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Predicting Experimental Choice Behavior and Life Outcomes from a Survey Measure of Present Bias

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Abstract

Using a representative sample of the German adult population, this paper investigates the extent to which a survey measure of present bias predicts present-biased choice behavior in incentive-compatible experiments and real-world outcomes related to investments in financial assets and human capital. The results are threefold. First, the survey and experimental measures of present bias are significantly related. Second, the survey measure predicts choices between immediate and delayed monetary payoffs in an incentive-compatible experiment, but not between payoffs at two future points in time. Third, the survey measure of present bias is a good predictor of the propensity to save money, to obtain a university degree, and to maintain a healthy life style. In most specifications, the survey measure tends to be a stronger predictor of real life outcomes than the experimentally elicited measure of present bias.

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1 Introduction

Recently, many studies have documented heterogeneity in the extent to which individuals discount the immediate future relative to the more distant future. Depending on the population under study, between 12 and 59 percent of individuals are found to exhibit present-biased time preferences (Augenblick *et al.*, 2015; Halevy, 2015)[1]. Identifying which individuals are present-biased is important for research and policy making because present-biased time preferences relate to dynamic inconsistency and self-control problems, with marked implications for economic decision-making and real-world outcomes (Achtziger *et al.*, 2015; Burks *et al.*, 2012; Grignon, 2009; Meier and Sprenger, 2010). Yet, while it is common to assume a quasi-hyperbolic formulation of time preferences in theoretical and experimental behavioral economics, there has been little progress in measuring the corresponding time preference parameters in surveys or questionnaires. The reason is that the costs of eliciting such preference parameters by means of incentivized experiments in large-scale surveys or practitioner questionnaires tend to be prohibitively high.[2] If survey measures of time inconsistent preferences could be found that validly predict both experimental choice behavior and real-world outcomes, such measures would open up abundant possibilities for behavioral economic research. For example, such survey instruments would facilitate links between behavioral economics and other fields such as labor economics, health economics, finance or the economics of education (see, e. g., Jaeger *et al.*, 2010; DellaVigna and Pasermann, 2005). In addition, they could potentially help policy practitioners identify individuals at risk of overspending or credit default (Gathergood, 2012).

Against this background, this paper assesses the extent to which a survey measure of present bias is associated with present-biased choice behavior in incentive-compatible experiments and real-world outcomes related to investments in financial assets and human capital in a representative sample of the German adult population.[3] First, we confirm that the survey measure is significantly related to a commonly used experimental measure of present bias, and can thus be viewed as a measure of the same underlying individual-specific trait. In line with the theory, we show that the survey measure predicts choices between immediate and delayed monetary payoffs in incentivized experiments, but not between payoffs at two future points in time. Second, we investigate if the (context-free) experimental measure is differentially associated with real-world decision-making than the questionnaire measure, which is context-dependent in a sense that it asks individuals about their behavior in everyday situations (see, e.g., Voors *et al.*, 2012, and the literature discussed therein).[4] Our results

[1] See Appendix A for a comprehensive overview.

[2] For prominent exceptions see, e. g., Andersen *et al.* (2008, 2014); Harrison *et al.* (2002); Meier and Sprenger (2015), and Tanaka *et al.* (2010).

[3] For a related literature that focuses on the validation or use of survey measures in behavioral economic research, see Dohmen *et al.* (2011); Winter (2004) and Vischer *et al.* (2013).

[4] Our data only allow us to benchmark the questionnaire measure against one commonly used experimental measures, which comes from choices about money today versus money in the future. Other experimental measures exist and might yield stronger results in terms of their capacity to predict real world outcomes. E.g., some authors argue that experiments are sensitive to the time horizon used (see e.g. Dohmen *et al.* (2012)) or that present bias should be elicited at two points in time (see Halevy (2015)). Others argue that real effort tasks work better to capture present bias (Augenblick *et al.*, 2015). We further discuss these issues in Section 3.2.

indicate that the survey measure of present bias is a good predictor of the propensity to save money, to obtain a university degree, to abstain from smoking and to follow a healthy diet. In this respect, it outperforms the experimental measure.

The remainder of this article is organized as follows. Section 2 presents the survey and experimental measures of present bias. Results are presented and discussed in Section 3. Section 4 provides a concluding discussion of the results and implications of this study.

2 Data and Measures of Present Bias

This study relies on a special sub-module of the German Socio-Economic Panel Study (SOEP), a representative longitudinal micro-data set for Germany (Wagner *et al.*, 2007). The data contain measures of time preferences that were elicited from incentivized monetary discounting experiments with multiple time horizons, a survey question on present bias, and information on real-world spending decisions and other outcomes.[5]

2.1 The survey measure of present bias

The survey measure of present bias was elicited in 2006 as part of the SOEP time preference module. The latter contains a question which asks to what extent individuals agree to the following statement: "I live for today and do not think about tomorrow". Answers are coded on a 7-point scale, with 1 referring to complete disagreement and 7 to complete agreement.[6]

This item allows constructing two different measures of present-biased preferences: the actual item score and an indicator variable, which equals one whenever individuals tend to agree or strongly agree with the above statement (corresponding to a score of five or higher). Using the latter, 21% of individuals are classified as present-biased, which falls within the range of findings in existing studies (Table A.I).

2.2 Experimental measures of time preferences

In the 2006-wave of the SOEP, 542 individuals participated in an incentivized experiment to elicit time preferences.[7] Participants were asked to indicate their preferences in two choices. For the first choice, the participants could decide between receiving € 200 immediately or a payment of $x_1 >$ € 200 in 1 month. For the second choice, the decision was between receiving € 200 in 12 months or a payment of $x_2 >$ € 200 in 13 months.[8] The set of delayed payments was the same for both choices. Participants were asked to choose for 20 delayed payments in increasing order.[9] Hence, in principle, participants would begin

[5]See Vischer *et al.* (2013) for evidence showing that the participants in the 2006 SOEP time preference experiments do not significantly differ from the rest of the SOEP population in terms of observables.

[6]The timeline was such that all individuals first participated in the experiments and then answered some additional questions as part of a survey. To the extent that the experiment induced individuals to think about their spending behavior, we thus need to assume that the experiment did not have a differential influence on the response behavior of individuals with different degrees of present bias.

[7]Only 17 individuals (3%) refused to participate. Severe item non-response bias is thus rather unlikely. Moreover, individuals were not allowed to self-select, which avoids self-selection based on a need of cash.

[8]Equal time horizons eliminate confounding from time-horizon effects (Dohmen *et al.*, 2012).

[9]For the monetary increments see Appendix B.

by choosing the early payment until the total increment was large enough to flip over and choose the later payment. Once a respondent switched from the smaller, earlier payment to the larger, delayed payment, the interviewer verified that the respondent also preferred the later payment for all higher increments (Richter and Schupp, 2014).[10]

Time preferences can be elicited from the switching decision. In the β-δ quasi-hyperbolic discounting model (Laibson, 1997), the point of indifference between an amount € 200 immediately or x_1 one period ahead is given by

$$u(200) = \beta\delta u(x_1), \tag{2.1}$$

where δ is the usual exponential discount factor and β indicates present bias.[11] If the choice is instead between receiving € 200 12 periods from now or x_2 13 periods from now, the point of indifference is

$$u(200) = \delta u(x_2). \tag{2.2}$$

Taking the ratio of Equation (2.1) and Equation (2.2) and solving for β yields

$$\beta = \frac{u(x_2)}{u(x_1)}. \tag{2.3}$$

Individuals are present-biased if $\beta < 1$. This implies that for present-biased individuals $u(x_2) < u(x_1)$ or (assuming monotonic preferences) $x_2 < x_1$. The degree of present-biasedness of an individual i can be measured by $x_{i,2}/x_{i,1}$, where $x_{i,1}$ and $x_{i,2}$ are the individual switching amounts in choice experiments one and two, respectively.[12] This is a standard proxy measure of present bias (see, e. g., Meier and Sprenger, 2010, 2015), which however comes with some limitations. First, we need to assume that individuals are expected utility maximizers with a utility function that is linear over the option set covered by the experiment (see Andersen *et al.*, 2008; Holt and Laury, 2002; Rabin, 2000). If utility was instead locally convex, one would need to jointly estimate the risk and time preference parameters (Andersen *et al.*, 2008; Andreoni and Sprenger, 2012).[13] Second, we need to assume no interest rate arbitrage, e.g., by controlling for knowledge about the prevailing interest rate. Third, it is required that discounting of income equals discounting of utility. Fourth, we need to assume that the future marginal utility of money is known and independent of future shocks.[14] Along the same lines as before, and maintaining the assumptions of quasi-

[10] After the experiment, a random 11% of all participants were sent a check (front-end delay), corresponding to one of their choices. Since respondents were familiar with the survey and because checks were sent immediately after the experiment, credibility problems were minimized (Vischer *et al.*, 2013).

[11] The quasi-hyperbolic discounting model is used here because of its popularity in behavioral economics. More general functional forms exist and are discussed in Andersen *et al.* (2014).

[12] We focus on those 346 individuals who switch at least once in the second choice experiment, i. e., excluding individuals for whom the range of offered payments does not suffice to elicit their time preferences even with the more distant time horizon. The excluded individuals are not systematically different in terms of the survey measure of present bias (Table C.I).

[13] We approach this issue by controlling for risk aversion, as part of the robustness checks.

[14] Alternative proxies of present bias can be constructed by taking differences of switching amounts or ratios of switching amounts at different points of the switching intervals. These measures yield very similar results (see Table C.II and C.III of Appendix C).

hyperbolic discounting and linear utility, an estimate of δ can be obtained based on Equation (2.2) by dividing 200 by the switching amount ($x_{i,2}$) from the second choice experiment.

3 Results

3.1 Relating the survey measure to the experimental measure of present bias

This section investigates whether the survey measure of present bias introduced in Section 2.1 predicts present-biased behavior in the incentive-compatible time preference experiment described in Section 2.2.

Table I: Validation results for the survey measure of present bias

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					β (experiment)					
Present-bias (scale 1-7)	-0.0013**	-0.0013**	-0.0021***	-0.0021***	-0.0018***					
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)					
Present-bias (>4)						-0.0069**	-0.0070***	-0.0097***	-0.0096***	-0.0087***
						(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Sex (male=1)		-0.0011	-0.0015	-0.0020	-0.0015		-0.0012	-0.0015	-0.0020	-0.0015
		(0.002)	(0.002)	(0.002)	(0.002)		(0.002)	(0.002)	(0.002)	(0.002)
German		-0.0029	-0.0013	-0.0013	-0.0026		-0.0028	-0.0011	-0.0011	-0.0024
		(0.005)	(0.005)	(0.005)	(0.004)		(0.005)	(0.005)	(0.004)	(0.004)
Father upper sec. edu.			-0.0073	-0.0068	-0.0069			-0.0076	-0.0071	-0.0072
			(0.005)	(0.005)	(0.005)			(0.005)	(0.005)	(0.005)
Mother upper sec. edu.			0.0050	0.0047	0.0051			0.0052	0.0049	0.0052
			(0.006)	(0.006)	(0.006)			(0.006)	(0.006)	(0.006)
Patience			-0.0013***	-0.0012**	-0.0012**			-0.0013***	-0.0013***	-0.0013***
			(0.000)	(0.000)	(0.000)			(0.000)	(0.000)	(0.000)
Willingness to take risks				-0.00074	-0.00085*				-0.00075	-0.00086*
				(0.001)	(0.000)				(0.000)	(0.000)
Thought about interest rate					0.0066***					0.0066***
					(0.002)					(0.002)
Observations	346	346	310	310	310	346	346	310	310	310
Age	X	X	X	X	X	X	X	X	X	X
Age squared	X	X	X	X	X	X	X	X	X	X
Log lik.	-770.4	-770.0	-679.0	-678.0	-673.9	-769.1	-768.8	-678.2	-677.1	-673.1
ML-R^2	.012	.014	.053	.06	.084	.02	.022	.059	.065	.089

Notes: 2006 SOEP data. Results from interval regressions. The dependent variable is the ratio of individual switching amounts in choice experiments 1 and 2 ($x_{i,2}/x_{i,1}$). Standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

Columns 1 and 6 of Table I present the results of an interval regression model, which relates the individual degree of present bias to the two survey measures, age and age-squared.[15] The resulting coefficients are negative and significant ($p < 0.05$) in both cases, indicating that a preference for having fun today as opposed to caring about tomorrow predicts present-biased choice behavior in the experiment.

[15]Interval regressions are used because from the switching amounts in the two experiments it is only possible to infer bounds on β.

To ensure that the relationship is not merely driven by unobserved heterogeneity, a number of exogenous control variables and a survey measure of impatience are added to the model. Throughout all specifications, the coefficients on the two survey measures of present bias remain highly significant. Columns 6-10 indicate that present-biased individuals demand 0.7 to 1 % larger amounts of money to switch to the later payment in choice experiment one than in choice experiment two.[16] Moreover, the indicator variable performs slightly better in terms of significance and variance explained. This makes sense, because in theory β should take effect only if it is smaller than the ratio of future consumption utility to immediate consumption utility.

According to Equations (2.1) and (2.2) present bias should predict choice behavior in choice experiment one, but not in choice experiment two. The results in Table II show that this is indeed the case. Present-biased individuals demand on average around € 1.40 more to switch to the later payment in choice experiment one, while the coefficient for the second choice experiment is not significantly different from zero.

Table II: Switching in choice experiments 1 and 2

Variables	$x_{i,1}$					$x_{i,2}$				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Present-bias (>4)	1.387** (0.616)	1.390** (0.616)	1.568** (0.653)	1.571** (0.653)	1.346** (0.649)	-0.0685 (0.561)	-0.0789 (0.560)	-0.477 (0.601)	-0.464 (0.598)	-0.487 (0.602)
Sex (male=1)		0.245 (0.507)	0.426 (0.529)	0.396 (0.534)	0.290 (0.529)		0.00306 (0.461)	0.0989 (0.487)	-0.0295 (0.489)	-0.0404 (0.490)
German		-0.747 (1.031)	-0.630 (1.043)	-0.629 (1.043)	-0.338 (1.035)		-1.327 (0.936)	-0.850 (0.960)	-0.844 (0.955)	-0.814 (0.959)
Father upper . sec. edu			0.174 (1.122)	0.207 (1.124)	0.227 (1.110)			-1.423 (1.033)	-1.285 (1.029)	-1.283 (1.029)
Mother upper sec. edu.			0.440 (1.314)	0.423 (1.315)	0.353 (1.298)			1.521 (1.210)	1.449 (1.203)	1.442 (1.203)
Patience			0.104 (0.113)	0.107 (0.113)	0.0966 (0.112)			-0.180* (0.104)	-0.168 (0.103)	-0.169 (0.103)
Willingness to take risks				-0.0476 (0.116)	-0.0218 (0.115)				-0.203* (0.106)	-0.201* (0.107)
Thought about interest rate					-1.512*** (0.535)					-0.156 (0.496)
Observations	346	346	310	310	310	346	346	310	310	310
Age	X	X	X	X	X	X	X	X	X	X
Age-squared	X	X	X	X	X	X	X	X	X	X
Log lik.	-1072.7	-1072.3	-951.6	-951.5	-947.5	-997.6	-996.6	-893.3	-891.5	-891.4
ML-R^2	.018	.021	.032	.033	.057	.003	.009	.028	.04	.04

Notes: 2006 SOEP data. Results from interval regressions. $x_{i,1}$ and $x_{i,2}$ refer to the individual switching amounts in choice experiment one and choice experiment two, respectively. Standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

In the empirical analysis, we have implicitly assumed that the utility function is linear over the option set covered by the experiment, even if individuals are not risk neutral overall (see Holt and Laury, 2002; Rabin, 2000). Taking account of the relationship between risk

[16] In terms of significance levels and variance explained, these findings are similar to the results reported in Dohmen *et al.* (2011) and Vischer *et al.* (2013).

and time preferences is however potentially very important (Andersen *et al.*, 2008). Hence, to ensure that effects of risk aversion do not confound the results, a general survey measure of the willingness to take risks was added to all models (see, e. g., Dohmen *et al.*, 2011). The results of this robustness check are displayed in columns 4 and 9 of Tables I and II. A comparison of the coefficient estimates on the survey measures across columns reveals that the point estimates hardly change when accounting for risk aversion.[17]

Due to arbitrage possibilities, individuals differ in their experimentally elicited intertemporal choice behavior depending on whether they take the current interest rate into account while deciding (Coller and Williams, 1999). Moreover, it is conceivable that individuals who are aware of the current interest rate are more considerate in general and also give different replies to the survey question. Hence, as an additional robustness check, we add a dummy variable to the empirical model, which indicates whether an individual has thought about the interest rate during the experiment. The results of this exercise, displayed in columns 5 and 10 of Tables I and II, reveals that thinking about the interest rate does indeed predict present-biased choice behavior. At the same time, its inclusion reduces the estimated coefficients slightly, but does not alter any of the main conclusions from the previous analyses.

3.2 Explaining spending, education, and health behaviors

To investigate whether the survey measures of β predict real-world outcomes, they are used as explanatory variables in regression models with (over)spending, education, and health behaviors as dependent variables. The results are displayed in Table III. They reveal that the binary survey-based measure of present bias is strongly associated with real-world outcomes, while the experimental measure of δ yields the expected sign, but remains mostly insignificant. The binary survey measure of present bias performs very well overall, and in particular in predicting outcomes related to overspending, education, and unhealthy eating. Individuals for whom the survey measure indicates that they are present-biased have a 14 percentage point lower probability of having completed college or university, are 11 percent more likely to be smokers and 20 percent more likely to follow an unhealthy diet. The results for smoking are in line with the results reported in Burks *et al.* (2012). Moreover, we find that present biased individuals are around 7 percent more likely to have positive consumer debt (not significant), which is about one third to one half of the effect estimated by Meier and Sprenger (2010) for the US credit card holders.

Table IV shows the results of a regression model which relates the same outcomes to the experimental measure of present bias. To allow for a direct comparison between the estimated coefficients in Tables III and IV, the experimental measure of β was dichotomized in this analysis, indicating whether the elicited β is smaller than one.[18] A comparison of the results reveals that in terms of coefficient size and significance, the survey measure fares better than the experimental measure, which only significantly predicts self-control problems related to overspending. In terms of explained variance, the survey measure captures around

[17] In addition, albeit being much less precise, the coefficient estimates on the survey measure of present bias are not statistically different from each other, when compared across groups of individuals with different degrees of risk aversion.

[18] We obtain similar, but slightly stronger results for the experimental measure, if we use the ratio of the two discount rates as a measure of the extent of present bias (see Table C.IV in Appendix C).

10-20 percent of the respective R^2 reported in the table while the experimental measure accounts for less than 5 percent.[19]

Why might the experimental measure predict real-world outcomes less well than the survey measure? First, it is conceivable that a context-free experimental measure is less strongly associated with real-world decision-making than a questionnaire measure, which asks individuals more explicitly about their behavior in everyday situations (Voors *et al.* (2012) and Chabris *et al.* (2008) report similar findings for prosocial preferences and discounting, respectively). Second, part of the low association between the experimentally elicited measure of present bias and real-world outcomes might relate to limitations in the experimental design. Thus for example, deriving present bias from the experiment relies on the assumption that for all individuals money equals consumption (no arbitrage possibilities). Moreover, consumption might map differently into utility across individuals or time due to different functional forms or curvatures of the utility function (Dohmen *et al.*, 2012). Last, using the experimental measure may lead to attenuation bias if the one-time comparison between two decisions is flawed by trembling, if decision-making about money differs from decision-making about time or other goods, or if the used elicitation technique yields an imprecise measure of present bias.[20]

Table III: *Survey* measure of present bias and real-world outcomes

	Spending				**Education and health**		
	Cash	**Save**	**Overspend**	**CDebt**	**College**	**Smoker**	**Unh. diet**
Present-biased (survey)	-0.442**	-0.733***	0.969***	0.0689	-0.146***	0.115*	0.207***
	(0.221)	(0.259)	(0.243)	(0.049)	(0.040)	(0.059)	(0.066)
δ (experiment)	6.337	-9.424*	-2.812	0.576	-0.335	0.264	-0.971
	(4.022)	(5.026)	(3.983)	(0.845)	(0.982)	(1.177)	(1.328)
Observations	345	344	346	326	346	310	310
Age	X	X	X	X	X	X	X
Age-squared	X	X	X	X	X	X	X
Male	X	X	X	X	X	X	X
Parental education	X	X	X	X	X	X	X
Log lik.	-631.2	-694.1	-648.2	-83.57	-156.9	-159.5	-202.8
R^2	0.118	0.098	0.116	0.072	0.111	0.115	0.125

Notes: SOEP data. Dependent variables: *Cash* "I always try to have some money set aside for unexpected expenses."(1-7); *Save* "I consume less today to be able to afford more tomorrow"(1-7); *Overspend* "My monthly expenses are often higher than what I can actually afford."(1-7); *CDebt* indicates positive consumer debt; *College* indicates a college or university degree. *Smoker* indicates current smoking; *Unh. diet* indicates following an unhealthy diet. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

[19] This can be seen by comparing the results presented in Tables III and IV to the ones in Appendix Tables C.V and C.VI, where all results are presented without control variables. In terms of size and significance, the omission of the control variables leaves the results almost unchanged.

[20] See Augenblick *et al.* (2015) for evidence that subjects show more present bias in effort than in monetary choices.

Table IV: *Experimental* measure of present bias and real-world outcomes

	Spending			Education and health			
	Cash	**Save**	**Overspend**	**CDebt**	**College**	**Smoker**	**Unh. diet**
Present-biased (experiment)	-0.105	-0.196	0.547***	-0.0118	-0.0535	0.0313	-0.0160
	(0.170)	(0.210)	(0.188)	(0.037)	(0.044)	(0.050)	(0.059)
δ (experiment)	6.604	-8.879*	-4.619	0.649	-0.173	0.211	-0.774
	(4.103)	(5.240)	(4.175)	(0.861)	(1.029)	(1.189)	(1.359)
Observations	345	344	346	326	346	310	310
Age	X	X	X	X	X	X	X
Age-squared	X	X	X	X	X	X	X
Male	X	X	X	X	X	X	X
Parental education	X	X	X	X	X	X	X
Log lik.	-633.5	-698.2	-654.2	-84.80	-160.2	-161.3	-207.7
R^2	0.106	0.076	0.085	0.065	0.094	0.104	0.097

Notes: SOEP data. *Present-biased (experiment)* is a variable which indicates whether the elicited β is smaller than one. β was dichotomized here to allow for a direct comparison between the estimated coefficients in this table with the ones from Table III. Dependent variables: *Cash* "I always try to have some money set aside for unexpected expenses"(1-7); *Save* "I consume less today to be able to afford more tomorrow"(1-7); *Overspend* "My monthly expenses are often higher than what I can actually afford."(1-7); *CDebt* indicates positive consumer debt; *College* indicates a college or university degree. *Smoker* indicates current smoking; *Unh. diet* indicates following an unhealthy diet. Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4 Conclusion

This study provides evidence that a survey measure of present bias significantly relates to present-biased choice behavior in an incentive-compatible experiment as well as to several real-world outcomes. It shows that present-biased time preferences, as identified from the survey measure, are positively associated with overspending and negatively associated with savings. In terms of education and health outcomes, the study finds that hyperbolic discounters have a 14 percentage point reduced probability of obtaining a higher educational degree, a 11 percentage point higher probability to smoke and a 20 percentage point higher probability to follow an unhealthy diet.

The results of this paper have several implications. First, they provide additional evidence that individuals differ in their time preferences and that these differences matter in terms of real world economic decision making. Second, they suggest that an indicator of present-bias accounts for a relatively large fraction (of about 10-20%) of the explained variance in simple models related to (human capital) investment choices. Taken together, this indicates that measures of present bias are important explanatory variable in empirical models of (human capital) investment decisions which, if left out, may confound other estimates. Third, the above results also indicate that the survey question about average (as opposed to one-time) and general (as opposed to monetary) intertemporal choice behavior is more predictive of present-biased real-world decision-making than the measure derived from a money experiment. Arguably, part of the difference in predictive power may be explained by limitations of the way in which time preferences were elicited in the experimental task, i.e., requiring believability of future promised pay, no interest rate arbitrage, equality of utility from money as opposed to utility from consumption, and expected locally linear utility maximization that is independent of future shocks. As a consequence, our results do not necessarily imply that survey measures, such as the one used in this study, should replace

experimental measures. The elicitation of experimental measures is incentive-compatible and firmly grounded in economic theory, and other experimental forms of eliciting time preferences may yield measures of present bias which more strongly correlate with real-life outcomes. Yet, our findings suggest that in terms of predictive power and variance explained, it can nevertheless be advantageous to use survey questions as proxies for behavioral time preference parameters in empirical models of behavioral economic decision-making, especially when compared to experimental measures from standard money today versus money tomorrow experiments. The results of this paper thus have marked implications for researchers and practitioners who aim at identifying individuals with present biased time preferences who are at risk of making suboptimal (human capital) investment decisions.

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