.668	0.792	0.913	0.992	1.000	4,160
Female	0.867	0.144	0.664	0.790	0.912	0.992	1.000	2,213
Age								
16-23	0.869	0.139	0.656	0.802	0.912	0.988	1.000	487
24-35	0.874	0.132	0.679	0.787	0.914	0.992	1.000	711
36-50	0.874	0.141	0.670	0.798	0.921	0.995	1.000	1,062
51-63	0.871	0.145	0.673	0.794	0.918	0.994	1.000	972
64-71	0.854	0.148	0.652	0.770	0.890	0.985	1.000	556
72+	0.867	0.144	0.663	0.793	0.911	0.990	1.000	372
Education								
Primary school	0.866	0.150	0.663	0.789	0.909	0.995	1.000	367
Intermediate vocational ed	0.870	0.138	0.669	0.794	0.910	0.991	1.000	989
Intermediate secondary ed	0.867	0.142	0.673	0.792	0.908	0.990	1.000	930
Higher vocational ed.	0.874	0.137	0.684	0.794	0.914	0.991	1.000	935
Higher secondary ed.	0.866	0.154	0.637	0.787	0.919	0.995	1.000	518
University degree	0.873	0.135	0.677	0.780	0.918	0.996	1.000	421
Individual gross monthly income								
€ 0-900	0.873	0.140	0.673	0.805	0.916	0.993	1.000	631
€ 901-1805	0.860	0.147	0.647	0.781	0.911	0.990	1.000	458
€1 806-2835	0.874	0.136	0.661	0.794	0.919	0.992	1.000	579
€ 2835+	0.869	0.145	0.664	0.787	0.910	0.995	1.000	768
Occupation								
Paid work	0.872	0.139	0.674	0.794	0.915	0.993	1.000	2,144
House work	0.870	0.144	0.674	0.798	0.918	0.994	1.000	293
Disabled	0.845	0.160	0.621	0.764	0.883	0.987	1.000	168
Retired	0.867	0.145	0.657	0.791	0.910	0.989	1.000	750
Others	0.870	0.140	0.667	0.788	0.916	0.993	1.000	805

Table 2B. MPI scores

			Percentiles					
	Mean	Sd	10	25	50	75	90	# of obs.
All	0.880	0.160	0.638	0.809	0.957	0.998	1.000	4,160
Female	0.877	0.163	0.636	0.807	0.955	0.998	1.000	2,213
Age								
16-23	0.884	0.155	0.640	0.818	0.957	0.997	1.000	487
24-35	0.881	0.154	0.643	0.796	0.958	0.998	1.000	711
36-50	0.887	0.155	0.647	0.821	0.963	0.999	1.000	1,062
51-63	0.881	0.162	0.641	0.815	0.959	0.999	1.000	972
64-71	0.862	0.173	0.612	0.789	0.933	0.995	1.000	556
72+	0.876	0.169	0.633	0.804	0.953	0.997	1.000	372
Education								
Primary school	0.872	0.176	0.607	0.804	0.948	0.999	1.000	367
Intermediate vocation	0.881	0.154	0.637	0.809	0.953	0.997	1.000	989
Intermediate seconda	0.878	0.161	0.650	0.807	0.950	0.998	1.000	930
Higher vocational ed.	0.883	0.159	0.639	0.813	0.961	0.998	1.000	935
Higher secondary ed.	0.879	0.168	0.609	0.814	0.958	0.999	1.000	518
University degree	0.885	0.155	0.648	0.802	0.962	0.999	1.000	421
Individual gross monthly income								
€ 0-900	0.888	0.152	0.653	0.818	0.964	0.998	1.000	631
€ 901-1805	0.872	0.165	0.607	0.790	0.952	0.997	1.000	458
€ 1806-2835	0.884	0.152	0.647	0.816	0.955	0.998	1.000	579
€ 2835+	0.881	0.160	0.632	0.803	0.959	0.999	1.000	768
Occupation								
Paid work	0.884	0.155	0.647	0.815	0.959	0.998	1.000	2,144
House work	0.874	0.164	0.634	0.798	0.951	0.998	1.000	293
Disabled	0.839	0.191	0.562	0.717	0.922	0.996	1.000	168
Retired	0.877	0.166	0.636	0.814	0.955	0.997	1.000	750
Others	0.882	0.161	0.638	0.817	0.959	0.998	1.000	805

Table 3. The correlation between rationality scores and age

	(1)	(2)	(3)	(4)
	CCEI	CCEI	MPI	MPI
Constant	.868***	.861***	0.885***	.870***
	(.007)	(.011)	(0.007)	(.013)
Age				
24-35	0.004	0.005	-0.005	-0.003
	(.008)	(0.010)	(0.009)	(0.011)
36-50	0.006	0.008	0.001	0.003
	(.011)	(0.010)	(0.009)	(0.011)
51-63	0.002	0.004	-0.005	-0.001
	(.011)	(0.010)	(0.009)	(0.011)
64-71	-0.015*	-0.038***	-0.026**	-0.050***
	(0.009)	(0.014)	(0.010)	(0.017)
72+	-0.001	-0.025*	-0.008	-0.034*
	(0.010)	(0.015)	(0.011)	(0.018)
Socioeconomic controls	no	yes	no	yes
R^2	0.0021	0.0079	0.0027	0.0111
# of obs.	3,910	3,910	3,910	3,910

OLS esttimates with the omitted age category being those from 16•23. Socio•economic controls include indicators for gender, employment statuses, and completed education levels, as well as levels of individual income and the number of children in the household. Standard errors, robust to heteroskedasticity, are in parentheses. *, **, *** indicate 10, 5, 1 percent significance levels, respectively.

Table 4. Evaluation a Cohort Effect:
the correlation between rationality scores, age, and performance on a target task

	(1)	(2)	(3)	(4)	(5)	(6)
	CCEI	MPI	CCEI	MPI	CCEI	MPI
Constant	.861***	.870***	0.865***	.870***	0.868***	.874***
	(.011)	(.013)	(0.014)	(.017)	(0.015)	(.017)
Age						
24-35	0.005	-0.003	0.011	0.020	0.010	0.019
	(0.010)	(0.011)	(0.014)	(0.015)	(0.014)	(0.015)
36-50	0.008	0.003	0.006	0.016	0.006	0.016
	(0.010)	(0.011)	(0.013)	(0.014)	(0.013)	(0.014)
51-63	0.004	-0.001	0.003	0.009	0.004	0.010
	(0.010)	(0.011)	(0.013)	(0.014)	(0.013)	(0.014)
64-71	-0.038***	-0.050***	-0.033*	-0.037*	-0.032*	-0.036*
	(0.014)	(0.017)	(0.019)	(0.022)	(0.019)	(0.022)
72+	-0.025*	-0.034*	-0.029	-0.030	-0.027	-0.027
	(0.015)	(0.018)	(0.020)	(0.023)	(0.020)	(0.024)
I(Missed the target)					0.002	0.009
					(0.012)	(0.013)
Size of miss (# of points)					-0.001	-0.001*
					(0.001)	(0.001)
Socioeconomic controls	yes	yes	yes	yes	yes	yes
R^2	0.0079	0.0111	0.0125	0.0143	0.0134	0.0163
# of obs.	3,910	3,910	2,374	2,374	2,374	2,374

OLS esttimates with the omitted age category being those from 16-23. Soc ioeconomic controls include indicators for gender, employment statuses, and completed education levels, as well as levels of individua l income and the number of children in the household. Columns 5 and 6 inc lude controls for whether, in a separate round, the participant failed to choose a specific target bundle and, if so, by how many points did she miss the target. Standard errors, robust to heteroskedasticity, are in parentheses. *, **, *** indicate 10, 5, 1 percent significance levels, respectively.

Table 5. The Role of General Cogntive Decline:
the correlation between rationality scores, age, and performance on Raven's Matrices

	(1)	(2)	(3)	(4)	(5)	(6)
	CCEI	MPI	CCEI	MPI	CCEI	MPI
Constant	.861***	.870***	0.851***	.861***	0.848***	.854***
	(.011)	(.013)	(0.018)	(.021)	(0.020)	(.024)
Age						
24-35	0.005	-0.003	0.013	0.019	0.014	0.019
	(0.010)	(0.011)	(0.016)	(0.018)	(0.016)	(0.018)
36-50	0.008	0.003	0.014	0.024	0.014	0.025
	(0.010)	(0.011)	(0.015)	(0.016)	(0.016)	(0.017)
51-63	0.004	-0.001	0.020	0.025	0.021	0.027
	(0.010)	(0.011)	(0.016)	(0.017)	(0.016)	(0.017)
64-71	-0.038***	-0.050***	-0.027	-0.031	-0.026	-0.029
	(0.014)	(0.017)	(0.023)	(0.027)	(0.024)	(0.027)
72+	-0.025*	-0.034*	-0.016	-0.022	-0.014	-0.019
	(0.015)	(0.018)	(0.025)	(0.029)	(0.025)	(0.029)
Score on Raven's Test (0-20)					0.0004	0.0007
					(0.0010)	(0.0012)
Socioeconomic controls	yes	yes	yes	yes	yes	yes
R^2	0.0079	0.0111	0.0118	0.0136	0.0118	0.0138
# of obs.	3,910	3,910	1,698	1,698	1,698	1,698

OLS esttimates with the omitted age category being those from 16-23. Soc io•economic controls inc lude indicators for gender, employment statuses, and completed education levels, as well as levels of individual income and the number of children in the household. Standard errors, robust to heteroskedasticity, are in parentheses. *, **, *** indicate 10, 5, 1 percent significance levels, respectively.

Table 6. The Role of Declining Health:
the correlation between rationality scores, age, and health

	(1)	(2)	(3)	(4)	(5)	(6)
	CCEI	MPI	CCEI	MPI	CCEI	MPI
Constant	.861***	.870***	0.849***	.862***	0.893***	.926***
	(.011)	(.013)	(0.014)	(.016)	(0.021)	(.024)
Age						
24-35	0.005	-0.003	0.014	0.004	0.015	0.005
	(0.010)	(0.011)	(0.013)	(0.014)	(0.013)	(0.014)
36-50	0.008	0.003	0.014	0.007	0.015	0.008
	(0.010)	(0.011)	(0.012)	(0.014)	(0.012)	(0.014)
51-63	0.004	-0.001	0.014	0.008	0.014	0.009
	(0.010)	(0.011)	(0.012)	(0.013)	(0.012)	(0.013)
64-71	-0.038***	-0.050***	-0.034**	-0.049**	-0.033**	-0.047**
	(0.014)	(0.017)	(0.016)	(0.020)	(0.016)	(0.020)
72+	-0.025*	-0.034*	-0.020	-0.035*	-0.019	-0.033
	(0.015)	(0.018)	(0.018)	(0.021)	(0.018)	(0.021)
Health controls	no	no	no	no	yes	yes
Socioeconomic controls	yes	yes	yes	yes	yes	yes
R^2	0.0079	0.0111	0.0107	0.0125	0.0164	0.0198
# of obs.	3,910	3,910	2,762	2,762	2,762	2,762

OLS esttimates with the omitted age category being those from 16-23. Health controls inc lude indicators for poor and good self•reported health (very good or excellent health category omitted), and for having a chronic ailment. Health controls also include the number of (i)adls with which the respondent has difficulty and a measure of body mass index. Socio•economic controls include indicators for gender, employment statuses, and completed education levels, as well as levels of individual income and the number of children in the household. Standard errors, robust to heteroskedasticity, are in parentheses. *, **, *** indicate 10, 5, 1 percent significance levels, respectively.

8 Appendix: Testing for Consistency with GARP

I. Afriat's (1967) Theorem

Let $\left\{(p^i, x^i)\right\}_{i=1}^{25}$be the data generated by a participant's choices, where p^i is the i-th observation of prices and x^i is the associated choice. An allocation x^i is *directly revealed preferred* to an allocation x^j, denoted $x^i R^D x^j$, if $p^i \cdot x^i \geq p^i \cdot x^j$. An allocation x^i is *revealed preferred* to x^j, denoted $x^i R x^j$, if there exists a sequence of allocations $\left\{x^k\right\}_{k=1}^{K}$ with $x^1 = x^i$ and $x^K = x^j$, such that $x^k R^D x^{k+1}$ for every $k = 1, ..., K-1$.

The Generalized Axiom of Revealed Preference (GARP) requires that if $x^i R x^j$ then $p^j \cdot x^j \leq p^j \cdot x^i$; that is, if x^i is revealed preferred to x^j, then x^i must cost at least as much as x^j given the prices when x^j is chosen. If the data are generated by a non-satiated utility function, then they satisfy GARP. Conversely, Afriat (1967) shows us that if a finite data set of choices satisfies GARP, then the data can be rationalized by a utility function.

Afriat's (1967) Theorem If the data set $\left\{(p^i, x^i)\right\}$ satisfies GARP, then there exists a piecewise linear, continuous, increasing, concave utility function $u(x)$ such that for each observation (p^i, x^i) $u(x) \leq u(x^i)$ for any x such that $p^i \cdot x \leq p^i \cdot x^i$.

This statement of the theorem is due to Varian (1982, 1983), who replaced the condition Afriat called *cyclical consistency* with GARP. Note that satisfying GARP entails only that choices are consistent with utility maximization. The implication that choices may be rationalized by a well-behaved utility function is a consequence of linear budget lines. When the budget constraints are linear, if any utility function can represent the choices, then a well-behaved one can too.

II. Goodness-of-fit

GARP offers an exact test. Choice data either satisfy the axiom, or they do not. It is therefore useful to measure the *extent* of GARP violations. This paper reports measures of GARP violations based on two indices: Afriat's (1972) critical cost efficiency index (CCEI), and Echinique et al.'s (2011) money pump index.

Afriat (1972) The CCEI measures the amount by which each budget constraint must be adjusted in order to remove all violations of GARP. For any number $0 \leq e \leq 1$, define the direct revealed preference relation $R^D(e)$ as

$$x^i R^D(e) x^j \iff e p^i \cdot x^i \geq p^i \cdot x^j,$$