

# Measuring Self Control

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PRELIMINARY

## Abstract

We use survey techniques to deepen our understanding of self control problems:

1. While standard theories of self control problems predict over-consumption, we find that many have the *opposite* problem of under-consuming.
2. As theory predicts, standard self control problems impede wealth accumulation, particularly in liquid form. Problems of under-consumption have the opposite effects.
3. Self control is linked to “conscientiousness”, a trait much studied by personality psychologists. This may explain why planners accumulate higher wealth than do non-planners (Ameriks, Caplin, and Leahy [2003]).

## 1 Introduction

That self control problems may impede wealth accumulation has been understood for almost 50 years (Strotz [1956]). Despite great advances in

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modeling (Laibson [1997] and Gul and Pesendorfer [2001]), empirical evidence remains in short supply. In this paper we use survey techniques to add to the small body of empirical work exploring the nature and behavioral implications of self control problems (Della Vigna and Paserman [2001] and Laibson, Repetto, and Tobacman [2003]). Our sample consists entirely of TIAA-CREF participants, and is a subset of that described in Ameriks, Caplin, and Leahy [2002a]).

The Gul and Pesendorfer model of self control and temptation forms the theoretical basis for our research. As described in section 2, we use a hypothetical 2-period allocation scenario to elicit the level of self control in their framework. We ask questions concerning the most preferred intertemporal allocation, the temptation to depart from this allocation, and the ability to resist such temptation. To a first approximation, self control is measured as the difference between the most preferred allocation, and the allocation that would be chosen in practice.

With our measure of self control in hand, we are in position to explore the nature and implications of self control problems. Three findings stand out:

1. Ever since the pioneering work of Strotz [1956], models of self control have stressed the over-weighting of current consumption, and the resulting tendency to over-consumption. Yet in our sample, an equal number suffer from the opposite self-control problem. As detailed in section 3, these households are drawn to under-consumption, expecting to use resources less quickly than they would ideally like.
2. We identify a robust relationship between measured self control and the level of net worth. Those who believe that they will consume at a faster than ideal rate in our allocation scenario accumulate in practice less wealth than do those with no such tendency. This form of self control problem has a particularly depressing impact on the level of liquid wealth, in accordance with theoretical predictions. In contrast, those with self control problems of the under-consumption variety have higher net worth, and significantly higher accumulation of liquid assets, than do those with no such tendency.
3. Personality psychologists describe personality in terms of the “big five”: five traits that are reliably found to emerge from personality inventories (Costa and Widiger [1994], Digman [1990], John [1990], and McCrae

and Costa [1987, 1999]). We show in section 5 that respondents who are high in one such factor - conscientiousness - have more self control than do those low in this factor. Strikingly, conscientiousness appears to operate in a symmetric fashion, reducing the extent of problems both of over-consumption and of under-consumption.

These findings may have significant implications not only for the modeling of self control problems, but also for our understanding of their psychological origins. The focus in the prior literature on problems of over-consumption is natural if one views self control problems as involving impulse control. In psychological terms, the image that informs much of the literature is that proposed by Thaler and Shefrin [1981] in which the thinking self is constantly battling an impulse to consume everything today (see Bernheim and Rangel [2001] and Benhabib and Bisin [2002] for other dual-self models of this variety). Yet the problem of under-consumption is hard to square with a simple impulse control view, and points to a richer psychology of self control. Indeed, our third finding is consistent with a broader personality theoretic view of self control, according to which conscientiousness is linked to personality dimensions associated with self-control (Costa and Widiger [1994]).

In addition to connecting our work to a rich psychological tradition, our third finding is strongly related to our earlier work on the relationship between wealth accumulation and planning (Lusardi [1999], Ameriks, Caplin, and Leahy [2002b]). Our new data reveal strong interconnections not only between conscientiousness and self control, but also between each of these variables and the propensity to plan. In psychological terms these findings are not unexpected, since conscientious individuals are seen as better able to make and to carry through long-term plans. In economic terms, they buttress our earlier hypothesis that those with a high propensity to plan have more self control, and tend therefore to accumulate more wealth.

Obviously, our sample of TIAA-CREF participants is not representative of the broader U.S. population. In particular, the non-random nature of the sample may be partially responsible for our first finding concerning the nature of self control problems. However, it is far from obvious how the self selected nature of the sample would change our other findings concerning the relationship between self control, wealth accumulation, and conscientiousness.<sup>1</sup> Of course, more work is required to explore these issues.

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<sup>1</sup>Even the first finding might generalize. Krusell, Kurucsu, and Smith [2002] calibrate

## 2 Survey Methods and Self Control

We begin by outlining some of the advantages we perceive in the use of survey methodology to explore the nature and implications of self control problems. We then specify the simple two-period consumption-savings problem of Gul and Pesendorfer [2001] that guides our survey methodology. We use this to motivate a “free dinner” allocation scenario aimed at measuring the level of self control. Finally, we point out that our survey question is relevant to the determination of self control in many models other than the Gul-Pesendorfer model, including the hyperbolic model of Laibson [1997], and the dual self models of Thaler and Shefrin [1981], Bernheim and Rangel [2001], and Benhabib and Bisin [2002].

### 2.1 Why Survey Methods?

Despite the rapid developments in self control theory, empirical findings remain in short supply. One empirical methodology that has been employed with some success is experimental. There is by now a large literature documenting self-control problems in experimental settings and documenting behavioral anomalies that models of with self-control problems may help to explain. Yet the experimental methods are not able to pin down effects of self control in the areas of greatest economic importance, such as wealth accumulation and asset pricing.

Laibson, Repetto, and Tobacman [2003] present the most comprehensive empirical work to date on the connection between self control problems and wealth accumulation. They use data on wealth accumulation, credit card borrowing, and consumption-income comovement to estimate a model of consumer choice. They allow the consumer to have hyperbolic time-preference and reject the null of exponential discounting in most specifications.<sup>2</sup>

Important as are the above lines of analysis, we believe that survey techniques have much to add to the understanding of problems of self control. Intuition suggests that there is tremendous cross-sectional variation in the level of self control. While some appear to have a very hard time refraining

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a variant of the Gul-Pesendorfer model of asset pricing. They find that the model better fits with various asset pricing facts, such as the risk-free rate puzzle, if the temptation is to save rather than to consume.

<sup>2</sup>Other efforts to estimate the effects of self-control problems include Passerman [2002], Fang and Silverman [2002], and DeJong and Ripoll [2003].

from spending, others seem to have no difficulty whatever in saving. Similar comments apply to diet and to smoking. Hence it may be important to make allowance for individual differences in self control. In this spirit, DellaVigna and Passerman [2001] look for cross-sectional variation in self-control and show that it predicts cross-sectional variation in behavior. They show that various indicators of self-control problems, such as smoking and contraceptive use, are negatively related to job search effort and exit rates from unemployment as predicted by their theory.

Our survey based approach is close in spirit to the work of Della Vigna and Passerman. Yet they face the difficulty that their data include at best indirect reflections of underlying self control problems. Clearly, we would like to have more direct measures of self control as a preference parameter. At the same time, we would like to have data on the most important economic variables that are influenced by self control, such as the level of net worth and of liquid assets. We have a sample in which precisely this high quality wealth data is available, and for whom we had the opportunity to design our own questions to elicit the level of self control at the individual level. Finally, the fact that the questions are of our own design enables us to dig somewhat deeper into the psychological and behavioral correlates of self control than has been possible hitherto.

There is one profound difficulty that complicates the use of survey techniques in economic analysis. Following the pioneering work of Barsky, Juster, Kimball, and Shapiro [1997], various researchers have tried to measure the impact on wealth accumulation of preference parameters such as the discount rate. Yet the correspondence between survey-measured preference parameters and actual behavior has generally been minimal. In part this may be due to the unnatural and counter-intuitive questions that must be asked to dig out the theoretically appropriate parameters. If survey techniques are to reach their full potential, the questions used to elicit key parameters must be made as natural and intuitive as possible. This is possible only if the theory permits of such a phrasing. Fortunately the self control and temptation model of Gul and Pesendorfer maps readily into natural language, and hence into survey methodology.

## 2.2 A Two Period Model

Gul and Pesendorfer show that a specific assumption on preferences over choice sets, set betweenness, when added to other standard assumptions,

gives rise to a new and fascinating class of utility functions. With these assumptions, observed behavior maximizes the sum of a standard direct utility function, and an additional “temptation”-based utility.

Consider a standard two period problem of allocating a fixed physical supply of a perfectly storable consumption good,  $W$ , across two periods. A Gul and Pesendorfer consumer maximizes the sum of a classical utility function and a second “temptation” function,  $T(c_1, c_2)$ . The utility associated with a particular set of feasible consumption choices,  $A \subset \Gamma(W) \subset R_+^2$ , is:

$$V(A) = \max_A [U(c_1, c_2) + T(c_1, c_2)] - \max_A [T(c_1, c_2)],$$

$U, T : R_+^2 \rightarrow R$ . Actual choices are made as a compromise between the “standard” utility function and the temptation function: the agent may be willing to move away from the otherwise ideal choice in order to reduce the disutility associated with rejecting the most tempting option.

A simple special case serves to clarify the workings of the model. Let both functions be logarithmic,

$$\begin{aligned} U(c_1, c_2) &= i \ln c_1 + (1 - i) \ln c_2; \\ T(c_1, c_2) &= \lambda[\tau \ln c_1 + (1 - \tau) \ln c_2]; \end{aligned}$$

with  $0 < i < \tau < 1$ , and  $\lambda \geq 0$ . In this case, the consumption profile most preferred by the individual as a singleton choice set involves consuming proportion  $i$  of the resource in the first period. On the other hand, with a larger choice set there is a temptation to consume a higher proportion  $\tau$  in the first period. With  $A = \Gamma(W)$ , the actual choice is a compromise between these two functions, giving weight  $\frac{\lambda}{1+\lambda}$  to the temptation as opposed to the ideal choice. The actual proportion of wealth consumed in period 1 is therefore:

$$a = \left[\frac{1}{1+\lambda}\right]i + \left[\frac{\lambda}{1+\lambda}\right]\tau.$$

Our specific interest is in the level of self control. This can be identified as the difference between and the ideal proportion of wealth consumed in period 1:

$$a - i = \left(\frac{\lambda}{1+\lambda}\right)(\tau - i). \tag{1}$$

Our goal is to design a question to measure this self control parameter.

## 2.3 The Hypothetical Choice Problem

While sophisticated, the Gul-Pesendorfer model maps well to psychological intuition concerning self control. The parameter  $a$  measures the ideal split between current and future consumption, in the sense that it is the split the agent would most prefer with complete commitment. The parameter  $\tau$  measures the most tempting allocation, in the sense that any deviation from it results in a utility penalty for “resisting temptation to move away from the ideal”. The parameter  $\lambda$  characterizes the relative weight of the temptation in actual decisions, with lower values corresponding to a greater ability to resist temptation. Hence we seek to measure precisely these allocations in a hypothetical problem of resource allocation.

In designing our hypothetical allocation problem, our goal was to isolate it as much as possible from the larger problem of wealth accumulation. To this end, we presented respondents with a scenario in which they had won a prize that they could use at any time in the next two years, but which would become valueless thereafter. In addition to removing the problem from having any obvious interaction with the wealth allocation problem, this technique may reduce the potential for the answer to the question to correspond to self justification based on actual wealth.

Why meals out at a restaurant? We wanted the prize to be attractive, yet too expensive for most agents to pay for out of their own resources (to remove simple substitution into the general lifetime pattern of consumption). At the same time, we did not want the prize to be a completely indivisible once in a lifetime experience, since this would reduce the information content of our allocation question. Wonderful dinners out at a restaurant seemed to us to fit the bill well, although this may be a locational bias. Here is the precise question:

- Suppose that you win 10 certificates, each of which can be used (once) to receive a “dream restaurant night.” On each such night, you and a companion will get the best table and an unlimited budget for food and drink at a restaurant of your choosing. There will be no cost to you: all payments including gratuities come as part of the prize. The certificates are available for immediate use, starting tonight, and there is an absolute guarantee that they will be honored by any restaurant you select if they are used *within a two year window*. However if they are not used up within this two year period, any that remain are valueless.

We made clear that our interest concerned the division of these certificates across the two years, stating that “the questions below concern how many of the certificates you would ideally like to use in each year, how tempted you would be to depart from this ideal, and what you expect you would do in practice.” Precisely:

- 3a. From your current perspective, how many of the ten certificates would you **ideally** like to use in year 1 as opposed to year 2?
- 3b. Some people might be tempted to depart from their ideal allocation in (a). Which of the following best describes you: (please mark only one)
  1. I would be **strongly** tempted to **keep more** certificates for use in the **second** year than would be ideal.
  2. I would be **somewhat** tempted to **keep more** certificates for use in the **second** year than would be ideal.
  3. I would **have no temptation in either direction** (skip to 3d)
  4. I would be **somewhat** tempted to **use more** certificates in the **first** year than would be ideal.
  5. I would be **strongly** tempted to **use more** certificates in the **first** year than would be ideal.
- 3c. If you were to give in to your temptation, how many certificates do you think you would use in year 1 as opposed to year 2?
- 3d. Based on your most accurate forecast of how you think you would **actually behave**, how many of the nights would you end up using in year 1 as opposed to year 2?

One point to note is that we were open-minded about the form of the temptation and self control problem, allowing respondents to reveal both a classical tendency to overconsumption, and the converse tendency to underconsumption. As indicated in the introduction, the results made it clear that there are indeed many with the converse self control problem.

While we asked questions on three different levels of consumption, our fundamental interest is in measured self control,  $a - i$ , as defined in equation (1) above. Our identifying assumption is that this measure is absolutely

identical in our free dinner scenario as it is in the general problem of wealth accumulation. With this assumption, the appropriate starting point for measuring this is the gap between the answer to question 3a on ideal consumption, and that to question 3d, on expected consumption. Modulo the integer constraints, the gap between expected and ideal consumption corresponds precisely to the self control problem in the Gul and Pesendorfer theory.

## 2.4 Other Models of Self Control

While our survey measure of self control is based on Gul-Pesendorfer model, it connects closely with other formulations of the self control problem. Consider in particular the hyperbolic discounting model of Laibson [1997]. In this model, changing tastes give rise to a time inconsistency problem. The self-control problem lies in one's inability to control one's own future selves who tend to place excessive weight on their own present experiences. One would like them to be more patient. How can one interpret our measure of self control, the actual-ideal gap, in this model? The obvious interpretation is that actual consumption is the solution to the game between the various temporal selves, while ideal consumption is the plan that maximizes utility from the present perspective. One difference is that there is no obvious counterpart to temptation in the standard formulation of the hyperbolic model; the agent either commits to the ideal or adjusts current behavior in light of future choices.

Benabou and Tirole [2000] have developed an extension of the hyperbolic model that allows for willpower and temptation. They modify the model to include imperfect knowledge of one's own preferences. Lapses in self-control set precedents that adversely affect future behavior. The agent may therefore be willing to incur costs to avoid temptation. Their model allows natural interpretations of the ideal and the most tempting levels of consumption. But their model does not provide for a distinct level of actual consumption: either the ideal level of consumption will be chosen, or the most tempting level.

A second approach to modelling self-control is the dual-self approach (Thaler and Shefrin [1981], Bernheim and Rangel [2001], Benhabib and Bisin [2002]). Whereas the conflict in the hyperbolic model is between the self at different points in time, the conflict in dual-self models is between different selves at the same point in time. Thaler and Shefrin model a doer who values only current consumption and a planner who maximizes the present value of

utility of each doer. In the end the doer makes the consumption choice, but the planner can alter the doer's preferences to produce an interior optimum at a cost. In this model, the ideal consumption would be the plan that maximized the planner's utility. Temptation would be associated with the doer's choice absent intervention by the planner and the actual would be the result of the interaction between planner and doer. Benhabib and Bisin and Berheim and Rangel replace the planner-doer dichotomy with automatic and controlled pathways in the brain. The controlled pathways represent reasoned goal pursuit, while the automatic pathways represent programmed responses that reflect the influence of evolution or classical conditioning. In the context of these models our ideal corresponds to the controlled pathways, temptation to the automatic, and actual to the outcome of the competition between them.

Overall, it appears that the most robust measures above are actual and ideal consumption, which differ in much the same way in all models of self control problems. Our measure of self control may therefore be of interest even for those who prefer formulations of self control other than that put forward by Gul and Pesendorfer.

### **3 The Nature and Extent of Self Control Problems**

Our question on self control was included in a new survey sent in February 2003 to a sample of TIAA-CREF participants. All of the approximately 2500 who received the survey had responded to two previous surveys: the Survey of Participant Finances (henceforth SPF), fielded in January 2000, and the Survey of Financial Attitudes and Behavior (henceforth FAB), fielded in January 2001. Combining our three surveys, we have very rich data on preference parameters, personality, behavior, demographics, wealth, and income.

The response rate to our third survey was on the order of 65%, with some 1632 providing responses. Adding the additional filter of replying to the third survey has not fundamentally altered the demographic structure of the sample, although response rates were higher among older households. Before tabulating these demographic data, we remove respondents for whom the answers to the question on self control are clearly meaningless. In particular, we asked respondents to place a cash value on the free dinner prize, and

removed from the sample the small number for whom the prize had no value. In addition, we restrict the universe to individuals who answered all relevant parts of the self control question, parts (a) through (d). Tables 1 presents key demographic statistics for the universe. Note that category totals are typically smaller than the full 1444 in the universe due to non-response.

**Table 1**  
**Demographic Characteristics of**  
**2003 Survey Respondents**

Characteristic	(n)	(%)
Gender		
Female	631	44.1
Male	801	55.9
Marital Status		
Curr. married	964	67.5
Prev. married	262	18.3
Never married	203	14.2
Education		
College or below	405	28.0
Masters or Prof.	517	35.8
Ph.D.	522	36.1
Occupation		
Teaching faculty	513	40.8
Mgmt., Sen. Admn.	232	18.5
Other Tech./Prof.	270	21.5
Other	241	19.2
Age		
Below 35	75	5.3
35-44	151	10.6
45-54	274	19.2
55-64	354	24.8
65-74	408	28.6
75+	166	11.6
Number of children		
0	1105	77.2
1	128	8.9
2	154	10.8
3+	45	3.1

Source: Authors' tabulations of 2003 FAB survey data.

Clearly respondents are unusually well educated, in fact roughly 1 in 3 are teaching faculty. In Ameriks, Caplin, and Leahy [2002a] we compared financial characteristics of respondents to the first two surveys with those of working households in the 1998 Survey of Consumer Finances (SCF). Net worth is some 2.5–3 times higher in our sample, while debt levels are generally lower. In contrast with the SCF, the vast majority of households in our sample have significant nonretirement financial assets, and very few have high levels of personal debt. There is also far greater homogeneity than in the SCF. If anything, these economic differences have been exacerbated by the additional filter of responding to the third survey.<sup>3</sup>

### 3.1 Ideals, Temptation, and Predictions

Table 2 presents the distribution of answers to the questions concerning the ideal allocation of resources. Some 60% of respondents indicated that their ideal allocation involved an equal split between the two periods. Yet among those who gave other answers, the overwhelming tendency was to wish to consume more in the first year, with more than eight times as many selecting answers of 6 and above as opposed to answers of 4 and below. The contrast at the extremes is especially striking. More than 15% of respondents stated a wished to consume all of their meals in the first year, with only a tiny fraction preferring to consume all in the second year.

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<sup>3</sup>Not only are the demographic and economic profiles of respondents different from those of the general population, so too are their behavioral and psychological profiles. In particular, the sample is increasingly self-selected on the basis of interest in responding to intricate survey questions. While our non-representativeness in economic and demographic terms clearly differentiates us from more standard surveys, not so the behavioral self selection. Respondents to surveys such as the HRS may be just as psychologically non-random as are respondents to our survey, since by definition they are the members of their demographic and economic cohort who were willing to answer the questions posed. There is no reason to believe this group to be psychologically representative of the population at large. As we advance in our understanding of the role of behavioral variables, so we will have to change the methodology for achieving randomness in the larger national surveys.

**Table 2**  
**Responses to Question 3a**  
**Ideal Allocation of Certificates to First Year**

Certificates	Freq.	%	Cumulative
10	226	15.7	15.7
9	0	0.0	15.7
8	43	3.0	18.7
7	56	3.9	22.6
6	188	13.0	35.6
5	874	60.5	96.1
4	20	1.4	97.5
3	10	0.7	98.2
2	14	1.0	99.0
1	14	0.7	99.8
0	3	0.2	100.0
All	1444	100.0	100.0

Source: Authors' tabulations of 2003 Survey Data

### 3.2 Measured Self Control

To a first approximation, the self control parameter in the GP model corresponds to the difference between expected and ideal consumption. Hence our self control measure is simply the arithmetic difference between questions 3d and 3a above, which we call the “EI gap”. Those who report that they expect to consume exactly what they would ideally like to consume have EI gaps of zero and consequently have no problem of self control. Those who expect to consume more than they would like to consume have positive EI gaps, and problems of over-consumption. Those who expect to consume less than ideal have negative EI gaps, and problems of under-consumption.

Before tabulating the distribution of the EI gap we note one set of adjustments. While we hypothesize that self control problems are identical across restaurant and wealth domains, we do not make any such assumption concerning ideal consumption. There are many factors that might make individuals wish to eat many meals this year that would have no implications whatever for their use of money over time. For example, they may be keen to try new restaurants sooner rather than later, without such apparent impatience spilling over onto their wealth accumulation. Conversely, they may

wish to delay eating these meals in order to anticipate them with all the more pleasure, as in Loewenstein [1987].

The fact that some individuals may choose ideally to consume all their meals in either the first or the second year gives rise to corner constraints. Consider individuals with the standard self control problem of over-consumption, yet who ideally want to eat all 10 meals this year. These people are prevented by the upper bound on actual consumption from expressing their self control problem. Equally those with self control problems of under-consumption who wish to eat all 10 meals in the second year are constrained in their ability to express this problem. In table 3, we report the distribution of the expected-ideal gap only for the 1199 for whom this measure is unaffected by the corner constraints. It is corner constraints of this form that force us to differentiate between measured and actual self control, even under our maintained hypothesis that this transfers perfectly across domains.<sup>4</sup>

**Table 3**  
**Distribution of the EI gap**

EI Gap	<i>n</i>	%	Cum.
4	2	0.2	0.2
3	5	0.4	0.6
2	33	2.8	3.4
1	104	8.7	12.1
0	831	69.3	81.4
-1	132	11.0	92.4
-2	72	6.0	98.4
-3	17	1.4	99.7
-4	2	0.2	99.9
-5	0	0	99.9
-6	1	0.1	100.0
All	1199	100.0	100.0

Source: Authors' tabulations of 2003 Survey Data

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<sup>4</sup>Including constrained individuals elongates the lower tail, since some potentially constrained individuals with ideal consumption of 10 reported very low levels of expected consumption.

Table 3 provides strong confirmation of our first finding. In our sample, more people expect to use a less than their ideal number of certificates in the fast year than expect to use a more-than-ideal number. Hence problems of under-consumption are at least as prevalent as are those of over-consumption. According to table 3, almost one respondent in five has a problem of under-consumption, while only one in eight has a standard problem of over-consumption.

### 3.3 Temptation as an Intermediary Variable

What explains the finding that there are more individuals in our sample with problems of under-consumption than with problems of over-consumption? Partial insight into this issue can be found by analyzing the connection between ideals, temptation, and expectations. Table 4 presents summary statistics comparing the ideal allocation with the most tempting allocation, and with the allocation predicted to be chosen in practice for the 1199 individuals summarized in table 3. As might have been hypothesized, on average the temptation generally raises first year consumption at the expense of second period consumption. On the whole, the temptation is to consume as much or more than would be ideal, as predicted by the classical self control models. Yet the answers on expected consumption display the opposite pattern: not only is the expected level of consumption below the temptation level, it is also below the ideal level.<sup>5</sup>

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<sup>5</sup>Note that we inferred that those with no temptation would consume precisely their ideal amount from the earlier answer. This method of completing the missing data seems valid given that none of those who reported answers to question 3b higher than 4, indicating a temptation to delay consumption, reported that their temptation consumption was less than their ideal consumption. Similarly, none who were tempted to consume more rapidly than would be ideal indicated to the contrary that they were tempted to consume less than would be ideal.

**Table 4**  
**Summary Statistics for Questions 3a, 3c, 3d**  
**Ideal, Temptation, and Expected Allocation of Certificates to**  
**First Year**

Question:	Mean	St. Dev.
3a: Ideal	5.25	0.92
3c: Temptation	5.49	1.49
3d: Expected	5.12	1.14

Source: Authors' tabulations of 2003 Survey Data

Further insight into this phenomenon can be gleaned from table 5. The first row of this table corresponds to those who are tempted to consume more in the second year than would be ideal (response 1 and 2 to question 3b); the second row corresponds to those who are not tempted (response 3), and the final row to those who are tempted to consume more than the ideal amount. The columns then record for each such value the average gap between temptation and ideal consumption (the "TI gap", as well as the EI gap.

**Table 5**  
**Temptation, the Temptation-Ideal Gap, and the Expected-Ideal**  
**Gap**

Temptation (Qn.3b)	%	Mean TI Gap: 3c-3a	Mean EI Gap: 3d-3a
Tempted by the second year	9.3	-1.63	-0.89
Not tempted	69.5	0	-0.15
Tempted by the first year	21.3	+1.7	+0.33
All	100.0	+0.19	-0.19

Source: Authors' tabulations of 2003 Survey Data

The TI gap in column 3 is just as one might have imagined: those who are tempted to consume more in the second year than ideal (corresponding to answers 1 and 2 to question 3b) generally report that the most tempting level of first year consumption below their ex ante ideal. Conversely, the TI gap is positive for those who give answers 4 or 5 to question 3b. Equally, there is little that is surprising about the EI gap in column 4, at least in

qualitative terms. In general, it seems that the actual level of consumption represents a compromise between the ideal and the temptation consumption, just as in the model of Gul and Pesendorfer. The striking fact lies in the small yet systematic negative gap between expected and ideal consumption for those who face no temptation, and in the asymmetry in adjustment to temptation. Those tempted to consume less than ideal anticipate that, on average, some 50% or so of this gap will be overcome. Those who are tempted to consume more than ideal anticipate closing a far larger proportion of the gap in practice.

## 4 Self Control and Wealth Accumulation

In this section we look first at the impact of self control problems on net worth. We then go somewhat further into refinements of our measure of self control, looking in particular for distinctions according to the nature of the problem. We find little evidence that such distinctions matter. Problems of over-consumption lower wealth, while problems of under-consumption raise them by a roughly equivalent amount. Finally, we look at assets that are differentiated in terms of liquidity, and show that the most liquid of these are more impacted by self control problems than are the least liquid.

### 4.1 Self Control and Net Worth

Table 6 summarizes the results of our basic regression analysis. In addition to our measure of self control, the right hand side variables are intended to capture demographic and economic variables likely to influence the level of net worth according to the classical life cycle hypothesis. Inclusion of these right hand side variables significantly shrinks our sample. In addition, we remove all annuitants, since their wealth is difficult to assess. Finally, we remove a few outliers with gross financial assets in excess of \$5 million. In the end, this reduces our regression sample to just 364.

**Table 6**  
**Net Worth Regression Results**

Variable	Coeff.	Std. Err.	Pr >  t
Expected-ideal gap	-0.146***	0.048	0.003
Ideal level	-0.019	0.033	0.558
Log 1999 income	0.198	0.179	0.269
Zero 1999 income	1.555**	0.776	0.046
Past income	0.469***	0.161	0.004
Zero past income	1.304*	0.707	0.066
Future income	-0.047	0.109	0.668
Zero future income	-0.190	0.467	0.685
Age	0.216***	0.046	0.000
Age <sup>2</sup>	-0.001***	0.000	0.003
Empl. status			
Working		<i>Omitted</i>	
Partially retired	0.068	0.224	0.762
Retired	0.267	0.264	0.313
Occupation			
Faculty		<i>Omitted</i>	
Mgmt./Sen. Admin.	-0.185	0.155	0.234
Tech./Professional	0.003	0.147	0.982
Other	-0.134	0.174	0.441
Education			
College or below	-0.236	0.172	0.169
M.A./Profesional		<i>Omitted</i>	
Ph.D.	0.051	0.128	0.692
R. has DB plan	-0.222*	0.127	0.082
S. has DB plan	-0.087	0.157	0.578
Marital status			
Curr. married		<i>Omitted</i>	
Prev. married	-0.601***	0.169	0.000
Never married	-0.345**	0.158	0.030
Male respondent	-0.061	0.113	0.587
Num. kids	0.013	0.063	0.842
Constant	-3.356***	1.127	0.003

Source: Authors' tabulation of 2003 survey data.

Notes: The dependent variable is log of net worth. We used a censored regression (Tobit) technique to include people with net worth of zero or less. There were 364 observations used in this regression. The Pseudo- $R^2$  was 0.2417,  $\chi(23)$  was 322.88, and log-likelihood was -506.50509.

The regression identifies a clear impact of self control problems on wealth accumulation, as suggested by theory. Note that we include also the answer to question 3a on the ideal level of consumption, and find it to have no explanatory power whatsoever. In quantitative terms, the equation suggests that the average over-consumer accumulates some 20% less than one with no self control problem, while the average under-consumers accumulates some 25% more.

The finding of a powerful impact of self control problems on wealth accumulation is very robust. Nothing of significance changes when we use dummy variables corresponding to possible constraints. The first dummy variable applies at a corner in which either expected consumption is 10, or ideal is 0: in both of these cases, there may be an unmeasured classical self control problem. The second dummy variable applies at any corner in which expected consumption is 0, or ideal is 10: in both of these cases, there may be an unmeasured converse self control problem. Introducing additional right hand side variables, such as preference parameters, information on parental gifts and bequests, and wealth shocks, has equally little impact on the key finding.

The regression above involves the assumption that the effects of self control problems on wealth are linear, and that the impact of problems of over-consumption and of underconsumption are equal and opposite. To gain insight into this issue, we have repeated the basic net worth regression using dummy variables for the various different levels of self control. The findings suggest that the linear assumption is not far off the mark. Over-consumption problems reduce wealth, while under-consumption problems raise wealth.

## 4.2 Self Control and the Composition of Wealth

Most theories of self control suggest that the impact of self control problems should differ as between liquid and illiquid assets. In particular, it should be hard for those with self control problems to accumulate financial assets outside their retirement account. Yet with respect to retirement assets, even the sign of the effect of self control problems is hard to predict.

Table 7 confirms that there does indeed appear to be a more significant impact of self control problems on liquid than on illiquid assets. The liquid assets we analyze are non-retirement financial assets. The less liquid assets are retirement assets. Note that the asymmetry in liquidity between retirement and non-retirement assets is radically reduced when individuals reach the age of retirement. For this reason, the sample for these regressions is

restricted to the group aged 64 and under.

**Table 7**  
**Regressions for Wealth Categories**

Variable	Non-Retirement Assets			Retirement Assets		
	Coeff.	S.E.	Pr >  t	Coeff.	S.E.	Pr >  t
Actual-ideal gap	-0.283***	0.079	0.000	-0.082	0.056	0.141
Ideal level	-0.003	0.057	0.962	0.018	0.040	0.647
Log 1999 income	0.058	0.308	0.851	0.086	0.216	0.689
Zero 1999 income	1.332	1.611	0.409	1.470	1.133	0.195
Past income	0.855***	0.302	0.005	0.540**	0.212	0.011
Zero past income	3.278*	1.755	0.063	1.255	1.234	0.310
Future income	-0.031	0.183	0.865	-0.067	0.129	0.605
Zero future income	0.371	0.803	0.644	-0.161	0.564	0.776
Age	-0.116	0.102	0.255	0.294***	0.072	0.000
Age <sup>2</sup>	0.002	0.001	0.171	-0.002***	0.001	0.003
Empl. status						
Working		<i>Omitted</i>			<i>Omitted</i>	
Partially retired	-0.211	0.386	0.585	0.435	0.271	0.109
Retired	-0.290	0.513	0.572	-0.039	0.360	0.914
Occupation						
Faculty		<i>Omitted</i>			<i>Omitted</i>	
Mgmt./Sen. Admin.	0.132	0.262	0.616	-0.105	0.184	0.570
Tech./Professional	0.009	0.254	0.971	0.059	0.178	0.741
Other	0.000	0.303	0.999	-0.308	0.213	0.149
Education						
College or below	-0.822***	0.295	0.006	-0.272	0.207	0.190
M.A./Professional		<i>Omitted</i>			<i>Omitted</i>	
Ph.D.	-0.343	0.222	0.122	0.110	0.156	0.482
R. has DB plan	-0.019	0.224	0.931	-0.284*	0.158	0.073
S. has DB plan	0.152	0.272	0.576	-0.005	0.191	0.981
Marital status						
Curr. married		<i>Omitted</i>			<i>Omitted</i>	
Prev. married	-0.188	0.293	0.521	-0.537**	0.206	0.010
Never married	-0.480*	0.278	0.085	-0.346*	0.195	0.077
Male respondent	-0.155	0.192	0.420	0.211	0.135	0.119
Num. kids	-0.083	0.108	0.444	-0.017	0.076	0.821
Constant	2.338	2.287	0.307	-5.809***	1.607	0.000
<i>N</i>	356			356		

Source: Authors' calculations based on 2000, 2001, and & 2003 survey data.

Note: Dependent variables are natural logarithms of the quantities listed at head of each set of columns. Asterisks indicate the level of statistical confidence for rejection of the hypothesis that the relevant coefficient is (independently) equal to zero: "\*\*\*" indicates rejection at better than a 1% level of confidence, "\*\*" indicates rejection at better than a 5% level, and "\*" indicates rejection at better than a 10% level.

As theory predicts, the impact of self control problems on non-retirement financial assets is larger and more statistically significant than that on illiquid retirement assets.

## 5 Conscientiousness and Self Control

Many personality psychologists describe personality in terms of the “big five”—five traits that are reliably found to emerge from personality inventories (Costa and Widiger [1994]; Digman [1990]; John [1990]; McCrae and Costa [1987, 1999]). Those five factors are: extraversion, agreeableness, conscientiousness, neuroticism, and openness. Two of these factors are thought to connect strongly to self control: neuroticism and conscientiousness (Olver and Mooradian [2003]).<sup>6</sup> We focus in particular on the link between conscientiousness and self control, since we have specific survey responses on this factor, and since it is strongly related to planning behaviors, another topic of direct interest in the analysis of wealth accumulation.

According to personality psychologists, there are many reasons for a possible link between conscientious and self-control. First, those high on conscientiousness feel capable and effective, so they feel that they can effectively manage issues in life. Second, they are well-organized and systematic in managing problems. Third, they are motivated by feelings of responsibility and obligation to ideal values. Fourth, they have high aspiration levels, and work to achieve their goals. The conscientious are diligent and purposeful, and have a sense of goals and direction in life. Fifth, they do not act quickly or impulsively. Instead, they are deliberate and think carefully before acting. We now confirm that these theoretical links show up in our data.

### 5.1 Measures and Findings

We asked four specific questions to assess the empirical connection between conscientiousness and self control. These questions are drawn directly from the conscientiousness personality scales as presented in Costa and Widiger [1989]. Respondents were asked to indicate on a simple six point scale the extent of their agreement or disagreement with the following statements.

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<sup>6</sup>These two dimensions are found to be linked to life satisfaction (Hayes and Joseph, 2003), as well as to emotional intelligence (Sakofske, Austin, and Minski, 2003), and to achievement (Barbaranelli, Caprara, Rabasca, and Pastorelli, 2003).

- Q1g: Sometimes I am not as dependable or reliable as I should be.
- Q1h: I never seem able to get organized.
- Q1i: I often feel that I speak or act too quickly, without thinking about the consequences.
- Q1j: I am often late for appointments.

There is one subtle aspect to the empirical relationship between conscientiousness and self control. Conscientiousness does not correlate with the level of self control per se: in fact very few economic, demographic, or psychological variables do have such a correlation. Yet conscientiousness *does* influence the absolute value of the self control problem. It appears to lower the divergence between actual and ideal consumption, regardless of sign. In essence, the conscientious have smaller problems of self control in either direction than to those who are not conscientious.

Table 8 illustrates this result for a regression of the absolute value of the self control problem on the first two of our conscientiousness questions (Q1g and Q1h), concerning respectively dependability and organization (all four measures are significant in univariate regressions, yet these are the two questions that retain significance when all four are added to the right hand side). Note that in order to increase sample size, we use only age and gender on the right hand side of the regression in addition to our psychological variables, ending up with a sample of 1414. The results are completely robust to alternative specifications.

**Table 8**  
**OLS Regression**  
**Absolute EI gap**

Variable	Coeff.	Std. err.	$Pr >  t $
Age	-0.008***	0.002	0.000
Not Dependable	0.077***	0.026	0.004
Not Organized	0.093***	0.026	0.000

Source: Authors' tabulations of 2003 Survey Data

The regression shows that the self control problems are smaller for those who are dependable or organized, two facets of conscientiousness. Given the psychological literature, it is not entirely surprising that conscientious individuals have higher levels of self control. Indeed, question 1j above from the personality scale is closely related to procrastination, which has been argued itself to be largely a result of self control problems (O'Donoghue and Rabin [1999]).

Note that there is one other interesting finding in the above table, which is the profound reduction in the scale of self control problems as individuals age. Again, this finding shows up only when one uses the absolute value of the self control measure. Older individuals experience fewer self control problems either of over-consumption, or of under-consumption, than do their younger counterparts. This finding is certainly consistent with the psychological literature, in which it is a common-place that temptation falls with age.

## 5.2 Self Control and the Propensity to Plan

Our interest in conscientiousness evolved in part from our earlier work on the propensity to plan. In Ameriks, Caplin, and Leahy [2002b] we uncovered a relationship between personality traits that might aid in the formation of financial plans, and the level of planning and wealth accumulation. In this follow-up survey, we were looking for a more well-established psychological foundation for this relationship. It was in this process that we became aware of the potential role of questions on conscientiousness.

That there would be a link between conscientiousness and planning is entirely to be expected, since the conscientious are conceptualized as having the ability to begin and carry through the plans that they have made. Planning per se is often seen as part and parcel of the conscientiousness factor. On our new survey, we asked one question directly aimed to measure the propensity to plan.

- I enjoy planning for activities like vacations well in advance.

Table 9 illustrates the close connection between the answers to this question and to those on conscientiousness.

**Table 9**  
**OLS Regression**  
**Enjoy Planning for Vacation**

Variable	Coeff.	Std. err.	$Pr >  t $
Age	-0.000	.002	0.772
Not Dependable	0.033	0.028	0.243
Not Organized	-0.204***	0.029	0.000
Speak Quickly	0.041	0.30	0.167
Late	-0.109***	0.031	0.000

Source: Authors' tabulations of 2003 Survey Data

The connection with conscientiousness suggests that those with a high propensity to plan may have greater self control than do those with a low such propensity. Further to this point, the propensity to plan appears to exert a direct influence on the level of self control over and above its linkage through conscientiousness. When it is added to the regression in the last section of the EI gap on conscientiousness, it has a coefficient of -0.11, and is significant at the 0.000 level. Those with a high propensity to plan have higher self control in part because they are more conscientious, and in part for other reasons that may relate more directly to the act of planning itself.

The results above lend indirect support to the conjecture in Ameriks, Caplin, and Leahy [2002b] that those with a high propensity to plan may accumulate more wealth because of their greater ability to exert self control. But armed with our new understanding of the two-sided nature of self control, we would have to add one amendment to this hypothesis. An increase in self control will increase wealth accumulation *only* for individuals with the standard problem of over-consumption. For those with an under-consumption problem, increases in self control should have the opposite effect of lowering wealth accumulation. More data will be needed before this conditional hypothesis can be put to the test.

### 5.3 Toward a Psychology of Self Control

Our findings relate to an old psychological debate on domain specificity. If personality characteristics are localized according to the problem under consideration, then self control in one arena will be only very weakly related

to that in another arena. The issue of whether behavior is linked to personality or attitudinal characteristics, and hence shows consistency across situations, or is determined by the situational context, is an age old debate within the field of psychology. Researchers have sought to address it by examining empirically the degree to which people behave in consistent ways that seem expressive of their underlying personality traits, attitudes, and/or values across the various situations they encounter in their lives (Mischel, 1969). In this regard, our finding that the self control parameter in our hypothetical free dinner situation translates well to the real world setting of wealth accumulation argues against domain specificity.

Our findings are relevant for another important debated concerning the psychology of self control. Are self control problems best viewed as the outcome of a struggle to resist primitive impulses, such as the urge to consume everything immediately? Proponents of the impulse control view treat self control as being linked to cognitions about and strategies for dealing with particular urges. In the field of health behavior, for example, people may be tempted by impulsive overeating, drinking too much, engaging in risky sexual behavior, etc. People's abilities to deal with these various impulses depend upon the strength of their temptations and the various strategies they have developed for resisting them.<sup>7</sup>

Our results suggest that the impulse control viewpoint of self control problems is incomplete. In particular, this viewpoint makes it hard to conceptualize underconsumption. It is a far stretch to imagine a primitive impulse not to spend. One alternative to the impulsivity view of self control is an approach based on broad personality traits. For reasons of deep personal psychology, some find it difficult to spend money, experiencing this as directly unpleasant or immoral. Despite perfect impulse control, these individuals may have self control problems of their own. Our results suggest the relevance of the personality theoretic viewpoint, since apparently conscientiousness plays a part in controlling not only problems of over-consumption, but also of under-consumption (Costa and Widiger, 1994).<sup>8</sup>

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<sup>7</sup>In practice, if not in theory, the impulse control view has generally been associated with the position that self control problems are domain specific. When self-control is conceptualized in terms of urges, it is typically understood as being domain specific, since people have different histories of trying to cope with different types of temptations. The ability to control eating or drinking, for example, may or may not be related to the ability to control the temptation to overspend or to engage in risky sexual behavior.

<sup>8</sup>Of course, under-consumption is also recognized in the health arena, since eating too

We believe that there is much fascinating work that remains to be done to clarify the psychology of self control. In addition to the role of personality, we believe that the role of habitual patterns of behavior needs to be considered at greater depth. Some may develop habits based on their past life circumstances that require self control to overcome. Analyzing connections between character, history, and the nature of self control problems is a crucial challenge for future research.

## 6 Concluding Remarks

We have used survey techniques to generate new insights into the nature and implications of self control problems. Clearly, self control problems represent a fascinating link between psychological forces and economic behavior, and survey techniques have much to offer to our search for understanding of cause and consequence.

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little can also be viewed as a personal problem. Drinking too little or having too little sex are not usually viewed as issues to be studied, although psychologists recognize the general concept of hypervigilance—being too strongly shaped by remote or implausible risks. Nonetheless, there has been a general tendency in the psychological analysis of self control to neglect the study of issues of under-consumption.

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