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Essays in Social Status and Finance

By

Nigel Barradale

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in

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in the

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University of California, Berkeley

Committee in charge:

Professor Jonathan Berk, Co-Chair
Professor Christine Parlour, Co-Chair
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Essays in Social Status and Finance

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Nigel Barradale

Abstract

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The field of household finance has established a correlation between savings behavior and education, income, and race. This is partly explained by a high discount rate ultimately leading to low social status. Chapter 1 establishes causation in the opposite direction, with a relatively low social status position leading to a relatively high discount rate. The method used is experimental, with 154 subjects interacting in high- or low-status assignments. The subsequent change in intertemporal preference is significantly determined by the status assignment. The effect is strongest among the subjects who initially have higher discount rates and does not depend on the sex of the subject. This result implies low status consumers have higher discount rates and make worse financial choices because of their low social status, a finding that must be addressed in the regulation of consumer financial products.

The evolution of uniquely exaggerated traits in humans is a topic that generates considerable interest and debate. In Chapter 2 I present an integrated theory that is based on the relationship between the individual and the group. This relationship involves diverse incentives—rewards and punishments—being applied by societies to their members, creating an evolutionary force. While the implications of direct incentives have been considered previously, I propose an indirect and potentially far more powerful incentive: social status. Through the awarding and withholding of social status, societies favor diverse psychological and morphological traits including intelligence, knowledge, norm-following, language ability, singing ability, and altruism towards one's group. Social status grants individuals proximate benefits in social interactions and ultimate benefits in inclusive fitness, at least in pre-industrial societies. Hence social status acts as a social incentive and is a component of a

wider evolutionary force that I term prosocial selection. In discussing the social bases of prosocial selection, I highlight both the desire of group members to have incentive systems that benefit themselves, and group selection, here the selection of groups with fitter incentive systems. In discussing the psychological bases of prosocial selection, I highlight genetic predisposition, behavioral conditioning, awareness of intrinsic incentives, and awareness of social incentives. Finally, I discuss the altruism generated through prosocial selection, termed social altruism, and contrast it with established theories of altruism. As a coherent theory of the evolution of many human behaviors, prosocial selection requires a considered debate.

Why are low-income households less likely to save than high-income households? In Chapter 3, I argue the cross-sectional relationship is explained by low status consumers being more impulsive. Formal tests using the Survey of Consumer Finances support this Status and Impulsiveness Hypothesis, while the Permanent Income Hypothesis and the Life Cycle Hypothesis are not supported. A decomposition of income allows me to determine the relative contributions of the different hypotheses towards the Income-Savings relationship: the SIH explains 85%; the PIH 14%; and the LCH 1%.

To Francesca, Merrill, and Florence.

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Acknowledgments

Chapter 1

Social Status and Intertemporal Preferences

Key Words: Consumer Finance; Household Finance; Experimental Finance; Social
Status; Discounting; Intertemporal Preference

JEL Classification: D14, D91, I3

1.1 Introduction

Regulation of the consumer finance industry has become a politically active issue, as evidenced by the proposed Consumer Financial Protection Agency. While most regulatory attention is focused on ensuring information transparency and preventing unfair or predatory behavior by financial institutions, less attention is focused on protecting consumers from poor decision making. A robust finding from the household finance literature (e.g., Campbell 2006) is that consumers often make poor financial decisions involving a tradeoff between present and future, such as overspending on credit cards, undersaving for retirment or against a rainy day, and not getting around to refinancing a mortgage. Those with lower social status, including consumers with less wealth or education, are more susceptible to this since they typically have a greater focus on immediate versus delayed rewards (e.g., Lawrance 1991; Warner & Pleeter 2001). In this chapter, I use experimental methods to demonstrate causation from a low status assignment to a greater focus on immediate rewards. This implies lower status people focus more on the present and make worse financial choices *because* they have low social status. Hence, a permissive regulatory system that frees high status people to optimize their personal finances may expose low status people to the dangers of their own short-term focus—metaphorically handing them the rope with which to hang themselves.

In the primary experiment, 154 subjects were randomly assigned to 2-person groups that worked on a shared task for 20 minutes. One person was assigned the high-status "Supervisor" role and the other the low-status "Worker" role within each group. The Supervisor was responsible for writing down the group's answers to the task, while the Worker merely provided help and support to the Supervisor. I measure the change in intertemporal preference with survey instruments taken both before and after the experimental manipulation. Compared to the subjects assigned the Supervisor role, the Workers became more focused on immediate rewards, exhibiting greater intertemporal inconsistency in Laibson's (1997) quasi-hyperbolic discounting framework. The random assignment of role within each group allows causality to be clearly determined—taking the subordinate versus the senior role within a group causes individual preferences to favor immediate versus delayed rewards.

Do the results hold only for small stakes? A strong finding from the intertemporal preferences literature is that intertemporal inconsistency and high discount rates are more pronounced for decisions involving smaller amounts (e.g., Thaler 1981). But the household finance literature finds a correlation with social status even for large amounts (e.g., Warner & Pleeter 2001). The current study elicited subjects' preferences over amounts that varied from the tens of dollars to the thousands of dollars. The change

in preferences was stronger with smaller stakes than with larger stakes, although the difference was not significant.

While the household finance literature indicates little difference in discounting between men and women (e.g., Harrison, Lau & Williams 2002), social status is often considered more important to men. Do the intertemporal preferences of men and women respond differently to social status? I test whether the change in intertemporal inconsistency as a result of the manipulation is different between men and women and find no significant effect. The preferences of both men and women appear equally sensitive to status level.

I also investigate whether the sensitivity to status is greater among those who initially have the highest intertemporal inconsistency and find strong evidence in support of this. Using a specification that includes the subject's initial intertemporal inconsistency interacted with status assignment increases the goodness of fit (measured by R^2) from about 6% to the 15%-20% range, and the t-statistic for the status manipulation increases from 2.8-3.0 to 3.5-10.7, depending on the precise formulation. This specification allows an accurate assessment of the impact on intertemporal preferences. The impact is not small. An average subject who valued a dollar in a week's time as 82.3¢ today would have seen that value decline to 77.5¢ after taking the low-status role or increase to 83.6¢ after the high-status role. The level of time inconsistency—measured as one minus the discount factor—is 37% higher for the low-status role compared to the high-status role.

In this subject pool, those who initially had high intertemporal inconsistency responded strongly to the status manipulation, while those who had low inconsistency responded only weakly. However, care needs to be used in extending this result to the wider population because the experimental subjects are unlikely to be representative. In gaining a place at U.C. Berkeley and then choosing to attend the experimental session, they came through filters that would exclude many people with high intertemporal inconsistency. Hence, the subject pool is likely skewed compared to the general population.

The basic result sheds light on perhaps the strongest cross-sectional finding in household finance: low status individuals have higher discount rates and make worse choices than high status individuals. Consider first the direct evidence related to discounting. Using the Panel Study of Income Dynamics, Lawrance (1991) calculates individual consumption Euler equations and finds poorer, less educated, and ethnic minority households have higher rates of time preference. Warner & Pleeter (2001) use a military downsizing program as a natural experiment, with the departing personnel being given the choice between an annuity and a lump-sum payment with a break-even discount rate exceeding 17%. The officers had much lower discount rates than the enlisted men, while younger, less educated, less intelligent, and Black personnel had higher discount rates. Harrison,

Lau & Williams (2002) conducted a nationally representative survey in Denmark and found more educated individuals have a lower discount rate.

Similarly, there is strong evidence that poorer, less educated, and ethnic minority households make worse financial choices with an intertemporal component. For example, poorer and less educated households tend to make investment mistakes, including non-participation in risky asset markets and the failure to exercise options to refinance mortgages (Campbell 2006). Poorer households tend to save less (Dynan, Skinner & Zeldes 2004), even though their greater likelihood of unemployment and uninsured health conditions implies a greater precautionary savings motive. Finally, Blacks and Hispanics in the U.S. under-invest in health and education and over-spend on positional goods relative to Whites (Hurst, Charles & Roussanov 2009).

The above findings are concerned with socioeconomic status (occupation, education, income, and wealth), intelligence, age, and ethnicity. These characteristics are all part of a larger construct termed social status. In this chapter, "social status" refers to *a power and influence hierarchy of the members of a society with accompanying dominance and submissive behaviors.* The status manipulation of this paper falls within such a definition, as do socioeconomic status, intelligence, age, and ethnicity. This is most clearly demonstrated by the small groups literature from sociology (reviewed in Webster 2003), with socioeconomic status, intelligence, age, and ethnicity being status cues that lead to power and influence within groups.[1] Hence the status manipulation of this paper is relevant to the household finance results.

Other explanations for the correlation between status and time preference must also be considered. The relationship between wealth and intertemporal preference has long been highlighted. For example, Irving Fisher (1930) notes "the smaller the income, the higher the preference for present over future income." Becker & Mulligan (1997) construct a model in which one's discount rate is determined by the resources spent "imagining" the future, and since the wealthy have more resources, they have a lower discount rate. While Becker & Mulligan argue for a direct causal link from wealth to discount rate, in this chapter I propose social status as a mediating mechanism—*relative* wealth leads to social status, and social status then determines one's discount rate. This is consistent with the failure of the savings rate to rise as countries become wealthier, despite an increase in the number of individuals who are wealthy in *absolute* terms.[2] Since relative wealth determines intertemporal preference, the aggregate rate of saving does not increase over

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[1] These findings are paralleled in other literatures, including human ethology (Eibl-Eibesfeldt 1989) and anthropology (Howitt 1904; Wiessner 1996).

[2] Indeed, there is evidence that the personal discount rate in wealthier countries is actually *higher* (Percoco & Nijkamp 2009)

time.

We should also expect initial differences in intertemporal preferences to lead to ultimate differences in wealth, on both a theoretical and an empirical level. In a simple endowment economy with infinitely lived agents, wealth flows to the agents with the lowest discount rate, as the agents with high discount rates borrow to over-consume.[3] Those with low discount rates make decisions that are better in the long-term, leading to greater wealth accumulation. This direction of causation has been demonstrated in an educational setting. Four-year-old children were given a choice between one treat immediately (e.g. a marshmallow) or two after a few minutes delay. Those choosing the delayed reward tended to achieve better teenage and adult outcomes (Mischel 1996). Similarly, impatience in eighth grade children is twice as important as I.Q. for end-of-year grades (Duckworth & Seligman 2005).

To help disentangle the wealth from social status effects, I ran a second experiment that resulted in a small financial gain or loss, but without manipulating social status. One hundred and eighty six experimental subjects played a game in which they guessed the movements of the stock market based on historical price movements. Those guessing correctly gained a dollar, and those guessing incorrectly lost a dollar. The game ended when they had either gained or lost five dollars relative to their starting endowment. The manipulation had no effect on intertemporal preferences, even though there was a large effect on measured emotions. Similarly, in one treatment of the social status manipulation, participants were given unequal pay, with the Supervisor earning $10 more than the Worker, and in this case the manipulation had little effect on intertemporal preferences. The psychological mechanism underlying this is unclear, but perhaps the experience of unanticipated gains or losses generates mental states that undermine the status effect. To use an old adage, the unanticipated winnings of the high status group may "burn a hole in their pockets."

The other possible reason for the correlation between status and intertemporal preferences is that some third factor is causing them both. Perhaps the parenting style of high-status parents leads to both low discount rates and high social status in their adult offspring, but without any causal link between discounting and status in the offspring. However the evidence for this is lacking.

The principal finding of this chapter has public policy implications. Because status drives intertemporal inconsistency, low status individuals will respond differently to financial deregulation and innovation than high status individuals. For example, the ease of accessing consumer credit or remortgaging to release residential equity may allow

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[3]See Ramsey (1928) and Becker (1980)

high status individuals the freedom to optimize their personal finances, while exposing low status individuals to the dangers of their own intertemporal inconsistency. In this regard, point-of-sale credit is especially pernicious.[4]

Many field behaviors have been correlated with intertemporal preferences, including lack of exercise, smoking and body mass index (Chabris et al. 2008), substance abuse (Kirby, Petry & Bickel 1990; Reynolds 2006), and delinquency in juveniles (White et al. 1994). These same behaviors are more prevalent in low- versus high-status groups. The findings of this chapter imply low social status is a cause of these behaviors due to the impact on intertemporal preferences. Interventions can be designed that address either social status or the intertemporal preferences directly. The next section discusses evidence that the neurotransmitter serotonin modulates the relationship between social status and intertemporal preferences. This evidence is strong. Hence, behavioral and pharmacological interventions to boost serotonergic action should reduce intertemporal inconsistency and improve intertemporal decision making.

More generally, the findings have implications for how we think about personal responsibility and the concept of "natural justice." In particular, if the preferences of an individual or group are the result of a status position that is assigned by the wider society, does that place some duty on the wider society to address the resulting behaviors? This is seen most clearly when ethnicity is a negative status characteristic, as with Blacks in the U.S. The poor educational and life outcomes of many Blacks can at least be partly attributed to high intertemporal inconsistency that results from their negative status characteristic. Does this place an obligation on society to implement programs, like positive discrimination, that address the status differential?

The rest of this chapter is organized as follows. Section 2 discusses the existing evidence that social status leads to changes in discounting. Based on this evidence, I construct a set of hypotheses and questions to test experimentally. Section 3 discusses the initial questionnaire, Section 4 discusses the social status manipulation, and Section 5 discusses the financial gain/loss manipulation. Section 6 concludes.

1.2 Motivation

The Introduction includes evidence from household finance that discounting and social status are correlated. However, we want to move beyond *correlation* and focus on *causation*. But why should we expect social status to determine one's discounting

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[4]Indeed, credit card contracts appear designed for consumers with time-inconsistent preferences (DellaVigna & Malmendier 2004).

preferences? While the household finance literature is silent on this, an answer is required to provide a theoretical basis to the empirical results of this chapter. Accordingly, in this section I provide an argument and supporting evidence from outside the finance discipline. The argument is evolutionary, and the evidence is neurological. While the evidence is circumstantial, it helps construct a set of hypotheses that can be tested in an experimental setting. It also points to some open questions where the existing evidence does not generate a strong prior belief.

In discussing the relationship between income and impatience, Fisher (1930) argues that the threat of starvation forces poorer individuals to focus on the present: "If a person has only one loaf of bread he would not set it aside for next year even if the rate of interest were 1000 per cent; for if he did so, he would starve in the meantime. A single break in the thread of life suffices to cut off all the future." In the developed world today, this argument is less applicable due to the great reductions in absolute poverty that have been achieved. Indeed, obesity may now be a greater threat to the poor than starvation. However, the argument is applicable in an evolutionary context: when resource levels are low, the organism focuses on the present to reduce the chance of immediate death. Applying the evolutionary psychology paradigm (Cosmides & Tooby 1987; Barkow 1989), we should expect psychological adaptations that reflect this evolutionary context, with people becoming more present-oriented when their level of resources is low. Since social status is a form of resource that is convertible into other forms (Chapter 2), we should expect low status to cause greater impatience.

While this evolutionary argument is suggestive, we require a mediating mechanism. There is one obvious candidate: serotonin. A monoamine neuromodulator in the central nervous system and hormone in the peripheral circulation, the serotonin system is highly conserved across species, including all vertebrates. Its effects are diverse, including responses such as sleep, appetite, sexual behavior, violence, suicide, and depression. Indeed, the main class of anti-depressant drugs currently prescribed target the serotonin system.

The level of serotonergic activity in the central nervous system functions as a signal. The question is, what is being signalled? Wilkinson (2005) suggests social status, even referring to serotonin as the "social status hormone." Various lines of evidence support this. For example, serotonergic function is positively correlated with socioeconomic status in healthy adults (Matthews et al. 2000) and with community social status (Manuck et al. 2005). The correlation with individual status has been replicated in primate studies (e.g. Higley et al. 1996). Causation from serotonin level to dominance behaviors and enhanced mood has been demonstrated using tryptophan, a precursor amino acid that crosses the blood-brain barrier (reviewed in Young & Leyton 2002). Whether serotonin

is as specific as the social status hormone or is more generally signalling organismal well-being is unclear, although the very wide range of functional responses to serotonin (reviewed in Barnes & Sharp 1999) suggests the latter.

There is also evidence that serotonin influences intertemporal preferences. In animal models, reducing brain serotonin increases the preference for smaller immediate rewards, and increasing serotonin increases the preference for larger delayed rewards (reviewed in Cardinal 2006). Among a non-clinical group of human males, lower serotonergic activity was correlated with greater psychological impulsiveness (Manuck et al. 2003), an effect that holds for a genetic marker of lower serotonin capacity.[5] Tryptophan depletion has also been used to demonstrate causation in human males, with reduced serotonin leading to greater impulsiveness (Walderhaug et al. 2002).

Recent neuroimaging research suggests we can be more specific in how intertemporal preferences are impacted by serotonin. McClure et al. (2004) conducted fMRI scanning while healthy subjects made intertemporal choices. They found the brain's dopamine system is preferentially activated by decisions involving immediate reward, and the relative strength of the activation predicts subjects' choices for immediate versus delayed rewards.[6] This implies the intertemporal inconsistency element of Laibson's (1997) quasi-hyperbolic discounting has an actual neurological basis. Dopamine is another monoamine neuromodulator, and it is known to mediate reward processing and behavioral reinforcement. Importantly, changes to the brain's dopamine level are driven by the level of serotonin (Ågren et al. 1986). This is a likely route for the level of serotonin to influence intertemporal preferences.

Based on this discussion, I formulate three hypotheses and ask four questions to be investigated in the experimental setting.

Hypothesis 1 *Changes to social status cause changes to intertemporal preferences, with relatively low social status leading to higher discounting.*

The evolutionary argument implies lower status individuals should become more focussed on the present. The neurological evidence implies lower status leads to less serotonin activity, and this in turn leads the organism to become present-oriented. However, direct causation from social status to intertemporal preferences has not previously been demonstrated and, in particular, it has not been demonstrated in humans.

Hypothesis 2 *In particular, intertemporal inconsistency becomes relatively greater for those in a junior versus senior status position.*

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[5] The s allele of 5-HTTLPR (Paaver et al. 2007)
[6] See also Hariri et al. (2006) and McClure et al. (2007)

The neuroimaging study of McClure et al. (2004) demonstrates the dopamine system is preferentially activated for decisions with immediate versus delayed rewards. Because serotonin leads to changes in dopamine activity, this is a likely route for serotonin to influence intertemporal preferences. I hypothesize that lower social status leads to a preference for immediate versus delayed rewards.

Hypothesis 3 *The effect holds for both men and women.*

Serotonin has been correlated with social status for both males and females. For example, Higley et al. (1996) find a correlation in female rhesus monkeys. Hence the neurological evidence suggests both men and women will respond similarly to the status manipulation. This is supported by the household finance results, which hold similarly for men and women. However, folk psychology suggests that social status is more important to men than women. I hypothesize that men and women will exhibit similar responses to the status manipulation.

Question 1 *Does the effect depend on the size of the stakes?*

While discount rates are generally lower for high stakes (e.g., Thaler 1981), the correlation between social status and discount rates has been demonstrated to hold even for large amounts (e.g., Warner & Pleeter 2001). I ask whether causation from social status to discounting is influenced by the size of the stakes, being weaker for high stakes and stronger for low stakes.

Question 2 *Does the change in preference depend on initial preference as well as status?*

People vary in the extent to which they are focused on immediate versus delayed rewards, with some being close to exponential discounters and others exhibiting a high level of intertemporal inconsistency. I ask whether individuals' sensitivity to social status is dependent on initial preference, with exponential discounters responding only weakly and those with a high level of intertemporal inconsistency responding strongly.

Question 3 *How do financial gains and losses interact with the effect of status?*

The household finance results indicate a correlation between wealth and lower discount rates. Since wealth leads to social status, we should expect this correlation. However, windfall changes to wealth that are not accompanied by changes to social status may generate other psychological responses, including priming for immediate consumption. I ask whether financial gains and losses—windfall changes to wealth—influence the hypothesized social status effect.

Question 4 *What is the magnitude of the effect?*

The magnitude of the change in preferences will indicate the relative importance of the hypothesized social status effect in explaining the correlation between social status and intertemporal preferences. Furthermore, the magnitude of the effect will indicate the extent to which intertemporal preferences are dynamic over time and so likely to affect asset prices. I ask how large is the magnitude of the effect.

These hypotheses and questions are tested in the experimental manipulations that follow.

1.3 Initial Questionnaire

1.3.1 Methods

Subjects

A total of 389 undergraduate students from the University of California at Berkeley participated in the experiments, which were held at the Experimental Social Sciences Laboratory ("XLab"). The questionnaires were conducted on computers using ZTree (Fischbacher 2007). The experimental sessions lasted just under an hour and the subjects were paid an average of $20 (earlier sessions) or $15 (later sessions).

The 26 subjects who answered zero to any financial question were excluded from the analysis for two reasons. First, the financial analysis uses a log specification, making zero responses problematical. Second, subjects placing zero value on future or uncertain cash flows may not have fully understood the question. This left 363 subjects whose responses to the initial questionnaire are analyzed.

Measures

The basic inference strategy can be described as "test-manipulate-retest," with (i) the primary variables of interest being tested both before and after an experimental manipulation; and (ii) subjects being randomly assigned to manipulation groups. This setup is similar to that used by the pharmaceutical industry to demonstrate the efficacy of new treatments. Testing both before and after the manipulation allows the innovation in the tested variables to be used. This filters out both idiosyncratic and systematic variation in the initial value of the tested variables, although there is a danger of subjects' preferences becoming anchored during the initial test phase. To reduce this risk, slightly different questions can be posed in the retest phase. The random assignment to manipulation group allows causation to be inferred, with the change in the tested variables being caused by the manipulation plus noise.

The initial questionnaire is included as Appendix A.1. The first set of questions (Q1-Q6) ask for basic demographic information. The second set (Q7-11) are derived from Glaeser et al.'s (2000) measure of social status, which was found to be significant in an economic trust game. Since the subjects were undergraduates and likely below the legal drinking age in California, Q11 asked about parties per week invited to, rather than beer servings per week consumed. Q13 measures one's sense of power and is taken from Anderson & Galinsky (2006). Q14-Q23 are general questions that could plausibly be related to intertemporal preferences, such as health, hunger, tiredness, time spent outdoors, and life satisfaction.

Question 24 measures positive and negative affect (a term in psychology for the experience of feeling or emotion) using a subset of questions asked in the PANAS questionnaire of Watson, Clark & Tellegen (1988) and the PANAS-X questionnaire of Watson & Clark (1994), with slight modification. Subjects rated the extent to which they were feeling 16 different emotional terms (Angry; Proud; Sad; Positive; Afraid; Happy; Guilty; Alert; Contented; Down; Confident; Irritable; Attentive; Ashamed; Joyful; and Nervous). For analysis, these emotional terms were grouped into pairs. In addition, the eight positive terms (Proud; Positive; Happy; Alert; Contented; Confident; Attentive; and Joyful) were grouped into a Positive Affect Score and the eight negative terms (Angry; Sad; Afraid; Guilty; Down; Irritable; Ashamed; and Nervous) into a Negative Affect Score. The subjects clicked buttons to indicate their response on a 9-point scale, rather than the 5-point scale of the PANAS-X. I took this approach because I am primarily concerned with the change in emotions from before to after the manipulation, and a 9-point scale is less prone to anchoring effects. The different scale and reduced set of questions imply the responses are not directly comparable to the PANAS scales.

The financial questions (Q25-27) are broadly modeled on those of Thaler (1981). The subjects receive a hypothetical prize from their bank (Q25 and Q27), or are offered a raffle ticket for sale by their bank (Q26). In Q25 the subjects are asked for the amount of money they would need to receive with certainty that would make them indifferent to a 50% uncertain payout. In Q26 the subjects were asked for the price that would make them indifferent to buying a raffle ticket with a 50% payout chance. In Q27 the subjects were asked for the amount of money they would need to receive now to make them indifferent to receiving a larger amount with a fixed delay. In each of the questions, the subjects were asked for their indifference point over amounts that varied widely in magnitude (from tens of dollars to thousands of dollars) and in Q27 for fixed delays of 1 week, 2 months, and 2 years.

These financial questions are matching tasks, as defined by Frederick, Loewenstein & O'Donoghue (2002), with hypothetical rewards being used. The subjects were required

to state the amount of money that would make them indifferent to the proposed payout. This method has three advantages in the current setting. First, the subjects were able to answer the questions relatively quickly, with most subjects completing the entire retest questionnaire in about 5 minutes. This is important because the experimental manipulations are likely to have a transitory effect on subjects, implying the effect may disappear while a long retest phase is being conducted. Second, a tight estimate of each subject's preferences is obtained, both before and after the manipulation. This is important because most subjects experience only a small change in preferences, which a coarse estimate would be unable to detect. Third, preferences are determined over payment amounts that vary considerably in orders of both magnitude and delay.

The use of matching tasks with hypothetical rewards has one major disadvantage, however, with less external validity than tasks involving real monetary rewards. The use of real rewards generally requires a choice task, as defined by Frederick, Loewenstein & O'Donoghue (2002), in which subjects are presented with a series of choices between A and B options. For example, the choice between $90 now and $110 in 2 months. The subjects make many such choices and have a chance of one choice being paid in real monetary terms. Camerer & Hogarth (1999) argue this increases effort and reduces noise. Choice tasks result in the filtration of the population by preference parameter. For example, the commonly used questionnaire of Kirby, Petry & Bickel (1999) asks 27 questions and results in each subject being assigned one of nine values for a hyperbolic discount parameter. There is a tradeoff between the coarseness of the filtration and the number of questions asked, with some questionnaires that produce a fine filtration requiring more than an hour to conduct (e.g., Tanaka, Camerer & Nguyen 2009). This tradeoff makes choice tasks unsuitable for the current experiment since both a fast test and a tight preference estimate are required.

While the current experiment uses hypothetical rewards, other researchers find the presence of real rewards makes little difference to subjects' responses (e.g., Johnson & Bickel 2002; Madden et al. 2004). Furthermore, the intertemporal preference parameters estimated in the present experiment are close to others' estimates based on real rewards or field behaviors, as discussed below.

Using the results from the financial questions, I estimate intertemporal and risk preferences for each subject. For intertemporal preference, I use Laibson's (1997) quasi-hyperbolic discount function, which is relatively standard and consistent with the neurological evidence in Section 2. I make a slight modification to allow a logarithmic

transformation and OLS estimation:

$$PV\left(x_t\right) = x_t \beta e^{-rt}$$
$$\ln\left[PV\left(x_t\right)/x_t\right] = \ln\left[\beta\right] - rt$$

where $PV\left(.\right)$ is the present value function, r is an exponential rate and β is an immediacy factor. For each subject $\ln\left[\beta\right]$ and r are estimated using an OLS regression with an intercept term and t the only independent variables. Table 1 presents the first four moments and median of r, $\ln\left[\beta\right]$ and β. The mean level of r is 17.4% per year, and the median is 12.1%. The mean level of β is 0.826, and the median is 0.907; this corresponds to the value of a dollar with any delay compared to a dollar now. Both β and r are skewed and have high kurtosis.

We can compare the level of β with others' estimates using field behaviors and real rewards. Brown, Chua & Camerer (2009) provide a recent summary. They report values of: 0.55 for retirement savings (Angeletos et al. 2001); 0.34 for welfare takeup by single mothers (Fang & Silverman 2007); 0.80 for credit card use (Shui & Ausubel 2004); 0.90 for unemployment spells (DellaVigna & Paserman 2005); 0.74-0.89 for experiments in Vietnam (Tanaka et al. 2009); and 0.70 for consumption data (Laibson et al. 2007). While my estimates are higher than many of these, it should be noted that the subject population of U.C. Berkeley undergraduates is unlikely to be representative of the general population.

For risk preference, I use the standard Prospect Theory utility function of Tversky & Kahneman (1992), with modification to allow a logarithmic transformation and OLS estimation. For choices over uncertain gains, the certainty equivalent is:

$$CE(px) = e^{q(p)}(px)^{1+\sigma}$$

where $CE\left(.\right)$ is the certainty equivalent function, p the objective probability, x the payment amount, $e^{q(p)}$ is a transformation of the objective probability, and σ is the curvature of the value function. In the current experiments, the uncertain gains all had a 50% probability of paying out, implying $e^{q(p)}$ is a constant, e^q. Question 26 tested the preference for certain losses against uncertain gains or, put more simply, the willingness to purchase a raffle ticket. This allows losses and gains to be compared and a loss aversion parameter λ to be estimated:

$$CE(-px) = e^{-\lambda}e^q(px)^{1+\sigma}$$

Taking logs:

$$\begin{aligned} \ln\left[CE(px)/px\right] &= q + \sigma \ln(px) \\ \ln\left[CE(-px)/px\right] &= -\lambda + q + \sigma \ln(px) \end{aligned}$$

This system can be estimated with OLS using a dummy variable to indicate a certain loss, or payment for the raffle ticket. To facilitate comparison with Tversky & Kahneman's (1992) estimates, the intercept term, q, is recentered to be the risk aversion parameter over the average (in log terms) expected payment. The average value of $\ln(px)$ in the initial questionnaire is 6.072, so the transformation is effected by simply taking $\sigma\left[\ln(px) - 6.072\right]$ on the right hand side. Without this transformation, q would be interpreted as the risk aversion over a $1 notional bet, which is less intuitive and outside the range of financial questions asked.

Table 2 presents the first four moments and median of λ, σ and q. The mean level of λ is 1.907, and the exponential of this is 6.73. This implies the subjects are highly loss averse, valuing a loss 6.73 times more highly than a gain. In comparison, Tversky & Kahneman found the median loss aversion parameter for their subjects of 2.25. The difference is likely due to the style of question asked and the different subject population, with Tversky & Kahneman using graduate students. The median level of σ is -0.161, while the comparable figure for Tversky & Kahneman is -0.12, calculated as one minus the exponent of their value function The mean level of q is -0.270 and the median is -0.006. The exponents of these are 0.76 and 0.99 respectively, which is the probability weighting the subjects apply to a 50% likely gain. Tversky & Kahneman also found their subjects to slightly underweight 50% probabilities.

1.3.2 Results

Tables 3 and 4 present correlations between the questionnaire items and the financial preference measures. Following Chabris et al. (2008), I do not cherry-pick behaviors to report but rather present the full set of variables that were hypothesized to be correlated with financial preferences.

The static correlations are most noteworthy for how little they find, perhaps because the population is self-selected students and not representative of the wider society. The immediacy factor, β, has more significance than the other measures, but most correlations are not significant. This may be caused by the relatively weak status structures of undergraduate students. Also the students who attend the experimental session have already come through filters that are correlated with intertemporal preferences: at high school they chose to study rather than relax or pursue other activities; and they chose

to sign up for and actually attend the experimental session.

In the static data, a few trends are discernible. Subjects with a high intertemporal inconsistency choose behaviors that are pleasurable in the short term like smoking, spending time outside, attending parties, and volunteering. In contrast, subjects with a low intertemporal inconsistency are more likely to study and so have a higher GPA. There are also variables one would expect to lead to social status that are positively correlated with β, including year at university, male height, and again GPA. These are consistent with the base hypothesis that social status leads to less intertemporal inconsistency.

GPA is interesting because it both leads to status and is the result of subjects choosing to study rather enjoying leisure time. This creates a positive-feedback loop: academic success leads to less intertemporal inconsistency, which leads to more studying, which leads back to academic success. Hence, it is not surprising that GPA has the greatest correlation with the immediacy factor β.

Some measures that were expected to be positively correlated with social status have no clear relationship with intertemporal preferences. The six measures of social status (working for pay; parent with a college degree; close friends; volunteering; parties; and girlfriend/boyfriend) that Glaeser et al. (2000) found significant in an economic trust game show no discernible pattern in relation to the immediacy factor, β, or the exponential rate, r. This may be because some of the behaviors not only lead to higher social status, but are also the result of a higher rate of time preference, like attending parties. Similarly, Anderson & Galinsky's (2006) "sense of power score" has no clear relationship to intertemporal inconsistency. This lack of a relationship also holds for the measured emotions except Afraid + Nervous, which has a significantly negative correlation with β.

With risk preferences, the main result is that women are more loss averse (higher λ). They also have greater curvature to the value function (lower σ) while having similar average risk aversion (q), and this implies they are more risk averse over large bets and less risk averse (or more risk seeking) over small bets.

In the next two sections, I present the social status and financial gain/loss manipulations. The primary measure is the effect these manipulations have on the financial preference parameters. Hence, I track the change in parameters for each individual from before the manipulation to afterwards, and then correlate the change with the experimental treatment. Unrecoverable software problems lead to two experimental sessions being abandoned during the manipulation phase, leaving 314 subjects whose change in preferences was analyzed. Table 5 presents the first four moments of the change in preference parameters as a result of the manipulations. The kurtosis of all five parameters is high, indicating the preferences of most subjects changed by a relatively small amount while the preferences of a minority changed by a relatively large amount. This large

number of outliers can bias the results and undermine the statistical tests. As a simple solution, for each observation I take the square root of the absolute change multiplied by the sign of the change. This reduces the effect of outliers. The moments on this basis are also presented in Table 5, and the kurtosis is considerably reduced.

1.4 Social Status Manipulation

1.4.1 Methods

The status manipulation utilized is similar to others in the literature (e.g., Snodgrass 1992; Hall et al; 2001, Anderson & Berdahl 2002; Wojciszke & Struzynska-Kujalowicz 2007), with two subjects working together on a shared task, one being assigned a high-status role and the other a low-status role. A total of 154 subjects participated in eight experimental sessions. Ten subjects were excluded from the analysis due to answering zero to one or more of the financial questions. Of the remaining 144 subjects, 111 participated in a game where the two roles enjoyed Equal Pay, and 33 participated in a game where the two roles were given Unequal Pay.

On entering the laboratory, subjects were seated in same-sex pairs. After completing the initial questionnaire, the experimenter approached each pair and offered the subject seated closest to the aisle a choice between two pieces of paper. The subject could not see the contents of the paper until after he or she had selected it. The other piece of paper was then given to the second person in the pair. The two pieces of paper described the roles of Supervisor and Worker that the subjects would take in a 2-person work group, and these role instructions are included in Appendix A.2. In brief, the Supervisor was responsible for writing down the group's answers to the task, and the Worker was responsible for advising and helping the Supervisor. To eliminate bias due to the top or bottom piece of paper being chosen more frequently, the order of the two pieces of paper was alternated—if the Supervisor description was on top for one pair, then the Worker description would be on top for the next pair. Two distinct treatments were conducted. In one the subjects were paid unequally, with the Supervisor earning $10 more than the Worker, and in the other the subjects were paid the same amount. All participants were made aware of the operative pay protocol.

After the roles had been assigned, the Supervisor was handed the task instructions. The first page described the task of assigning social responsibility scores to fictitious organizations. The subsequent 5 pages contained approximately 2,000 words of text describing 8 fictitious organizations. To encourage the groups to work diligently, an $80 prize was given to the team with the "best" answers, where "best" was defined as being

closest to the average answers of all the groups. The subjects were given 20 minutes to complete the task. Most groups finished the task in about 15 minutes and then continued talking quietly until the experimenter announced the end of the game. In almost all cases the Supervisor chose to retain the task instructions and, as instructed, wrote down the answers of the group. Since there was only one set of instructions, the Worker had to look over to the Supervisor's desk to read them.

The experimental setup was designed to isolate the status interaction as the manipulated factor. Hence, the two subjects were treated equally, apart from the instructions, and the assignment of roles was transparently random. There was no attempt to devalue either subject or to suggest the Supervisor in any way deserved the role by being "better" than the Worker. Since social status was manipulated, I refer to the Supervisors as the High Status Group and the Workers as the Low Status Group.

1.4.2 Results

In the Equal Pay Treatment, the subjects generally enjoyed the experimental manipulation. As highlighted in Table 6, in this treatment both High Status and Low Status Groups experienced a large fall in negative affect, with all components of the Negative Affect Score (i.e. Angry + Irritable; Sad + Down; Afraid + Nervous; Guilty + Ashamed) declining significantly for both groups. Their emotional responses were similar, with no significant differences between the two groups. The theme of the subjects enjoying the manipulation is supported by some of the feedback forms at the end of the experiment. For example, "I enjoyed the group work a lot" (Supervisor); "The corporate responsibility segment was one of the best activities I've done in XLab" (Supervisor); and "the team exercise was great" (Worker).

However, if we focus on the Unequal Pay Treatment, a slightly different picture emerges. The Low Status Group became more Angry + Irritable than the High Status Group, and less Happy + Joyful. Also the High Status Group became more Guilty + Ashamed than the Low Status Group. Both groups seem to have viewed the pay differential as unfair, and the Low Status Group responded with anger and the High Status Group with guilt. This view is supported by some of the feedback: "very unfair payment system" (Worker); "I contributed more to the decision making. The worker should earn equal pay." (Worker).

With the financial preference response to the manipulation, we can formally test the hypotheses and answer the questions formulated in Section 2. In support of Hypothesis 1 (*status causes changes to intertemporal preferences*) and Hypothesis 2 (*in particular, intertemporal inconsistency*), in Table 7 we see the High Status Group responded with

an increase in the immediacy factor, β, while the Low Status Group responded with a decrease. The difference between the two groups is highly significant, with a t-statistic of 2.99 or 2.79 depending on whether we use the unadjusted change in β or the square root specification. The R^2 statistic is about 5%-6%. The magnitude of the difference is 0.056, which compares with a population mean of 0.826 and standard deviation of 0.222 reported in Table 1. Interestingly, the coefficients are greater for the Equal Pay Treatment than the Unequal Pay Treatment, and if we focus just on the Equal Pay Treatment the R^2 statistic increases to about 6%-7%. While the difference between the two pay treatments is not significant in this specification, it hints that pay differentials considered unfair may undermine the effect of the status manipulation.

The impact of the manipulation on the exponential rate, r, is much less significant. Indeed, Table 7 indicates r becomes *higher* for the High Status Group relative to the Low Status Group. This appears inconsistent with the basic argument that low status leads to a greater rate of time preference. To investigate further, we can look in more detail at the structure of subjects' responses. In particular, the intertemporal preferences question (Q27) elicited preferences over cash flows in 1 week, 2 months, and 2 years, and we can group the responses for these time periods. Table 8 presents such an analysis in the first three columns. For each subject and each time period, I take the average of the discount factor $(PV\,(x_t)\,/x_t)$ before and after the manipulation, and then track the change according to whether the individual was in the High or Low Status Group. If we focus initially on the Equal Pay Treatment (Panel B), we see the manipulation has an effect of 0.059 (t-stat = 2.32) for the 1 Week preference, 0.056 (t-stat = 2.31) for the 2 Month preference, and 0.037 (t-stat = 1.39) for the 2 Year preference. Hence, the manipulation appears to change preferences primarily over the short time periods, 1 Week and 2 Months, rather than the 2 Year period. This implies the immediacy factor, β, and the exponential rate, r, will move in the same direction as a result of the manipulation.

We can also use Table 8 to address Question 1, whether the size of the reward interacts with the status manipulation. For each time period, the subjects were asked their preferences over small, medium, and large amounts, corresponding roughly to tens of dollars, hundreds of dollars, and thousands of dollars. The specific amounts differed between the initial questionnaire and the ending questionnaire to reduce anchoring, but the amounts were of similar order of magnitude. Since the status manipulation primarily had an effect on the 1 Week and 2 Month time periods, I consider size changes over these time periods combined. In the fourth column, 1 Wk + 2 Mo, I present the same analysis as the first three columns, but taking each subject's average response over the two shortest time periods. In the last three columns, I then break this out into the three size categories. The impact of the manipulation for the Equal Pay Treatment (Panel B)

for the small amounts was 0.064 (t-stat 2.28); for the medium amounts was 0.064 (t-stat 2.29); and for the large amounts was 0.043 (t-stat 1.64). Hence, the manipulation had a similar effect on the small and medium size amounts, but slightly less effect on the large amounts. However, this difference is not statistically significant.[7]

Also note that in Table 8 there is no obvious pattern to the responses for the Unequal Pay Treatment (Panel A). The manipulation has opposite effects on the 1 Week versus 2 Month time periods (-0.004 vs. +0.030), and on the Small versus Medium size amounts (+0.069 vs. -0.026). These responses appear to be noise, consistent with the suggestion that unfair pay differentials undermine the status manipulation.

I use Table 9 to investigate Question 2, whether the magnitude of the subject's response to the status manipulation will depend on their initial preferences. Specifically, do those with high intertemporal inconsistency (smaller β) respond more strongly and experience a larger change of β in the direction of the manipulation? I compare the existing model with Change in Beta depending on Status Group (Specification I) against one in which Change in Beta depends on Status Group multiplied by One minus Initial Beta (Status * 1-Initial Beta) (Specification II). The second specification appears better, based on t-statistics and the R^2 measure.[8] To confirm this, Specification III is a multiple regression with Status * 1-Initial Beta and both level effects, Status and Initial Beta, as independent variables; the standard errors are clustered by experimental session to allow for intra-session correlation, and a separate dummy variable is included for each session.[9] In this case Status is not significant while Status * 1-Initial Beta remains highly significant. This continues to hold when control variables from the Initial Questionnaire are included (Specification IV). Hence the subjects with greater intertemporal inconsistency respond more strongly to the status manipulation.

I address Hypothesis 3 (*effect holds for both men and women*) in Table 9, Specification V, by adding an interaction term for sex (coded as Woman $= \frac{1}{2}$, Man $= -\frac{1}{2}$) to Specification III and running a regression including the triple interaction term together with the double interaction and level terms. The triple interaction term is not significant, whether we use the Change in Beta (Panel A) or the Square Root of the Change in Beta (Panel B) as the dependent variable. This implies there is no significant difference between men and

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[7]In a separate specification, a size term was added to the quasi-hyperbolic discount function, and the change in this term was not significantly related to the status assignment.

[8]To address the non-normality of the dependent variable, Panel A uses bootstrap standard errors, while Panel B takes the square-root of the distribution and then uses robust standard errors. The specifications in other tables generally have binary independent variables, so are much less sensitive to the use of robust or bootstrap standard errors.

[9]The sessions varied by time of day, physical location of the experimental laboratory, and timing within the academic year.

women in their response to the manipulation, consistent with Hypothesis 3.

Since treatments were run including both Equal and Unequal Pay, we can formally investigate Question 3 (*interaction with financial gains and losses*). In Table 9, Specification VI, I add an interaction term for the Unequal Pay Treatment (coded as Unequal Pay Treatment = 1, Equal Pay Treatment = 0) to Specification III and run a regression including the triple interaction, double interaction, and level terms. The triple interaction term is significantly negative in both Panel A and Panel B. This implies that paying the subjects unequally *undermines* the social status manipulation, reducing the effect of the manipulation on intertemporal preferences.

Using the coefficients from Table 9 (Specification II, Panel A) we can calculate predicted values of beta following the status manipulation. This is presented in Table 10, with starting values of beta being the mean and median values from Table 1. If we focus on the Mean Beta case, the Initial Beta of 0.826 is predicted to increase to 0.836 for the High Status Group and reduce to 0.775 for the Low Status Group. This is a large effect, in answer to Question 4.

The social status manipulation had no significant effect on risk preferences. This is demonstrated in Table 11 for the square root of the change in each of the risk preference parameters, loss aversion (λ), curvature of the value function (σ), and average risk aversion (q). The lack of significance also holds when the dependent variable is the change in parameter, rather than the square root of the change.

1.5 Financial Gain/Loss Manipulation

1.5.1 Methods

A total of 235 subjects participated in this manipulation. Sixteen subjects were excluded from the analysis due to answering zero to one or more of the financial questions. Unrecoverable software problems led to the abandonment of two experimental sessions during the manipulation phase, resulting in 49 subjects' responses not being recorded. The responses for the remaining 170 subjects are analyzed.

Subjects were seated in the laboratory in the order in which they arrived. After completing the initial questionnaire, they played a game in which they were asked to guess the movements of the stock market. The instructions are included in Appendix A.3. In brief, the subjects were shown ten daily price movements of the S&P Composite starting at a random date from 1950-2008 and then had to guess whether the movement on the eleventh day was up or down. Those guessing correctly gained a dollar and those guessing incorrectly lost a dollar compared to their original stake. The game

ended for each subject after 27 turns or when their total gains or losses reached five dollars, whichever occurred first. Of the 170 subjects analyzed, 45 ended on +5 dollars ("Winners"), 46 on -5 dollars ("Losers") and 79 between the two ("Midders").

1.5.2 Results

The game was designed to mirror the intensity of actually investing in the stock market, with participants assigning their successes and failures to both luck and skill. This is supported by responses to the feedback form at the end of the experiment. For example, "I learned that I am terrible at estimating if a stock will go up or down" (Loser); "I feel that its (sic) pretty random" (Winner); "The game was exciting" (Midder); "Pretty intense" (Winner); "Very exhilarating" (Midder); "Intense!" (Midder). The emotional responses of the participants was significantly determined by their performance, with Winners increasing positive affect, Midders reducing positive affect, and Losers both increasing negative affect and reducing positive affect (Table 12).

While the manipulation had a large impact on emotions, it had little impact on financial preferences. This is demonstrated in Table 13, with no significance being achieved for any of the financial preference parameters. The contrast with the status manipulation impact on intertemporal preferences is particularly stark–the slope estimate for the β parameter is -0.010 (t-stat = -0.43) in the financial manipulation compared to 0.056 (t-stat = 2.99) for the status manipulation with equal pay (Table 7).

1.6 Conclusions

In this chapter I have demonstrated that status roles impact financial preferences. In particular, taking a subordinate versus dominant role in a status interaction results in increased focus on immediate rewards–people's intertemporal inconsistency increases in Laibson's (1997) quasi-hyperbolic discounting framework. The change in preference holds more strongly for decisions over short-term payoffs and is not significantly affected by the magnitude of the decision. The sensitivity to social status is greatest among those who initially have a greater intertemporal inconsistency. Men and women respond similarly, with no significant difference in their response to the status manipulation.

Including differential financial rewards undermines the main effect when those rewards are viewed as unfair. It is unclear whether this would continue to be the case if the differential rewards were viewed as fair. In a separate financial manipulation, small financial gains and losses did not prompt changes in preferences. Both these manipulations with differential pay rewards led to significant differences in emotional responses

between the high- and low-payment groups.

The research findings have broad implications for the regulation of financial products. While the time-consistency of high-status consumers argues for greater financial freedom and choices, the time-inconsistency of low-status consumers argues for the restriction of financial freedom and choices. This tension between high- and low-status groups must be explicitly addressed in the regulatory system.

1.7 Appendix: Experimental Materials

1.7.1 Initial Questionnaire

Q1. What is your subject ID? (it is marked on your desk)

Q2. What year are you in at university? (1=freshman; 4=senior)

Q3. What is your cumulative GPA (approximately)?

Q4. What do you expect your major to be?

Q5. How tall are you?

Q6. What sex are you?

Q7. On average, how many hours per week do you spend working for pay?

Q8. Does your father or mother have a college degree?

Q9. How many close friends do you have?

Q10. On average, how many hours per week do you spend volunteering?

Q11. On average, how many parties per week are you invited to?

Q12. Do you have a regular girlfriend / boyfriend? (Yes/No)

Q13. In rating each of the items below, please use the following scale:

In my relationships with others... (1=Disagree Strongly; 5=Neither Agree nor Disagree; 9=Agree Strongly)

- I can get people to listen to what I say
- My wishes do not carry much weight
- I can get others to do what I want
- Even if I voice them, my views have little sway
- I think I have a great deal of power
- My ideas and opinions are often ignored
- Even when I try, I am not able to get my way
- If I want to, I get to make the decisions

Q14. Compared to other undergraduates on campus, how busy would you say you are? (1=Not busy; 5=Average; 9=Extremely busy)

Q15. People vary in their sense of time. How fast does time go by for you? (1=Time seems to drag; 5=Average; 9=Time seems to fly by)

Q16. All in all, how would you describe your state of health these days? (1=Very poor; 5=Average; 9=Very good)

Q17. Do you smoke? (Yes/No)

Q18. Are you currently suffering from a cold? (Yes/No)

Q19. How hungry are you at the moment? (1=I'm feeling full/ I just ate; 5=Normal; 9=I'm hungry/ I'm about to eat)

Q20. How tired are you at the moment? (1=Not at all; 5=Normal; 9=Very tired)

Q21. On average over the past month, how much time per day have you spent outside? Approximate time per day (1=0 - 15 mins; 2=15 - 30 mins; 3=30 - 60 mins; 4=1 - 2 hours; 5=2 - 3 hours; 6=3 -4 hours; 7=4 -6 hours; 8=6 - 8 hours; 9=8 - 10 hours; 10=10+ hours)

Q22. All things considered, how satisfied are you with your life as a whole these days? (1=Dissatisfied; 5=Neither satisfied nor dissatisfied; 9=Satisfied)

Q23. How would you rate your general feeling of well-being at the moment? (1=Poor; 5=Average; 9=Good)

Q24. Please indicate to what extent you feel the following at the moment: (1=Not at all; 5=Moderately; 9=Extremely)

Angry; Proud; Sad; Positive; Afraid; Happy; Guilty; Alert; Contented; Down; Confident; Irritable; Attentive; Ashamed; Joyful; Nervous

Q25. You have won a CERTAIN-or-50/50 Prize in a lottery organized by your bank. The bank will either pay you a smaller amount with certainty or give you a 50% chance of winning a larger amount (and a 50% chance of winning nothing). The 50/50 outcome is decided by the flip of a coin, where you may be present.

Consider the following 50/50 amounts. For each, you must decide on the CERTAIN amount that would make you indifferent between receiving the CERTAIN amount and the 50/50 amount.

(If the CERTAIN amount is too high, you would rather receive that. If it is too low, you would rather receive the 50/50 amount. You will be indifferent somewhere between the two.)

(Note there is no "correct" answer - the question is merely asking about your preference.)

- 50% chance of $92 and 50% chance of $0 vs. $ Certain:
- 50% chance of $7,400 and 50% chance of $0 vs. $ Certain:
- 50% chance of $1,140 and 50% chance of $0 vs. $ Certain:

Q26. Your bank offers to sell you a 50/50 Raffle Ticket. The 50/50 Raffle gives you a 50% chance of winning a fixed amount of money (and a 50% chance of winning nothing). The outcome is decided by the flip of a coin, where you may be present. In either case you lose the amount you paid for the Ticket.

Consider the following 50/50 Raffles. For each, you must decide on the Ticket price that would make you indifferent between buying the Ticket and not.

(If the Ticket price is too low, you would definitely buy it. If it is too high, you would not. You will be indifferent somewhere between the two.)

(Note there is no "correct" answer - the question is merely asking about your preference.)

- Payment to enter Raffle with 50% chance of $740 and 50% chance of $0:
- Payment to enter Raffle with 50% chance of $5,200 and 50% chance of $0:
- Payment to enter Raffle with 50% chance of $142 and 50% chance of $0:

Q27. You have won a NOW-or-LATER Prize in a lottery organized by your bank. The bank will either pay you a smaller amount NOW or a larger amount LATER (assume there is no risk of the payment not happening).

Consider the following LATER amounts and dates. For each, you must decide on the NOW amount that would make you indifferent between receiving the NOW amount and the LATER amount.

(If the NOW amount is too high, you would rather receive that. If it is too low, you would rather receive the LATER amount. You will be indifferent somewhere between the two.)

(Note there is no "correct" answer - the question is merely asking about your preference.)

- $4,400 in 2 months vs. $ Now:
- $2,500 in 2 years vs. $ Now:
- $1,900 in 1 week vs. $ Now:
- $240 in 1 week vs. $ Now:
- $300 in 2 years vs. $ Now:
- $27 in 1 week vs. $ Now:
- $48 in 2 years vs. $ Now:
- $80 in 2 months vs. $ Now:
- $730 in 2 months vs. $ Now:

1.7.2   Status Manipulation

Worker (Unequal Pay)

CONGRATULATIONS! You have been assigned to the role of WORKER in your group. You are expected to help the other group member, the SUPERVISOR, in a decision-making task. The task involves making a series of decisions concerning the social responsibility of organizations. While all decisions are the responsibility of the SUPERVISOR, you should have an important contribution by giving the SUPERVISOR a second opinion and generally acting in a supporting role.

Due to your lesser input to the task, your pay for the experiment will be $15. The SUPERVISOR will earn $25 in recognition of his/her greater responsibilities. In addition, your group may receive a performance bonus of $80, with $30 going to you and $50 to the SUPERVISOR.

When you are finished reading these instructions, please turn the sheet over and display it prominently at your workspace so the experimenter can see your role. Then read the instructions for the social responsibility task. The SUPERVISOR will write down the answers to the questions on that task.

(On reverse, in large font:) WORKER PAY=$15

Supervisor (Unequal Pay)

CONGRATULATIONS! You have been assigned to the role of SUPERVISOR in your group. You are responsible for the performance of your group in a decision-making task. The task involves making a series of decisions concerning the social responsibility of organizations. The other group member, the WORKER, is expected to help you and provide a second opinion, but all decisions are your responsibility.

Due to your greater input to the task, your pay for the experiment will be $25. The WORKER will earn $15 in recognition of his/her lesser responsibilities. In addition, your group may receive a performance bonus of $80, with $50 going to you and $30 to the WORKER.

When you are finished reading these instructions, please turn the sheet over and display it prominently at your workspace so the experimenter can see your role. Then read the instructions for the social responsibility task. As the SUPERVISOR, you will write down the answers to the questions on that task.

(On reverse, in large font:) SUPERVISOR PAY=$25

Worker (Equal Pay)

CONGRATULATIONS! You have been assigned to the role of WORKER in your group. You are expected to help the other group member, the SUPERVISOR, in a

decision-making task. The task involves making a series of decisions concerning the social responsibility of organizations. While all decisions are the responsibility of the SUPERVISOR, you should have an important contribution by giving the SUPERVISOR a second opinion and generally acting in a supporting role.

The pay for each group member has been set at $15 for the experiment. In addition, your group may receive a performance bonus of $80, to be split equally.

When you are finished reading these instructions, please turn the sheet over and display it prominently at your workspace so the experimenter can see your role. Then read the instructions for the social responsibility task. The SUPERVISOR will write down the answers to the questions on that task.

(On reverse, in large font:) WORKER

Supervisor (Equal Pay)

CONGRATULATIONS! You have been assigned to the role of SUPERVISOR in your group. You are responsible for the performance of your group in a decision-making task. The task involves making a series of decisions concerning the social responsibility of organizations. The other group member, the WORKER, is expected to help you and provide a second opinion, but all decisions are your responsibility.

The pay for each group member has been set at $15 for the experiment. In addition, your group may receive a performance bonus of $80, to be split equally.

When you are finished reading these instructions, please turn the sheet over and display it prominently at your workspace so the experimenter can see your role. Then read the instructions for the social responsibility task. As the SUPERVISOR, you will write down the answers to the questions on that task.

(On reverse, in large font:) SUPERVISOR

Task Description

SOCIAL RESPONSIBILITY TASK

Please write both of your subject numbers and roles below:

Subject ID (on your desk):   Subject ID (on your desk):

Role: Role:

TASK INSTRUCTIONS

Organizations vary in their level of social responsibility. They go to different lengths to protect the interests of local communities, the environment, their employees, their suppliers and customers, and the disadvantaged members of society.

Ratings of social responsibility can be based either on objective criteria or on the public's perception of the organization. Surveys are one method of eliciting the public's perception of social responsibility, and those surveys may be completed in a group setting.

Your task is to rate organizations on their social responsibility. You will be given descriptions of fictitious organizations that you will rate on a scale of 1-9, where 9 denotes an organization that is extremely socially responsible.

As a reward for performance, the group that has the best answers will be given a bonus payment of $80. The "best answers" are defined as those closest to the average of all the groups completing the exercise. Hence, one strategy is to rate each organization based on your expectation of the average response for all the groups.

Please discuss the answers quietly in your group. No communication with other groups is allowed. To prevent cheating, each group has a different set of questions, with organizations shown in a different order and assigned different letters.

Write your rating for each organization immediately below the description of the organization.

You will have approximately 2 minutes to rate each organization. The experimenter will let you know when there are 5 minutes and 1 minute remaining on the task. At the completion of the task, you must stop writing and hand back the questions and answers.

Please wait to turn over the page until the experimenter tells you to.

1.7.3   Financial Gain/Loss Manipulation

Initial Instructions:

You will play a Prediction Game. You will be shown 10 historical daily percentage price movements of the stock market and then you must predict whether the next day's movement is up or down. If you are correct in your Prediction, then your number of Credits will increase by 10, and if you are incorrect then your number of Credits will reduce by 10.

You will start with 0 Credits and the game will end when you reach +50 or -50 Credits. If you have not reached +50 or -50 Credits after 27 Predictions, then the game will end at that point.

Your pay for the experiment will be $15 plus or minus one tenth your ending number of Credits. Hence if you end with +50 Credits you will earn $20 and if you end with -50 Credits you will earn $10.

You will have several seconds to consider each set of price movements before your Prediction is requested, and another few seconds before your Prediction is required.

Please answer quickly if a red flashing prompt appears in the top right corner.

Prediction Input Screen:

For these historical daily price movements of the stock market, please enter your prediction of whether the next day's movement was up or down

10 days ago:

9 days ago:

8 days ago:

7 days ago:

6 days ago:

5 days ago:

4 days ago:

3 days ago:

2 days ago:

1 day ago:

Please enter your prediction (1 = Up; 0 = Down)

(Footnote:) Current Number of Credits:

Prediction Result Screen:

CORRECT! / WRONG!

Previous number of Credits:

Winnings for Period:

Current number of Credits:

Waiting Screen:

Current status of all subjects:
Finished on +50
Finished on -50
Still playing

Ending Screen:

Your ending number of credits is:
Your pay for the experiment is:
Current status of all subjects:
Finished on +50
Finished on -50
Still playing

1.7.4 Ending Questionnaire

Q1. On the decision-making task, who made the greatest contribution? (1=Definitely Me; 5=Both Equally; 9=Definitely the Other Person)

Q2. How assertive were you on the task? (1=Very Unassertive; 5=Average Assertiveness; 9=Very Assertive)

Q3. How assertive was the other group member on the task? (1=Very Unasser-tive; 5=Average Assertiveness; 9=Very Assertive)

Q4. Who would you say had more social status on the task? (1=Definitely Me; 5=Both Equally; 9=Definitely the Other Person)

Q5. How fair do you consider the relative payments received for the task? (1=Unfair, I deserve More; 5=Fair; 9=Unfair, I deserve Less)

Q6. How hungry are you at the moment? (1=I'm feeling full/ I just ate; 5=Normal; 9=I'm hungry/ I'm about to eat)

Q7. How tired are you at the moment? (1=Not at all; 5=Normal; 9=Very tired)

Q8. How would you rate your general feeling of well-being at the moment? (1=Poor; 5=Average; 9=Good)

Q9. Please indicate to what extent you feel the following at the moment: (1=Not at all; 5=Moderately; 9=Extremely)

Angry; Proud; Sad; Positive; Afraid; Happy; Guilty; Alert; Contented; Down; Confident; Irritable; Attentive; Ashamed; Joyful; Nervous

Q10. You have won a CERTAIN-or-50/50 Prize in a lottery organized by your bank. The bank will either pay you a smaller amount with certainty or give you a 50% chance of winning a larger amount (and a 50% chance of winning nothing). The 50/50 outcome is decided by the flip of a coin, where you may be present.

Consider the following 50/50 amounts. For each, you must decide on the CERTAIN amount that would make you indifferent between receiving the CERTAIN amount and the 50/50 amount.

(If the CERTAIN amount is too high, you would rather receive that. If it is too low, you would rather receive the 50/50 amount. You will be indifferent somewhere between the two.)

(Note there is no "correct" answer - the question is merely asking about your preference.)

- 50% chance of $68 and 50% chance of $0 vs. $ Certain:
- 50% chance of $6,200 and 50% chance of $0 vs. $ Certain:
- 50% chance of $1,460 and 50% chance of $0 vs. $ Certain:

Q11. Your bank offers to sell you a 50/50 Raffle Ticket. The 50/50 Raffle gives you a 50% chance of winning a fixed amount of money (and a 50% chance of winning nothing). The outcome is decided by the flip of a coin, where you may be present. In either case you lose the amount you paid for the Ticket.

Consider the following 50/50 Raffles. For each, you must decide on the Ticket price that would make you indifferent between buying the Ticket and not.

(If the Ticket price is too low, you would definitely buy it. If it is too high, you would not. You will be indifferent somewhere between the two.)

(Note there is no "correct" answer - the question is merely asking about your preference.)

- Payment to enter Raffle with 50% chance of $560 and 50% chance of $0:
- Payment to enter Raffle with 50% chance of $6,800 and 50% chance of $0:
- Payment to enter Raffle with 50% chance of $122 and 50% chance of $0:

Q12. You have won a NOW-or-LATER Prize in a lottery organized by your bank. The bank will either pay you a smaller amount NOW or a larger amount LATER (assume there is no risk of the payment not happening).

Consider the following LATER amounts and dates. For each, you must decide on the NOW amount that would make you indifferent between receiving the NOW amount and the LATER amount.

(If the NOW amount is too high, you would rather receive that. If it is too low, you would rather receive the LATER amount. You will be indifferent somewhere between the two.)

(Note there is no "correct" answer - the question is merely asking about your preference.)

- $530 in 2 months vs. $ Now:
- $36 in 2 years vs. $ Now:
- $2,200 in 2 years vs. $ Now:
- $170 in 1 week vs. $ Now:
- $88 in 2 months vs. $ Now:
- $23 in 1 week vs. $ Now:
- $4,300 in 2 months vs. $ Now:
- $340 in 2 years vs. $ Now:
- $1,800 in 1 week vs. $ Now:

Q13. Please use this opportunity to provide any feedback you have about the questions and the running of the experiment

Bibliography

[1] Ågren, Hans. et al.,1986, Interacting neurotransmitter systems: A non-experimental approach to the 5HIAA–HVA correlation in human CSF, *Journal of Psychiatric Research* 20(3), 175-193

[2] Anderson, Cameron & Jennifer L. Berdahl, 2002, The experience of power: Examining the effects of power on approach and inhibition tendencies, *Journal of Personality and Social Psychology* 83, 1362-1377

[3] Anderson, Cameron & Adam D. Galinsky, 2006, Power, optimism, and risk-taking, *European Journal of Social Psychology* 36, 511-536

[4] Barkow, Jerome H., 1989, *Darwin, Sex and Status: Biological Approaches to Mind and Culture*, Toronto: University of Toronto Press

[5] Barnes, Nicholas M. & Trevor Sharp, 1999, A review of central 5-HT receptors and their function, *Neuropharmacology* 38, 1083-1152

[6] Becker, Robert A., 1980, On the long-run steady state in a simple dynamic model of equilibrium with heterogeneous households, *Quarterly Journal of Economics* 95, 375-382

[7] Becker, Gary S. & Casy B. Mulligan, 1997, The endogenous determination of time preference, *Quarterly Journal of Economics* 112, 729-758

[8] Brown, Alexander L., Zhikang Eric Chua & Colin F. Camerer, 2009, Learning and visceral temptation in dynamic saving experiments, *Quarterly Journal of Economics*, 124, 197-231

[9] Camerer, Colin F. & Robin M. Hogarth, 1999, The effects of financial incentives in experiments: A review and capital-labor-production framework, *Journal of Risk and Uncertainty* 19, 7-42

[10] Campbell, John Y., 2006, Household finance, *Journal of Finance* 61, 1553-1604

[11] Cardinal, Rudolf N., 2006, Neural systems implicated in delayed and probabilistic reinforcement, *Neural Networks* 19, 1277-1301

[12] Chabris, Christopher F. et al., 2008, Individual laboratory-measured discount rates predict field behavior, *Journal of Risk and Uncertainty* 37, 237-269

[13] Cosmides, Leda & John Tooby, 1987, From evolution to behavior: Evolutionary psychology as the missing link, in *The latest and the Best: Essays on Evolution and Optimality*, ed. J. Dupre, 277-306. Cambridge: MIT Press

[14] DellaVigna, Stefano & Ulrike Malmendier, 2004, Contract design and self-control: Theory and evidence, *Quarterly Journal of Economics* 119, 353-402

[15] DellaVigna, Stefano & M. Daniele Paserman, 2005, Job search and impatience, *Journal of Labor Economics* 23, 527-588

[16] Duckworth, Angela L. & Martin E.P. Seligman, 2005, Self-discipline outdoes IQ in predicting academic performance in adolescents, *Psychological Science* 16, 939-944

[17] Dynan, Karen E., Jonathan Skinner & Stephen P. Zeldes, 2004, Do the rich save more? *Journal of Political Economy* 112, 397-444

[18] Eibl-Eibesfeldt, Irenaus, 1989, *Human Ethology*, New York: Aldine

[19] Fang, Hanming & Dan Silverman, 2007, Time-inconsistency and welfare program participation: Evidence from the NLSY, *NBER Working Paper Series* No. 13375

[20] Fischbacher, Urs, 2007, z-Tree: Zurich Toolbox for Ready-made Economic Experiments, *Experimental Economics* 10(2), 171-178

[21] Fisher, Irving, 1930, *The Theory of Interest*, New York: Macmillan

[22] Frederick, Shane, George Loewenstein & Ted O'Donoghue, 2002, Time discounting and time preference: A critical review, *Journal of Economic Literature* 40, 351-401

[23] Glaeser, Edward L., David I. Laibson, José A. Scheinkman & Christine L. Soutter, 2000, Measuring trust, *Quarterly Journal of Economics* 115, 811-846

[24] Hall, Judith A., Jason D. Carter & Terrence G. Horgan, 2001, Status roles and recall of nonverbal cues, *Journal of Nonverbal Behavior* 25, 79-100

[25] Hariri, Ahmad R., et al., 2006, Preference for immediate over delayed rewards is associated with magnitude of ventral striatal activity, *Journal of Neuroscience* 26, 13213-13217

[26] Harrison, Glenn W., Morten I. Lau & Melonie B. Williams, 2002, Estimating individual discount rates in Denmark: A field experiment, *American Economic Review* 92, 1606-1617

[27] Higley, J.D., et al., 1996, Stability of interindividual differences in serotonin function and its relationship to severe aggression and competent social behavior in rhesus macaque females, *Neuropsychopharmacology* 14, 67-76

[28] Howitt, Alfred W., 1904, *The Native Tribes of South-East Australia*, London: Macmillan and Co.

[29] Hurst, Erik, Kerwin K. Charles & Nikolai Roussanov, 2009, Conspicuous consumption and race, *Quarterly Journal of Economics* 124, 425-467

[30] Johnson, Matthew W. & Warren K. Bickel, 2002, Within-subject comparison of real and hypothetical money rewards in delay discounting, *Journal of the Experimental Analysis of Behavior* 77, 129-146

[31] Kirby, Kris N., Nancy M. Petry & Warren K. Bickel, 1999, Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls, *Journal of Experimental Psychology* 128, 78-87

[32] Laibson, David, 1997, Golden eggs and hyperbolic discounting, *Quarterly Journal of Economics* 112, 443-477

[33] Laibson, David, Andrea Repetto & Jeremy Tobacman, 2007, Estimating discount functions with consumption choices over the lifecycle, *NBER Working Paper* No. 13314

[34] Lawrance, Emily C., 1991, Poverty and the rate of time preference: Evidence from panel data, *Journal of Political Economy* 99, 54-77

[35] Madden, Gregory J. et al., 2004, Delay discounting of potentially real and hypothetical rewards: II. Between- and within-subject comparisons, *Experimental and Clinical Psychopharmacology* 12, 251-261

[36] Manuck, Stephen B., Janine Flory, Matthew Muldoon & Robert E. Ferrell, 2003, A neurobiology of intertemporal choice, in *Time and decision: Economic and psychological perspectives on intertemporal choice*, eds. G. F. Loewenstein, D. Read and R. Baumeister, 139-172. New York: Russell Sage

[37] Manuck, Stephen B. et al., 2005, The socio-economic status of communities predicts variation in brain serotonergic responsivity, *Psychological Medicine* 35, 519-528

[38] Matthews, Karen A., Janine D. Flory, Matthew F. Muldoon & Stephen B. Manuck, 2000, Does socioeconomic status relate to central serotonergic responsivity in healthy adults? *Psychosomatic Medicine* 62, 231-237

[39] McClure, Samuel M., David I. Laibson, George Loewenstein & Jonathan D. Cohen, 2004, Separate neural systems value immediate and delayed monetary rewards, *Science* 306, 503-507

[40] McClure, Samuel M., et al., 2007, Time discounting for primary rewards, *Journal of Neuroscience* 27, 5796-5804

[41] Mischel, Walter, 1996, From good intentions to willpower, in *The Psychology of Action: Linking Cognition and Motivation to Behavior*, eds. P.M. Gollwitzer and J.A. Bargh, 197-218. New York: Guilford Press

[42] Paaver, Marika, et al., 2007, Platelet MAO activity and the 5-HTT gene promoter polymorphism are associated with impulsivity and cognitive style in visual information processing, *Psychopharmacology* 194, 545-554

[43] Percoco, Marco, & Peter Nijkamp, 2009, Estimating individual rates of discount: A meta-analysis, *Applied Economics Letters* 16, 1235-1239

[44] Ramsey, Frank P., 1928, A mathematical theory of saving, *The Economic Journal* 38, 543-559

[45] Reynolds, Brady, 2006, A review of delay-discounting research with humans: relations to drug use and gambling, *Behavioural Pharmacology* 17, 651-667

[46] Shui, Haiyan & Lawrence M. Ausubel, 2004, Time inconsistency in the credit card market, *14th Annual Utah Winter Finance Conference*. Available online at http://ssrn.com/abstract=586622

[47] Snodgrass, Sara E., 1992, Further effects of role versus gender on interpersonal sensitivity, *Journal of Personality and Social Psychology* 62, 154–158

[48] Tanaka, Tomomi, Colin F. Camerer & Quang Nguyen, 2009, Risk and time preferences, Experimental and household survey data from Vietnam, *American Economic Review*, Forthcoming

[49] Thaler, Richard, 1981, Some empirical evidence on dynamic inconsistency, *Economics Letters* 8, 201-207

[50] Tversky, Amos & Daniel Kahneman, 1992, Advances in prospect theory: Cumulative representation of uncertainty, *Journal of Risk and Uncertainty* 5, 297-323

[51] Walderhaug, Espen, 2002,Lowering of serotonin by rapid tryptophan depletion increases impulsiveness in normal individuals, *Psychopharmacology* 164, 385-391

[52] Warner, John T. & Saul Pleeter, 2001, The personal discount rate: Evidence from military downsizing programs, *American Economic Review* 91, 33-53

[53] Watson, David & Lee Anna Clark, 1994, The PANAS-X: Manual for the positive and negative affect schedule - Expanded form, *University of Iowa Working Paper*

[54] Watson, David, Lee Anna Clark & Auke Tellegen, 1988, Development and validation of brief measures of positive and negative affect: The PANAS Scales, *Journal of Personality and Social Psychology* 54, 1063-1070

[55] Webster, Murray, 2003, Working on status puzzles, in *Advances in Group Processes 20*, eds. S.R. Thye & J. Skvoretz, 173-215. Oxford: Elsevier Ltd.

[56] Wiessner, Pauline, 1996, Leveling the hunter: Constraints on the status quest in foraging societies, in *Food and the Status Quest*, eds. P. Wiessner and W. Schiefenhövel, 171-91. Providence: Berghahn

[57] White, Jennifer L., et al., 1994, Measuring impulsivity and examining its relationship to delinquency, *Journal of Abnormal Psychology* 103, 192-205

[58] Wilkinson, Richard, 2005, *The Impact of Inequality: How to Make Sick Societies Healthier*, New York: The New Press

[59] Wojciszke, Bogdan & Anna Struzynska-Kujalowicz, 2007, Power influences self-esteem, *Social Cognition* 25, 472-494

[60] Young, Simon N. & Marco Leyton, 2002, The role of serotonin in human mood and social interaction: Insight from altered tryptophan levels, *Pharmacology, Biochemistry and Behavior* 71, 857–865

Table 1.1: Intertemporal Preference Estimates

This table presents summary statistics for subjects' discount rates, r, and intertemporal incon-sistency, β, based on responses to Q27 in the Initial Questionnaire. ($n = 363$). The following regression was estimated for each subject:

$$\ln\left[PV_i\left(x_{jt}\right)/x_{jt}\right] = -r_i t + \ln\left[\beta_i\right] + \varepsilon_{ijt}$$

	r_i	$\ln\left[\beta_i\right]$	β_i
Mean	0.174	-0.274	0.826
Median	0.121	-0.098	0.907
StDev	0.302	0.541	0.222
Skew	2.768	-4.400	-1.786
Kurtosis	23.91	25.277	2.698

Table 1.2: Risk Preference Estimates

This table presents summary statistics for subjects' loss aversion, λ, curvature of the value function, σ, and average risk aversion, q, based on responses to Q25 and Q26 in the Initial Questionnaire. The following regression was estimated for each subject:

$$\ln\left[CE_i\left(px_j\right)/px_j\right] = -\lambda_i 1(\text{raffle}) + q_i + \sigma_i\left[\ln\left(px_j\right) - 6.072\right] + \varepsilon_{ij}$$

Where $1(\text{raffle})$ is an indicator function taking a value of 1 for the raffle, Q26, and 0 for the lottery, Q25. The risk aversion term, q_i, is recentered to be the risk aversion over the average (in log terms) expected payout by deducting 6.072 from the expected payment amounts on the right hand side. ($n = 363$).

	λ_i	σ_i	q_i
Mean	1.907	-0.201	-0.270
Median	1.880	-0.161	-0.006
StDev	1.605	0.219	0.920
Skew	0.377	-1.636	-2.330
Kurtosis	-0.575	3.465	6.745

Table 1.3: Correlation Coefficients Between Surveyed Variables and Intertemporal Preferences

This table presents correlation coefficients between the surveyed variables and the discount rate, r, and intertemporal inconsistency, β. 2-tailed significance levels: *=10%; **=1%; ***=0.1%. ($n = 363$).

	Variable mean	r_i	β_i
Year at University	2.96	0.021	0.083
Cumulative GPA	3.41	-0.022	0.218***
Height (m)	1.68	0.004	0.077
Male Height (m)	1.76	-0.022	0.110*
Female? (1=Yes)	0.57	-0.121*	0.055
Ln (1+hours per week working for pay)	1.14	0.125*	0.037
Father or mother with degree? (1=Yes)	0.76	-0.012	0.050
Ln (1+ no of close friends)	1.98	0.042	-0.024
Ln (1+ hours per week volunteering)	0.79	-0.020	-0.103*
Ln (1+ parties per week)	0.76	0.012	-0.145**
Regular girlfriend/boyfriend? (1=Yes)	0.45	0.058	0.007
Sense of power score	1.49	-0.070	-0.060
How busy are you? (9=Extremely)	6.11	-0.047	0.023
How fast does time go? (9=Time flies)	6.81	-0.091*	-0.065
State of health? (9=Very good)	6.50	-0.048	-0.013
Do you smoke? (1=Yes)	0.09	0.050	-0.144**
Do you have a cold? (1=Yes)	0.11	0.003	0.006
How hungry are you? (9=Hungry)	4.91	-0.039	0.044
Time outside (9=Lots)	5.17	-0.061	-0.123*
Life Satisfaction (9=Satisfied)	6.41	0.031	-0.010
Well-Being (9=Good)	6.46	0.013	-0.003
Angry + Irritable	4.99	-0.030	-0.070
Proud + Contented	9.36	0.054	0.026
Sad + Down	5.55	0.026	-0.043
Positive + Confident	11.45	0.007	-0.023
Afraid + Nervous	5.50	-0.013	-0.136**
Happy + Joyful	10.46	0.018	-0.004
Guilty + Ashamed	3.77	0.022	0.054
Alert + Attentive	10.42	0.063	-0.097*

Table 1.4: Correlation Coefficients Between Surveyed Variables and Risk Preferences

This table presents correlation coefficients between the surveyed variables and the loss aversion, λ, curvature of the value function, σ, and average risk aversion, q. 2-tailed significance levels: *=10%; **=1%; ***=0.1% ($n = 363$).

	Variable mean	λ	σ	q
Year at University	2.96	-0.049	-0.047	-0.043
Cumulative GPA	3.41	-0.029	-0.008	-0.001
Height (m)	1.68	-0.086	0.066	-0.005
Male Height (m)	1.76	0.036	0.082	0.051
Female? (1=Yes)	0.57	0.246**	-0.153**	0.011
Ln (1+hours per week working for pay)	1.14	-0.002	-0.106*	-0.111*
Father or mother with degree? (1=Yes)	0.76	0.010	-0.090*	-0.082
Ln (1+ no of close friends)	1.98	0.005	-0.081	-0.062
Ln (1+ hours per week volunteering)	0.79	0.069	-0.066	-0.040
Ln (1+ parties per week)	0.76	0.017	-0.153**	-0.076
Regular girlfriend/boyfriend? (1=Yes)	0.45	0.036	-0.092*	-0.045
Sense of power score	1.49	0.096*	-0.095*	-0.014
How busy are you? (9=Extremely)	6.11	0.050	-0.012	-0.012
How fast does time go? (9=Time flies)	6.81	0.051	-0.087*	-0.045
State of health? (9=Very good)	6.50	0.003	-0.069	-0.060
Do you smoke? (1=Yes)	0.09	0.076	-0.088*	-0.040
Do you have a cold? (1=Yes)	0.11	-0.056	-0.005	-0.004
How hungry are you? (9=Hungry)	4.91	-0.064	-0.060	-0.083
Time outside (9=Lots)	5.17	-0.005	-0.087*	-0.060
Life Satisfaction (9=Satisfied)	6.41	0.000	-0.058	-0.024
Well-Being (9=Good)	6.46	0.041	-0.081	-0.070
Angry + Irritable	4.99	-0.028	0.077	0.036
Proud + Contented	9.36	0.036	-0.065	-0.007
Sad + Down	5.55	-0.001	-0.001	-0.034
Positive + Confident	11.45	0.033	-0.117*	-0.035
Afraid + Nervous	5.50	0.070	0.002	0.071
Happy + Joyful	10.46	0.081	-0.111*	-0.001
Guilty + Ashamed	3.77	-0.092*	0.003	-0.017
Alert + Attentive	10.42	0.065	-0.067	0.024

Table 1.5: Preference Change Moments

This table presents summary statistics for the change in subjects' preferences from before the manipulation to afterwards. $\sqrt{v_2 - v_1}$ is an abbreviation for $abs\left(v_2 - v_1\right)^{0.5} * sign\left(v_2 - v_1\right)$. $(n = 314)$.

	Panel A: Intertemporal Preference Moments			
	$r_2 - r_1$	$\beta_2 - \beta_1$	$\sqrt{r_2 - r_1}$	$\sqrt{\beta_2 - \beta_1}$
Mean	-0.012	-0.004	-0.016	-0.011
StDev	0.224	0.116	0.357	0.257
Skew	-2.421	0.145	-0.161	0.053
Kurtosis	22.18	11.49	0.10	0.07

	Panel B: Risk Preference Moments					
	$\lambda_2 - \lambda_1$	$\sigma_2 - \sigma_1$	$q_2 - q_1$	$\sqrt{\lambda_2 - \lambda_1}$	$\sqrt{\sigma_2 - \sigma_1}$	$\sqrt{q_2 - q_1}$
Mean	-0.140	0.021	0.075	-0.107	0.038	0.049
StDev	1.021	0.152	0.551	0.792	0.314	0.539
Skew	-0.328	1.439	2.654	0.028	0.090	0.493
Kurtosis	6.53	7.08	13.71	-0.38	-0.71	0.48

Table 1.6: Emotional Response to Status Manipulation

This table presents the mean change in measured emotional responses from before the status manipulation to afterwards for the High Status Group and the Low Status Group. In the Unequal Pay treatment, the High Status Group was paid $10 more than the Low Status Group. 2-tailed significance levels based on Student's t-test: *=10%; **=1%; ***=0.1%.

Treatment:	Equal Pay (n=111)			Unequal Pay (n=33)		
Group:	Supervisor	Worker	Diff.	Supervisor	Worker	Diff.
Well-Being	-0.41*	0.00	-0.41	0.19	-1.88*	2.07*
Angry + Irritable	-1.30***	-1.09**	-0.21	-1.50*	1.71	-3.21**
Proud + Contented	0.04	-0.20	0.24	0.38	-1.71*	2.08*
Sad + Down	-1.50***	-1.89***	0.39	-2.81**	-0.47	-2.34
Positive + Confident	-0.55*	0.00	-0.55	-0.81	-1.76*	0.95
Afraid + Nervous	-0.95*	-1.62**	0.67	-1.94*	-1.06*	-0.88
Happy + Joyful	-0.30	-0.24	-0.07	0.94	-2.29**	3.23**
Guilty + Ashamed	-0.70***	-0.53*	-0.17	2.00*	-0.94	2.94**
Alert + Attentive	-0.16	-0.11	-0.05	0.50	-0.06	0.56
Positive Affect Score	-0.98	-0.55	-0.44	1.00	-5.82*	6.82*
Negative Affect Score	-4.45***	-5.13***	0.68	-4.25**	-0.76	-3.49

Table 1.7: Intertemporal Preference Response to Status Manipulation

This table presents the mean change in discount rate, r, and intertemporal inconsistency, β, from before the status manipulation to afterwards for the High Status Group and the Low Status Group. $\sqrt{v_2 - v_1}$ is an abbreviation for $abs\left(v_2 - v_1\right)^{0.5} * sign\left(v_2 - v_1\right)$. In the Unequal Pay treatment, the High Status Group was paid \$10 more than the Low Status Group. Status is coded as High $= +\frac{1}{2}$, Low $= -\frac{1}{2}$. 2-tailed significance levels based on unadjusted standard errors: *=10%; **=1%; ***=0.1%. The difference estimates are based on the following regression:

$$v_{i2} - v_{i1} = Difference_v * Status_i + const_v + \varepsilon_{iv}$$

Dependent Variable:	$r_2 - r_1$	$\beta_2 - \beta_1$	$\sqrt{r_2 - r_1}$	$\sqrt{\beta_2 - \beta_1}$
Panel A: Status Game (Unequal Pay) (n=33)				
High Status	0.011	0.001	0.040	-0.010
Low Status	-0.038	-0.016	-0.092	-0.073
Difference (H-L)	0.049	0.017	0.132	0.063
(t-stat)	(1.36)	(0.98)	(1.39)	(0.97)
Unadjusted R^2	5.65%	3.00%	5.88%	2.92%
Panel B: Status Game (Equal Pay) (n=111)				
High Status	0.025	0.020	0.030	0.036
Low Status	-0.068	-0.047	-0.031	-0.096
Difference (H-L)	0.093	0.067**	0.061	0.132**
(t-stat)	(1.61)	(2.85)	(0.79)	(2.60)
Unadjusted R^2	2.33%	6.95%	0.57%	5.85%
Panel C: Status Game Combined (n=144)				
High Status	0.022	0.016	0.032	0.026
Low Status	-0.061	-0.040	-0.045	-0.091
Difference (H-L)	0.083*	0.056**	0.077	0.116**
(t-stat)	(1.84)	(2.99)	(1.23)	(2.79)
Unadjusted R^2	2.32%	5.91%	1.05%	5.19%

Table 1.8: Change in Discount Factors by Time and Size

This table presents the mean change in responses to the intertemporal preferences questions for different time periods and payment amounts for both the High Status and Low Status Groups. For each question we take the individual's stated preference, $PV(x_t)/x_t$, then average over the relevant time period or payment amount, both before the status manipulation and afterwards. In the unequal pay treatment, the High Status Group was paid \$10 more than the Low Status Group. Status is coded as High = $+\frac{1}{2}$, Low = $-\frac{1}{2}$. 2-tailed significance levels based on unadjusted standard errors: *=10%; **=1%; ***=0.1%. The difference estimates are based on the following regression:

$$v_{i2} - v_{i1} = Difference_v * Status_i + const_v + \varepsilon_{iv}$$

Discount Factors	By Time Period			1 Wk+	1Wk + 2Mo by Pmt Size		
	1 Wk	2 Mo	2 Yr	2 Mo	Small	Med.	Large
Mean DF	0.839	0.804	0.640	0.822	0.774	0.846	0.845
Median DF	0.918	0.873	0.671	0.888	0.819	0.935	0.941
Panel A. Dep Var: Change in DF (Unequal Pay, n=33)							
High Status	-0.008	0.007	0.000	0.000	0.038	-0.058	0.019
Low Status	-0.004	-0.023	0.042	-0.013	-0.031	-0.032	0.023
Difference (H-L)	-0.004	0.030	-0.042	0.013	0.069*	-0.026	-0.003
(t-stat)	(-0.24)	(1.45)	(-1.33)	(0.81)	(2.13)	(-1.18)	(-0.18)
Unadjusted R^2	0.19%	6.34%	5.41%	2.08%	12.74%	4.26%	0.11%
Panel B. Dep Var: Change in DF (Equal Pay, n=111)							
High Status	0.010	0.026	0.020	0.018	0.025	0.002	0.026
Low Status	-0.049	-0.030	-0.018	-0.039	-0.039	-0.062	-0.017
Difference (H-L)	0.059*	0.056*	0.037	0.057**	0.064*	0.064*	0.043*
(t-stat)	(2.32)	(2.31)	(1.39)	(2.68)	(2.28)	(2.29)	(1.64)
Unadjusted R^2	4.69%	4.66%	1.75%	6.19%	4.55%	4.60%	2.41%
Panel C. Dep Var: Change in DF (Combined, n=144)							
High Status	0.006	0.021	0.015	0.014	0.028	-0.011	0.025
Low Status	-0.038	-0.028	-0.004	-0.033	-0.037	-0.055	-0.008
Difference (H-L)	0.044*	0.050**	0.019	0.047**	0.065**	0.044*	0.032*
(t-stat)	(2.21)	(2.61)	(0.85)	(2.79)	(2.85)	(1.95)	(1.55)
Unadjusted R^2	3.32%	4.56%	0.51%	5.19%	5.41%	2.61%	1.67%

Table 1.9: Initial Beta, Sex, and Pay Interactions with Status Manipulation

This table investigates (i) whether the initial level of beta determines the magnitude of the subject's beta response to the status manipulation; (ii) whether there is a significant sex interaction; and (iii) whether there is a significant difference between the Equal and Unequal Pay Treatments. In Panel A, the change in Beta, $(\beta_{2i} - \beta_{1i})$ is the dependent variable, while in Panel B, $abs\,(\beta_{2i} - \beta_{1i})^{0.5} * sign\,(\beta_{2i} - \beta_{1i})$ is the dependent variable. Status is coded as High $= +\frac{1}{2}$, Low $= -\frac{1}{2}$; Sex is coded as Female $= +\frac{1}{2}$, Male $= -\frac{1}{2}$; Uneq is coded as Unequal Pay Treatment $= 1$, Equal Pay Treatment $= 0$; Initial Beta is β_{1i}. The Controls are the independent variables from Table 3, except that Sex is excluded, and the emotion terms are grouped into separate Positive Affect and Negative Affect Scores. T-stats are shown in parentheses; bootstrap standard errors use 1,000 replications; and 2-tailed significance levels are: *=10%; **=1%; ***=0.1%.

Specification:	I	II	III	IV	V	VI
Panel A. Dep Var: Change in Beta (n=144)						
Status	0.056**		-0.015	-0.013	-0.015	-0.018
	(2.95)		(-1.63)	(-0.59)	(-1.19)	(-1.34)
Initial Beta (β_1)			-0.073*	-0.088	-0.077	-0.063
			(-1.79)	(-1.59)	(-1.24)	(-1.29)
Status * 1-β_1		0.353***	0.362***	0.375***	0.361***	0.404***
		(3.54)	(5.71)	(4.71)	(4.28)	(7.06)
Sex * Status * 1-β_1					0.155	
					(0.49)	
Sex					0.008	
					(0.33)	
Sex * Status					-0.050	
					(-1.74)	
Sex * 1-β_1					-0.075	
					(-0.45)	
Uneq * Stat * 1-β_1						-0.480***
						(-8.12)
Uneq * Status						0.046***
						(3.29)
Uneq * 1-β_1						-0.105*
						(-1.80)
Constant	-0.012	-0.020*	0.039	0.104	0.810	0.034
	(-1.33)	(-2.44)	(1.13)	(0.47)	(0.42)	(0.77)
Unadjusted R^2	5.91%	19.14%	24.45%	37.13%	25.53%	25.93%
Standard Errors	Btstrap	Btstrap	Btstrap	Btstrap	Btstrap	Btstrap
Session Dummies	No	No	Yes	Yes	Yes	Yes
Cluster by Session	No	No	Yes	Yes	Yes	Yes
Controls	No	No	No	Yes	No	No

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Table 1.9 Continued

Specification:	I	II	III	IV	V	VI
Panel B. Dep Var: Sqrt Change in Beta (n=144)						
Status	0.116**		-0.035	-0.023	-0.033	-0.052
	(2.79)		(-0.92)	(-0.34)	(-0.77)	(-1.18)
Initial Beta (β_1)			-0.102	-0.120	-0.097	-0.095
			(-1.85)	(-0.94)	(-1.31)	(-1.55)
Status * 1-β_1		0.728***	0.798***	0.790***	0.775***	0.889***
		(4.72)	(7.84)	(5.08)	(6.32)	(10.73)
Sex * Status * 1-β_1					0.359	
					(0.60)	
Sex					0.006	
					(0.10)	
Sex * Status					-0.079	
					(-0.77)	
Sex * 1-β_1					-0.048	
					(-0.17)	
Uneq * Stat * 1-β_1						-1.200***
						(-9.42)
Uneq * Status						0.163*
						(2.57)
Uneq * 1-β_1						-0.378***
						(-5.85)
Constant	-0.033	-0.049*	0.033	0.258	0.028	0.037
	(-1.56)	(-2.55)	(0.73)	(0.85)	(0.46)	(0.71)
Unadjusted R^2	5.19%	16.51%	21.47%	30.93%	22.00%	23.33%
Standard Errors	Robust	Robust	Robust	Robust	Robust	Robust
Session Dummies	No	No	Yes	Yes	Yes	Yes
Cluster by Session	No	No	Yes	Yes	Yes	Yes
Controls	No	No	No	Yes	No	No

Table 1.10: Predicted Value of Beta from Status Manipulation

This table presents predicted values for beta as a result of the status manipulation. The predictions are based on the Mean Beta and Median Beta from Table 1 with the effect of the status manipulation from Table 9 (Specification II, Panel A).

	Mean Beta	Median Beta
Initial Beta	0.826	0.907
Predicted Beta for High Status	0.836	0.903
(% Increase in $(1-\beta)$)	(6.0%)	(-4.3%)
Predicted Beta for Low Status	0.775	0.870
(% Increase in $(1-\beta)$)	(-29.3%)	(-39.5%)

Table 1.11: Risk Preference Response to Status Manipulation

This table presents the change in loss aversion, λ, curvature of the value function, σ, and average risk aversion, q, from before the status manipulation to afterwards for the High Status Group and the Low Status Group. $\sqrt{v_2 - v_1}$ is an abbreviation for $abs\left(v_2 - v_1\right)^{0.5} * sign\left(v_2 - v_1\right)$. In the Unequal Pay Treatment, the High Status Group was paid \$10 more than the Low Status Group. Status is coded as High $= +\frac{1}{2}$, Low $= -\frac{1}{2}$. 2-tailed significance levels based on unadjusted standard errors: *=10%; **=1%; ***=0.1%. The difference estimates are based on the following regression:

$$v_{i2} - v_{i1} = Diff_v * Status_i + const_v + \varepsilon_{iv}$$

Dep. Var:	$\lambda_2 - \lambda_1$	$\sigma_2 - \sigma_1$	$q_2 - q_1$	$\sqrt{\lambda_2 - \lambda_1}$	$\sqrt{\sigma_2 - \sigma_1}$	$\sqrt{q_2 - q_1}$
Panel A: Status Game (Unequal Pay) (n=33)						
High Status	-0.105	0.052	0.264	-0.025	0.085	0.181
Low Status	0.445	0.036	0.277	0.313	0.067	0.204
Diff. (H-L)	-0.551	0.016	-0.013	-0.339	0.019	-0.023
(t-stat)	(-1.39)	(0.21)	(-0.05)	(-1.15)	(0.15)	(-0.11)
Unadj R^2	5.89%	0.15%	0.01%	4.11%	0.07%	0.04%
Panel B: Status Game (Equal Pay) (n=111)						
High Status	-0.241	-0.005	-0.016	-0.188	-0.033	-0.057
Low Status	-0.015	0.012	-0.002	-0.067	0.052	0.003
Diff. (H-L)	-0.226	-0.017	-0.014	-0.120	-0.084	-0.060
(t-stat)	(-1.19)	(-0.71)	(-0.16)	(-0.80)	(-1.52)	(-0.59)
Unadj R^2	1.27%	0.46%	0.02%	0.59%	2.06%	0.32%
Panel C: Status Game Combined (n=144)						
High Status	-0.211	0.008	0.046	-0.151	-0.007	-0.004
Low Status	0.093	0.018	0.064	0.022	0.055	0.051
Diff. (H-L)	-0.304*	-0.010	-0.018	-0.174	-0.062	-0.055
(t-stat)	(-1.76)	(-0.39)	(-0.18)	(-1.30)	(-1.20)	(-0.59)
Unadj R^2	2.14%	0.11%	0.02%	1.17%	1.00%	0.24%

Table 1.12: Emotional Response to Financial Gain/Loss Manipulation

This table presents the change in emotional responses from before the financial gain/loss manipulation to afterwards for the High Status Group and the Low Status Group. 2-tailed significance levels based on unadjusted standard errors: *=10%; **=1%; ***=0.1% ($n = 170$). The slope estimates are based on the following regression:

$$v_{i2} - v_{i1} = Slope_v * (wins_i - losses_i)/10 + const_v + \varepsilon_{iv}$$

	Winner	Midder	Loser	Slope	(Slope t-stat)
Well-Being	0.62	-1.27***	-2.31***	2.93***	(6.69)
Angry + Irritable	0.36	2.29***	2.84***	-2.70***	(-3.29)
Proud + Contented	3.20***	-1.27*	-2.44***	5.68***	(8.43)
Sad + Down	-1.47*	0.93	3.60***	-5.08***	(-6.33)
Positive + Confident	1.04	-2.02***	-2.93***	4.21***	(6.92)
Afraid + Nervous	-0.87*	-1.12**	-0.29	-0.81	(-1.40)
Happy + Joyful	1.89***	-1.95***	-2.49***	4.45***	(7.34)
Guilty + Ashamed	-0.49	0.22	1.33**	-1.76**	(-3.09)
Alert + Attentive	0.73	-0.56	-1.33**	2.03***	(3.49)
Positive Affect Score	6.87***	-5.80***	-9.20***	16.37***	(8.68)
Negative Affect Score	-2.47	2.32*	7.49***	-10.35***	(-5.41)

Table 1.13: Preference Response to Financial Gain/Loss Manipulation

This table presents the change in discount rate, r, intertemporal inconsistency, β, loss aversion, λ, curvature of the value function, σ, and average risk aversion, q, from before the financial gain/loss manipulation to afterwards for the Winner, Midder, and Loser Groups. $\sqrt{v_2 - v_1}$ is an abbreviation for $abs\,(v_2 - v_1)^{0.5} * sign\,(v_2 - v_1)$. 2-tailed significance levels based on unadjusted standard errors: *=10%; **=1%; ***=0.1% ($n = 170$). The slope estimates are based on the following regression:

$$v_{i2} - v_{i1} = Slope_v * (wins_i - losses_i)/10 + const_v + \varepsilon_{iv}$$

Panel A: Time Preference Parameters				
Dep Var:	$r_2 - r_1$	$\beta_2 - \beta_1$	$\sqrt{r_2 - r_1}$	$\sqrt{\beta_2 - \beta_1}$
Winner	-0.001	0.011	-0.033	0.026
Midder	0.003	-0.015	0.006	-0.027
Loser	-0.024	0.026	-0.070	0.048
Slope	0.024	-0.010	0.029	-0.017
(t-stat)	(0.69)	(-0.43)	(0.43)	(-0.33)
Unadj. R^2	0.28%	0.11%	0.11%	0.06%

Panel B: Risk Preference Parameters						
Dep Var:	$\lambda_2 - \lambda_1$	$\sigma_2 - \sigma_1$	$q_2 - q_1$	$\sqrt{\lambda_2 - \lambda_1}$	$\sqrt{\sigma_2 - \sigma_1}$	$\sqrt{q_2 - q_1}$
Winner	-0.200	0.045	0.199	-0.187	0.096	0.128
Midder	-0.266	0.001	-0.023	-0.180	-0.006	-0.027
Loser	-0.122	0.061	0.182	-0.039	0.102	0.180
Slope	-0.062	-0.010	-0.008	-0.137	0.015	-0.062
(t-stat)	(-0.32)	(-0.34)	(-0.08)	(-0.89)	(0.24)	(-0.60)
Unadj. R^2	0.06%	0.07%	0.00%	0.47%	0.03%	0.21%

Chapter 2

Social Incentives and Human Evolution

Key Words: Evolutionary anthropology; social status; altruism; intelligence, language evolution

2.1   Introduction

Many traits that are uniquely exaggerated in humans, including intelligence, altruism, and language, are the subject of lively academic debate concerning their evolutionary origins (e.g., Deacon 1997; Sober and Wilson 1998; Miller 2000; Geary 2004; Greenspan and Shanker 2004; Lieberman 2006). The debate is noteworthy since these same traits have played a major role in our evolution as a species. As Darwin (1874:49) argues:

> Man in the rudest state in which he now exists is the most dominant animal that has ever appeared on this earth... He manifestly owes this immense superiority to his intellectual faculties, to his social habits, which lead him to aid and defend his fellows, and to his corporeal structure... Through his powers of intellect, articulate language has been evolved; and on this his wonderful advancement has mainly depended.

Meanwhile, considerable evidence has accumulated that many of these traits are the subject of social incentives that groups apply to individuals. These incentives are diverse, including: gossip, teasing, criticism, shaming, ridicule, ostracism, supernatural punishment, sorcery (being the victim or being accused of the use of sorcery), and physical violence (Berndt and Berndt 1988:340-345; Keltner et al. 2001; Wiessner 2005; Boehm 2007). While the evolutionary implications of direct incentives have been considered previously (e.g. Boyd and Richerson 1992; Bingham 1999; Boehm 2007), I propose an indirect and potentially far more powerful incentive: social status. By demonstrating that social status is used by the group to reward prosocial traits and that social status has fitness implications, I describe an evolutionary force that has targeted such traits as intelligence, creativity, knowledge, language ability, singing ability, norm-following, heroism, and altruism towards one's group.[1]

Social status has been discussed in the context of human evolution previously, although not as a defined evolutionary force. With altruism and morality, it has long been noted that status, prestige and esteem can act as a motivation. For example, Darwin (1874:135-7) argues a "powerful stimulus to the development of the social virtues, is afforded by the praise and the blame of our fellow-men... The self-regarding virtues... come to be highly esteemed." More recently, Goode (1979) explores how prestige acts as a social control system, Alexander (1987) finds a desire for reputation may motivate altruism, Pettit (1990) and McAdams (1997) argue that some norms may be enforced by

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[1]These are likely to be adaptive traits for later hominids. For a discussion of the adaptive traits of early hominids, see Lovejoy (2009).

the awarding or withholding of esteem, and Willer (2006) and Whitmeyer (2007) demonstrate that prestige can solve the collective goods problem. With language evolution, Dessalles (1998) argues that people provide honest information in return for status. In contrast, Burling (1986, 2005) notes that linguistic ability is an asset for those seeking leadership positions in human groups and, since leaders have more offspring, linguistic ability is positively selected for. These accounts provide the seeds from which to grow a social status theory of human evolution and uniqueness.

2.2   What is Social Status?

The first problem is the lack of a common definition of social status, partly reflecting the varying histories of different disciplines. Within vertebrate ethology, the status hierarchy was first described by Schjelderup-Ebbe (1922) by analyzing the pecking order of chickens, with those higher up pecking those lower down and having preferential access to scarce resources. Such a definition based purely on aggressive interactions was found to be less relevant to nonhuman primates, and especially to apes, leading Chance (1967; Chance and Jolly 1970) to propose a determination based on attention structures, with those higher up being the focus of attention more often. This method has been applied to status hierarchies in children (reviewed in Hold-Cavell 1996). Within sociology, the small groups literature highlights three diagnostic tools, since those higher up talk more, are evaluated more positively by others, and are more influential within the group (reviewed in Ridgeway 1983). In contrast, political economy views status in terms of social stratification, which Weber (1968 [1922]) subcategorizes into wealth, power, and prestige. Wiessner (1996a) notes that many strongly egalitarian societies only allow the prestige form, which may be based on Linton's (1936) ascribed characteristics (like age and gender) or achieved characteristics (like accomplishments or friendship networks). Within sociobiology, Barkow (1989) distinguishes dominance, prestige, status and power, while Mazur (2005) distinguishes dominance, official, and socioeconomic hierarchies.

While all of these researchers have made major contributions to their fields, we require a functional definition that can be applied across species, cultures, and age-groups without reverting to arbitrary distinctions. Accordingly, I define social status to be *a power and influence hierarchy of the members of a group with accompanying dominance and submissive behaviors*. Applying this definition, it is clear that status is ubiquitous in human societies, including hunter-gatherer groups considered the most egalitarian (Wiessner 1996b). Even societies that are established to prevent the formation of status hierarchies, like the kibbutzim formed by Jews living in Israel, fail in this central goal (Rosenfeld 1951). Status hierarchies develop early in childhood and have even been

documented among a group of 11-16 month-old infants in daycare (Russon and Waite 1991). We seem to be programmed to expect and accept status hierarchies, and this goes a long way back in our evolutionary past with many dominance and submissive behaviors retained from the nonhuman primates (Mazur 1973; Barkow 1989). Indeed, since status hierarchies have been described in fish (Mazur 2005), it could be argued that our acceptance of status hierarchies is more innate than our breathing the air.

Among chimpanzees, status is dependent not solely on size and strength but also requires guile, bravado, and political cunning (Goodall 1986; de Waal 1998). The alpha male, in particular, performs services for the group, like keeping order, and receives support and respect in return (de Waal 1998). But that support is not limitless, with the group being quite able to put the alpha male to flight and using the waa vocalization to demonstrate their hostile resistance to authority (de Waal 1996; Boehm 1999). While the status hierarchy is essentially linear and transitive, it is also situation specific—the relative status of two individuals may vary according to the presence of a third individual, for example (Goodall 1988:121). In common with other primates, status and reproductive success are positively correlated, although the relationship is stronger for males than females (Ellis 1995; Pusey, Williams, and Goodall 1997).

Among adult humans, the status hierarchy is more subtle. Given our definition of status, there are two basic methods of discerning the hierarchy in a society: (i) Measure the levels of power and influence, most simply by asking members of the society—responses based on "status," "influence," "respect," and "prominence" are very closely correlated and have very high levels of inter-informant reliability (Anderson, John, Keltner, and Kring 2001; Flynn 2003); and (ii) Observe dominance and submissive behaviors in face-to-face interactions. The first method has the advantage that it can be applied relatively easily to large groups, allowing the determinants of status within a society to be investigated. Four studies have surveyed established adult populations to find the determinants of individual, as opposed to occupational, status levels.

In the first study, Faunce and Smucker (1966) surveyed inhabitants of a peasant village in Guatemala, a factory town in Costa Rica, and a rural village in Michigan. To determine the status hierarchy, informants were asked to place cards with the names of household heads on a ten-step ladder according to the target's standing or prestige in the community. The factors correlated with the resulting status measure were, in rough descending order of importance: income; occupational prestige; popularity (mentioned as a friend); age; involvement in community organizations; and education. The reasons informants gave (as opposed to the factor correlations) for the status placements were: personal qualities (almost half of all responses); occupational prestige; activity in community affairs; age; income; and education. The personal qualities mentioned included

friendliness, honesty, dependability, morality, and other similar attributes.

The second study, Flynn (2003), was conducted among a pool of 161 professional engineers at the headquarters of a large American telecommunications firm. Informants rated target employees according to respect, value, and influence, with a status measure calculated as the average of these. Regressing status on ten independent variables (including gender, race, tenure, hierarchical level, education, and performance goal level) obtained an R^2 statistic of 26%, with only hierarchical level and performance goal level statistically significant at the 5% level. Including four variables based on the frequency and imbalance of favor exchange increased the R^2 statistic to 63%. This is consistent with the observation of Blau (1963) that helping others within the workplace can increase social status.

The third study, Price (2003), was conducted among Shuar hunter-horticulturalists in an Ecuadorian Amazon village. Regressing the male villagers' status, based on who was the most respected in the village, on altruism, based on who did more to help the community, obtained an R^2 statistic of 75%. Other variables tested were only significant to the extent they influenced altruism. The fourth study, von Rueden, Gurven, and Kaplan (2008), was similarly conducted among male Amazonian hunter-horticulturalists, the Tsimane in Bolivia. The level of status, as measured by respect, was significantly correlated with the following measures, in descending order of importance: community influence, social support, food production, prosocial personality, likelihood of winning dyadic fights, likelihood of getting his way in the group, and physical size.

It is clear that status assignment in human groups has progressed from the primate dependence on physical dominance, although a vestige remains in some societies, particularly those without the freedom of exit, like prison societies (Janos 1990). Instead, the routes to status in human societies are highly diverse (Eibl-Eibesfeldt 1989). We may control scarce resources and use this to gain power and influence over others (Emerson 1962). We may have formal authority or belong to a prestigious group. We may display status cues (Berger, Webster, Ridgeway, and Rosenholtz 1986) of our high status level, including the conspicuous consumption of positional goods (Veblen 1934 [1899]; Hirsch 1976). But of most relevance is the display of prosocial traits, with societies awarding status for traits that benefit the group (Eibl-Eibesfeldt 1996; Wiessner 1996a,b).

There are many prosocial traits that groups reward with status. From the above studies, I highlight education, community involvement, age, helping others, and altruism towards one's group. For foraging societies, Wiessner (1996b:174) finds "knowledge, ritual expertise, abilities in planning and organization, mediation, hunting skill, generosity, defense and interaction with outsiders." A brief review of the Australian Aboriginal literature (including Howitt 1904; Parker 1905; Warner 1937; Elkin 1964 [1938]; Berndt

and Berndt 1988 [1964]; Hiatt 1996; Lourandos 1997; and Mulvaney and Kamminga 1999) further indicates: intelligence; creativity; language and multilingual ability; singing and dancing ability; heroism; physical coordination, strength, stamina, and fighting ability; signs of genetic fitness; skill with supernatural forces and ritual proficiency; and skill with curative medicines. In a modern setting, I can add personality traits (Anderson et al. 2001) and norm-following, although the latter is somewhat contradictory as I discuss later.

2.3   Status as a Social Incentive

For status to act as a social incentive and an evolutionary force, it is necessary to demonstrate social benefits, and ultimately survival and reproductive benefits, arising from status. These benefits need not be manifested in a modern setting, although applying the evolutionary psychology paradigm (Cosmides and Tooby 1987; Barkow 1989; Barkow, Cosmides, and Tooby 1992) would imply current psychological adaptations to the status structures of our hunter-gatherer ancestors. One such psychological adaptation is the desire for, and enjoyment of, status that is exhibited by humans. This status motivation appears less extreme than that exhibited by male chimpanzees (e.g., de Waal 1998), presumably indicating the inclusive fitness reward to status was less extreme for our hunter-gatherer ancestors. Yet this status motivation may be the strongest evidence for the existence of reproductive benefits—if there were no such benefits, then a reduced status desire would have been selected for among our ancestors in order to save the individual effort devoted towards status. In support of this is some evidence of a genetic basis to status motivation (Manuck et al. 2004).

In demonstrating the benefits of status, I consider two types of evidence: (i) that status has a proximate benefit in social interactions; and (ii) that status has an ultimate fitness benefit, presumably as a result of those social interactions. Due to changes in the modern social environment, including contraception, abundant food, and low mortality rates, the evidence for the second of these is likely to be weak in a modern setting, suggesting we should look to pre-industrial societies. In contrast, assuming the evolutionary psychology paradigm holds, we should expect psychological adaptations to preserve the benefits of status in social interactions, suggesting modern and pre-industrial societies should both provide good evidence. This is the pattern I find.

2.3.1   Proximate Benefits of Status

To demonstrate a benefit in social interactions, I first consider dyadic interactions. Various economic experiments are relevant. Bickman (1971) tested subjects' honesty in returning an experimenter's dime that had been left in a phone booth, and found the subjects were honest 77% of the time with a high status experimenter, but only 38% of the time with a low status experimenter. Glaeser et al. (2000) conducted a trust game with American undergraduates and found the recipients were more trustworthy, returning a greater proportion of the money entrusted with them, when their counterpart was of higher status, as measured by such variables as family income, parental education, popularity, or time spent volunteering. Ball et al. (2001) ran an experimental market in which the status of either the buyers or sellers was manipulated through the award of gold stars at an award ceremony. Irrespective of whether the stars were awarded randomly or through a faux economics test, the group wearing the stars performed significantly better—as sellers, for example, their profits increased by 46%, and this was due to the behavior of both groups. Other experiments that demonstrate similar results include Solomon and Herman (1977), Pandey (1979), and Goodman and Gareis (1993). Overall, it appears we behave more favorably towards people with high status, whether that status is real (e.g., Pandey 1979; Glaeser et al. 2000) or the result of simple manipulation (e.g., Bickman 1971; Goodman and Gareis 1993; Ball et al. 2001).

The second element of social interactions to consider is increased social influence, which has been most thoroughly investigated in the small groups literature of sociology. Starting in the 1940s, social interaction in jury-type groups was analyzed, with relatively homogenous groups first considered, and then heterogeneous groups from the 1950s (reviewed in Webster 2003). In all these groups, social hierarchy develops, with those higher up talking more, being addressed more, being chosen as leaders, being more persuasive, and being evaluated more positively. In heterogeneous groups the individual's status characteristics in the wider social context, including age, sex, occupation, and race, is strongly predictive of social influence (Berger, Cohen, and Zelditch 1966, 1972), implying status processes at the societal and interpersonal levels are homologous. An extension of this research highlights that social influence and differential rewards can lead to status characteristics becoming positive or negative (Ridgeway 1991, 2000; Webster and Hysom 1998), and this may generate a positive-feedback process with disadvantaged groups having low social influence and being negatively evaluated, leading to further disadvantage. In this context, recent research among actual juries is somewhat encouraging—while early research with mock juries suggested women and ethnic minorities lacked social influence (e.g. Strodtbeck, James and Hawkins 1957), it now appears that socioeconomic status (or social class) is much more important and that sex and ethnicity have only a weak

impact on social influence (York and Cornwell 2006).

A third social benefit comes from the making and breaking of social norms. Various "naturalistic" experiments demonstrate that higher status individuals have a greater flexibility to break norms. For example, when one car blocks another at an intersection, the following car is less likely to honk its horn if the blocking car is high status or the blocked car is low status (Doob and Gross 1968; Diekmann et al 1996). When subjects witness a petty theft, they are less likely to intervene if the thief is dressed to appear high status (Guéguen 2003). Within the American criminal justice system, there appears to be a bias according to status. As Reiman (2003:104) states, "*For the same criminal behavior*, the poor are more likely to be arrested; if arrested, they are more likely to be charged; if charged, more likely to be convicted; if convicted, more likely to be sentenced to prison; and if sentenced, more likely to be given longer prison terms than members of the middle and upper classes." This bias has been confirmed in a meta-analysis of mock jury decisions (Mazzella and Feingold 1994).

Another perspective on group norms highlights that peripheral or new members are under the greatest pressure to conform in order to gain acceptance into the group (e.g. Hughes 1946:517; Dittes and Kelley 1956; Blau 1960). This can result in an inverted U-shape of conformity, since those who are outside the group are unlikely to conform, peripheral members conform strongly, and secure members have leeway over their conformity (Homans 1961; Phillips and Zuckerman 2001). But this does not always hold. For example, appointed leaders generally conform more strongly to the group's norms (e.g. Schrag 1954), suggesting they act as exemplars of normative behavior (Stein 1982). If so, there may be some norms that the leader must embody, but with a secure position the leader may modify other norms on behalf of the group (Homans 1950, 1961). This process of norm formation is illustrated by another naturalistic experiment, in which pedestrians were monitored at a crosswalk with a red traffic light (Guéguen and Pichot 2001). Without prompting, 15.6% of pedestrians crossed, but with a confederate crossing first the proportion was 9.3%, 17.9%, or 54.5%, depending on whether the confederate was dressed to appear as low, middle, or high status. It seems we are more likely to follow high status people.

2.3.2 Ultimate Benefits of Status

We can now consider the ultimate fitness benefits of status. Three benefits are considered—food, safety, and reproductive success—with the focus on pre-industrial societies as mentioned earlier.

Among group-living animals, access to food generally follows the status hierarchy.

But with humans, this does not necessarily hold. In a forager setting, the meat of large animals is widely shared with the best hunters contributing the most but generally receiving only a standard share in return (Wiessner 1996b; Gurven 2004). In these egalitarian societies, strong rules ensure an equitable distribution of food (Woodburn 1982), at least in normal times. It is less clear what happens during times of generalized nutritional stress, like famines. One aspect of living so close to nature is the high risk of sickness and injury, and here it seems that high status provides a benefit with greater aid received from others, at least in a hunter-horticulturalist setting (Gurven et al. 2000; Sugiyama and Sugiyama 2003).

The connection between safety and status is more uncertain. While the high status individuals are at a reduced risk of punishment by the group, they may also be expected to perform risky services for the group. For example, among the Yąnomamö hunter-horticulturalists, the village headman is expected to investigate any signs of enemy raiding near the village, a dangerous task leading to the death of many headmen (Chagnon 1997:136).

Enhanced reproductive success is the most obvious benefit to social status, at least for males in pre-industrial societies (Hill 1984; Betzig 1986; Barkow 1989). Among hunter-gatherers this arises for a variety of reasons, including high status males having: younger and more fertile mates; higher offspring survivorship; younger age at first child; and more mates (Smith 2004). But the benefit may not just be direct, and Wiessner (2002) suggests the primary status benefit for !Kung males is being able to control band composition and direct resources towards their kin, effectively creating an inclusive fitness benefit to status.

2.4   Prosocial Selection

So far in this chapter I have found that groups apply diverse social incentives towards their members, with those incentives having fitness implications. I have focused on status as perhaps the most important incentive, demonstrating it is awarded for prosocial traits and has reproductive and survival benefits. Accordingly, I have described an evolutionary force that I term *prosocial selection*. Some of the traits favored through prosocial selection include: intelligence, knowledge, norm-following, language ability, singing ability, heroism, and altruism towards one's group. Since these traits are uniquely exaggerated in humans compared to other primates, an evolutionary argument can be made that prosocial selection was the selective force responsible for their exaggeration. However, to develop this argument further I need to explore the social and psychological bases of prosocial selection—why do groups and individuals behave in accordance with, and im-

plement, prosocial selection? Through this discussion I can begin to illuminate the causes of prosocial selection being a transformative force in human, as opposed to chimpanzee or bonobo, evolution. I then investigate the prosocial behaviors resulting from prosocial selection in more detail, behaviors that I term *social altruism.*

2.4.1   Social Bases of Prosocial Selection

In considering the reasons that societies use status and other social incentives to reward prosocial traits, I utilize two complementary perspectives. The first stresses individual agency, with the groups establishing norms that are for the collective benefit of the majority. This is the "democracy" perspective. The second stresses competition between groups, both direct and indirect, with those groups having better incentive systems from a group fitness perspective flourishing before others. This is the "group selection" perspective.

Following the first perspective, democracy, we can enquire as to the type of status system a democratic group would create. Three preferences appear likely: (i) status differences are minimized, since the average person is in the middle of the status hierarchy; (ii) leaders are selected on the basis of their competence; and (iii) prosocial traits are rewarded. The three preferences conflict, suggesting the optimum chosen by groups will vary with circumstances. For example, during times of war, the leadership and motivational elements are more important, implying a stronger status hierarchy may be tolerated.

In most species, status hierarchies are determined through individual contests, but with some primates the group may intervene to favor one of the competing parties (e.g. Nadler 1976; Dunbar 1993; Nishida and Hosaka 1996; de Waal 1996), an effect that is common in humans (e.g. Ridgeway and Diekema 1989). Such intervention is an initial step in the group exercising power over the dominant individuals (Boehm 1999) and may have ultimately led to human egalitarian societies characterized by Boehm's (1993) *reverse dominance hierarchy*, with the group collectively dominating the highest status individuals. In considering the impediments to such group intervention in primate hierarchies, three factors are apparent. First is the free-rider problem, although being a member of a coalition on which the dominant depends may offset the costs of intervention. Second is the coordination problem, with a lack of intelligence and communication skills being compounded by group dispersal in the fission-fusion societies of chimpanzees and bonobos. Third is the politics problem, as highlighted by de Waal (1998), with factions forming that may undermine the collective good.

Would these impediments have impacted our ancestors differentially to other pri-

mates? The first and third appear common and are unlikely to differentiate. The second, the coordination problem, is a better candidate. Compared to other primates, humans are more intelligent and communicative, although the abilities of the other apes in this regard should not be underestimated (e.g. Inoue and Matsuzawa 2007). Our ancestors may also have travelled in more cohesive groups than the chimpanzees or bonobos, so making a "divide and conquer" strategy difficult for domineering individuals. The evidence for this is indirect, but persuasive. Unlike chimpanzees, the australopithecines appear to have been adapted to life in a mosaic savanna, lakeside, and riverine, rather than a densely forested, environment (Hunt 2006; Lee-Thorp and Sponheimer 2006; Sponheimer et al 2006). Indeed, the high level of sexual size dimorphism in *Australopithecus afarensis* (Johanson and White 1979; but see also Reno et al. 2003; Plavcan et al. 2005; Gordon, Green and Richmond 2008) is consistent with other savanna-living primates (Plavcan and van Schaik 1997). These environments are dangerous, causing chimpanzees to aggregate into larger parties when predators are a threat (Tutin, McGrew and Baldwin 1983). If *Australopithecus* did likewise, we may surmise they lived in fairly large and cohesive groups, analogous to those of baboons. With the intelligence and communication skills of an ape, and the group size and cohesiveness of baboons, our australopithecine ancestors could have started to shape the status hierarchy for the benefit of the majority, ultimately leading to the reverse dominance hierarchy of some egalitarian hunter-gatherers.

The second perspective on the use of social incentives to promote prosocial traits comes from group selection. Purely genetic models of group selection often require unrealistic assumptions (e.g., Maynard Smith 1964) and, besides, humans are typified by strong cultural and behavioral flexibility, so purely genetic models should be less applicable to us than to other species. An alternative is cultural group selection, with cultural traits varying between groups and being correlated with group fitness. Darwin viewed this as an important factor in human evolution, arguing, for example: "Natural selection arising from the competition of tribe with tribe... together with the inherited effects of habit, would, under favorable conditions, have sufficed to raise man to his present high position in the organic scale" (Darwin 1874:66). Much of the literature focuses on situations in which cultural group selection can counteract genetic selection at the individual level (e.g. Boyd and Richerson 1982, 1985; Soltis, Boyd, and Richerson 1995; Jablonka and Lamb 2005; Mace, Holden, and Shennan 2005). Since the group and individual levels are generating opposing incentives, we may consider these models to be incentive-incompatible.

An alternative is to focus on cultural group selection that is incentive-compatible, with the group and individual levels generating consistent incentives. This occurs with the selection of social incentive systems at the group level, since those incentive systems

contribute to the social environment to which the individual is adapted. Since the social incentive systems are a group property, a hybrid gene-culture analysis is required, even though there is no assumed conflict between the two levels of selection. As a hypothetical example, we can assume one tribe awards status for heroism while another punishes the cowardly. When they meet in battle, the expected outcome will be positively correlated with the relative fitness of the two systems, and so the fitter one is likely to spread. If that is the heroism reward system, then genes or cultural "memes" that encourage heroism in the individual will be favored.

The motivation for individuals to implement the social incentive systems is an important consideration, particularly whether a collective action problem is created. With the social status incentives there is unlikely to be a problem because status is a group property and the granting of status for prosocial traits is not the responsibility of an individual. Instead, the group need merely agree on norms as to the traits that will be rewarded. What is the cost to an individual when another is granted enhanced status? Well, the individual's own status is thereby reduced somewhat, implying the individual is likely to want some compensation in return. Since this applies to all those in the group other than the one gaining enhanced status, this latter individual is likely to be providing a benefit to the group. This is consistent with the democracy argument for prosocial selection. Can an individual contravene the group's status hierarchy and attempt to grant another less status? In general this is a norm breach—being disrespectful to others—and may be subject to social sanction, as well as retaliation by the affected individuals and their allies. In primate societies, showing a lack of respect can be a prelude to risky power struggles (De Waal 1998), a pattern likely repeated in human societies. Does the group have an incentive to renege and not grant the status expected for prosocial behaviors? Such behavior would reduce the incentive for future prosocial behaviors and weaken the group, so should be selected against.

With social incentives other than status, there is more likely to be a collective action problem. A positive incentive may well reduce another's endowment—a woman given in marriage to reward some man may have been previously betrothed, for example (Morgan 1980 [1852])—and a punishment requires a subset of individuals to act as punishers. This punishment may appear to be altruistic (e.g. Gintis 2000; Fehr and Gächter 2002), although in many situations the social punisher may be at little risk of retribution and may personally gain from increased group cohesion (e.g. Wiessner 2005). The group leadership may assume responsibility for punishment, since they have the most to gain from a well-ordered group and are at least risk of retribution. Furthermore, punishment may be made incentive-compatible by awarding status for punishers, or by establishing punishment as a norm with those who fail to punish being subject to punishment them-

selves (Maynard Smith 1999:203-4), although Wiessner (2005) finds little evidence for this among the !Kung.

In a modern economic setting, it is often beneficial for the group to become more formalized, taking on legal personification to facilitate contracting between the individual and the group. This formation of firms for economic enterprise alleviates the collective action problems arising from the use of incentives other than status—the wealth of the firm can be used for monetary payments to employees in a similar manner that status is granted collectively by the group.

2.4.2   Psychological Bases of Prosocial Selection

Some of the traits targeted by prosocial selection lead to changes in individual behaviors, most obviously with social altruism. We can enquire as to the mechanisms through which this behavioral change is effected. Four mechanisms are apparent: (i) genetic predisposition, with genes that influence behaviors having been favored through prosocial selection; (ii) behavioral conditioning, with individuals choosing behaviors semi-automatically due to prior reinforcement of similar behaviors, perhaps with the reinforcement resulting from observation of others' behaviors; (iii) awareness of the intrinsic incentives, with individuals realizing they receive an emotional "reward" for prosocial behaviors; and (iv) awareness of the social incentives, with individuals able to behave in ways that maximize their social return. These will be discussed in turn.

The processes through which genes impact human behavior is the subject of considerable academic debate (reviewed in Laland and Brown 2002). The leading school, evolutionary psychology, posits the existence of genetically encoded psychological adaptations to our ancestors' Pleistocene environment (Cosmides and Tooby 1987; Barkow 1989; Barkow, Cosmides, and Tooby 1992; Barrett, Dunbar, and Lycett 2002; see Buller 2005 for a critique). Since that environment was not just ecological but also social, we should expect adaptations to prosocial selection. These adaptations may be concerned with both the implementation of, and the individual responses to, prosocial selection. However the genetic bases of these adaptations are unclear.

Eibl-Eibesfeldt (1996) argues that parent-offspring behaviors act as pre-adaptations for the evolution of prosocial behaviors among adults, including food sharing, protective behaviors, etc. By providing food to others, for example, we recall the nutritional dependence of infants on their parents and thus create a status differential. This approach is promising and can incorporate other phenomena, for example viewing the empathy we feel towards others in our group as an extension of the empathy parents feel towards their children. Some evidence in this direction comes from the action of two closely related

peptides, vasopressin and oxytocin. Both peptides act as hormones in the peripheral circulation and as neuropeptides in the central nervous system, being widely expressed in the brains of both males and females (Lim and Young 2006). Vasopressin is related to paternal behavior in mammals, facilitating pair bonding and paternal care of offspring (this is controlled genetically: Young et al. 1999; Lim et al. 2004; Hammock and Young 2005, including pair bonding in human males: Walum et al. 2008); however there is also a connection with increased male aggression (reviewed in Caldwell et al. 2008), suggesting a mixed affect on prosocial behavior. Oxytocin shows similar effects in females, facilitating pair bonding, maternal care of offspring and defense against aggressive intruders (reviewed in Campbell 2008). Oxytocin is also related to general social behavior in both males and females, increasing sociability (Depue and Morrone-Strupinsky 2005), reducing social fear (Kirsch et al. 2005), and enhancing the perception of emotion in others (Domes et al. 2007). There is also evidence from the experimental economics trust game that plasma oxytocin levels are positively related to trustworthiness (individuals return a greater proportion of the money entrusted with them: Zak, Kurzban, and Matzner 2005) and that intranasal oxytocin administration increases trust (individuals entrust a greater amount with another: Kosfeld et al. 2005).

Many of the traits connected with the two neuropeptides, particularly oxytocin, are also traits likely to be targeted through prosocial selection. Hence we may surmise that genetic mutations connected with the synthesis, release, or reception of the neuropeptides will have been favored to the extent that beneficial prosocial behaviors resulted, from an inclusive fitness perspective. These mutations will have biased behaviors, for example reducing the risk of behaving in an untrustworthy manner when trustworthiness was an important trait due to prosocial selection. These neuropeptides, together with other neurotransmitters like serotonin, present one model of the genetic predisposition towards prosocial behaviors, a model that currently has the strongest genetic evidence.

The second mechanism through which behavioral change is effected is behavioral conditioning, which merely refers to behaviors that are followed semi-automatically, rather than classical Pavlovian conditioning (Medin, Ross, and Markman 2005). Many of these behaviors are socially transmitted and may spread through the group, creating cultural differences and cultural evolution that is Darwinian (Mesoudi, Whiten, and Laland 2004; Richerson and Boyd 2005). This cultural evolution impacts, and is impacted by, genetic evolution through multiple channels (Durham 1991). Various cultural transmission rules have been considered, including: follow one's parents (Cavali-Sforza and Feldman 1981); follow the majority of the group (Boyd and Richerson 1985); and follow the most successful individuals (Henrich and Gil-White 2001). These transmission rules can result in cultural group selection which overrides selection at the individual level, as I mentioned

earlier. However, this is not a required assumption of prosocial selection. Instead, I assume the individual's following of the behavior benefits the individual *on average*—there will be situations in which following the behavior would be positively harmful to the individual but, due to genetic constraints (including limited processing capacity and behavioral biases), the behavior still occurs. To reiterate, group level selection is consistent with individual level selection.

The third mechanism is an awareness of our intrinsic incentives. Damasio (1994) argues our emotions act as an intrinsic incentive mechanism, and those emotions may arise due to genetic and environmental influences. This is consistent with evidence that altruistic behavior leads to positive affect and emotional reward is a motivation for some altruistic behavior (Bierhoff 2002; Dovidio et al. 2006).

The fourth mechanism is an awareness of the social incentives, including the status implications, connected with a behavior. The significance of this mechanism is unclear, and many instances could be subsumed under the previous mechanisms. For example, a behavior may lead to status, which in turn leads to positive affect. The behavior becomes connected with positive affect and is repeated because the person is aware of that connection, rather than the connection to status. However, this is speculative and requires further investigation.

The above mechanisms should be viewed as complementary and mutually reinforcing. This is found in Ostrower's (1995) study of elite philanthropy, with philanthropists: (i) teaching their children and guiding their friends towards giving; (ii) reporting pleasure from giving and a fear of guilt from not giving as motivating factors; and (iii) desiring the status resulting from elite philanthropy. While genetics were beyond the scope of her study, she does lend support to the other mechanisms.

2.5   Social Altruism

As a result of prosocial selection, behaviors are exhibited that benefit the group at the apparent cost to the individual, when the social incentives are excluded. This behavior is termed *social altruism*. As per the above, social altruism may be displayed due to: genetic predisposition; behavioral conditioning; awareness of intrinsic incentives; and awareness of social incentives. Of these, the first three may lead to behaviors that are costly to the individual, even when the social incentives are included. For example, genes may be selected because they encourage us to behave social altruistically, which has a fitness benefit on average; but those genes are unlikely to perfectly distinguish instances that are fitness enhancing from those that are fitness detracting, and so both behaviors are likely to be exhibited. This is not, of course, to suggest the ability to

better distinguish between the behaviors would be socially desirable. Quite the opposite, in fact—the many instances when people behave altruistically at a personal cost is a wonder of human societies and may have been a necessary prerequisite for our evolution as a species.

While *altruism* has been mentioned repeatedly in this article, no attempt is made to present a formal definition. Both academic and vernacular usage varies widely, so a formal definition would inevitably alienate some group of readers without benefiting the main argument. Broad definitions of altruism include behaviors that are immediately costly but have positive expected future return (e.g., Trivers 1971), while narrow definitions only include behaviors with a net cost to the individual (e.g., Sober and Wilson 1998). Further debate concerns the roles of intrinsic incentives and incentives applied to genetic relatives in calculating costs and benefits. As should be clear from the above discussion, social altruism falls within a broad definition of altruism, since prosocial behaviors are exhibited which the group rewards through social incentives. Social altruism may also give rise to narrowly-defined altruism and the extent to which this occurs depends on the relative importance of the various psychological bases of prosocial selection.

2.5.1 Comparison with Existing Theories

To relate social altruism to the existing literature, it is helpful to separately consider three forms of social incentives that are applied: social status; other positive incentives (i.e., reciprocity with the group); and other negative incentives (i.e. punishments). Of these, the literature on social status is the least developed, if we distinguish reputation from status. This is despite the correlation between status and altruism having been demonstrated in a variety of disciplines, including anthropology (e.g., Wiessner 1996a,b), sociology (e.g., Ridgeway 1982), organizational behavior (e.g., Blau 1963, Flynn 2003), primatology (e.g., Moore 1984), economics (e.g., Fershtman and Weiss 1998; Harbaugh 1998), developmental psychology (e.g., Ginsburg and Miller 1981), and social psychology (e.g., Hardy and Van Vugt 2006; Willer 2006). This correlation between altruism and status may be the reason that academics receive high status in society despite the relative low wages. Our twin roles of contributing to the body of world knowledge and teaching the future generations could both be regarded as altruistic. Also within academia, status is granted to those who make the greatest knowledge contribution, measured in terms of publications, and the resulting status competition often leads to an excessive workload, despite the theoretical disincentive of tenure.

Before discussing similarities and differences with other theories of altruism, two points are worth highlighting. First, social altruism concerns the relationship of the

individual with the group, rather than dyadic relationships between individuals. This is consistent with status in human groups being the result of interactions among the entire network of group members rather than dyadic encounters (Ridgeway and Diekema 1989). Second, social altruism provides an explanation for the greater level of altruism towards non-relatives found in humans compared to other vertebrates, rather than being a universal theory of altruism. However, an incipient form of social altruism may exist in other species, contributing to such behaviors as peacemaking, and alarm and food calls (e.g., Hauser and Marler 1993).

Many theories of altruism have been proposed over the years, but the three most firmly established are group selection, kin selection, and reciprocity. All three trace their roots to Darwin (discussed in Richards 1987). They are discussed in turn.

2.5.2   Group Selection

Up until the 1960s, group selection was often used to explain apparently altruistic behaviors, on the basis that groups with many altruists would out-compete other groups (e.g., Wynne-Edwards 1962). Using mathematical models, Maynard Smith (1964) argued that this simplistic reasoning is generally implausible, since the individual level selection for selfishness is usually stronger than the group level selection for altruism. Following this and William's (1966) critique, the theory of group selection was shunned academically, and it is only in the last few years that researchers, with David S. Wilson to the fore (e.g., Sober and Wilson 1998; Wilson and Wilson 2007), have successfully argued for a more nuanced perspective. One theoretical approach is for the altruists in any group to preferentially interact with one another. This process, termed *assortative interactions*, reduces the cost of altruism and the benefit of selfishness, since individuals are more likely to interact with their own type (e.g., Wilson and Dugatkin 1997). While this may be a strong effect in some species, there is evidence from meat sharing by hunter-gatherers suggesting only a weak role in human evolution—among the !Kung, the best hunters who altruistically provide the most meat disperse and form their own camps, rather than congregating in camps of "super-hunters" as would be predicted by the assortative interactions hypothesis (Wiessner 2002:425). Another theoretical approach more focused on human evolution highlights the level of direct competition and warfare between hunter-gatherer groups, which may have been a significant facilitator of group selection in our evolutionary past (e.g., Choi and Bowles 2007; Bowles 2009).

2.5.3   Kin Selection

Kin selection was first proposed by Darwin as an explanation for the extreme altruism exhibited by social insects. As Darwin (1859:258) noted: "selection may be applied to the family, as well as the individual." This led to a large literature (reviewed in Dugatkin 2007), including Hamilton's (1964) famous equation linking the benefit to relatives, the coefficient of relatedness, and the direct personal cost:$rb > c$. Following this perspective leads one to a definition of fitness including one's relatives, which is also known as inclusive fitness. Prosocial selection and social altruism can both be considered in this framework, with social incentives applied to one's relatives incentivizing oneself, for example.

2.5.4   Reciprocity

Reciprocity was also proposed by Darwin, although as a stimulus to social and moral qualities in humans. Darwin (1874:135) argued as a first step to these qualities that "each man would soon learn that if he aided his fellow-men, he would commonly receive aid in return." This was after noting the deficiency in the group selection argument that the most altruistic would decrease in number in any group. Trivers (1971) developed the theory of reciprocal altruism more formally, focusing on repeated dyadic interactions among individuals. One issue that Trivers noted is subtle cheating, with individuals returning slightly less than they are given. This is particularly a problem when the value of help is subjective and returns are of a different kind (how does a smallish hindquarter of a kangaroo compare to a nice shell necklace given a month later?), although strategies like gradually increasing investment in a relationship may help (e.g., Roberts and Sherratt 1998). Also, reciprocity is theoretically more effective within smaller groups where the probability of repeat interactions is higher. This makes it surprising that reciprocity appears to be rare in the small societies of the animal kingdom (Hammerstein 2003) while common in large human societies. In contrast to reciprocal altruism, social altruism is concerned with the relationship between the individual and the group. This is generally an asymmetric relationship, with the individual more dependent on the group than vice versa. Hence subtle cheating is reduced with the individual having a strong incentive not to be caught cheating. Also, group size is less relevant for prosocial selection, and is limiting only to the extent that monitoring individual behaviors and assigning status levels become problematic.

Although Darwin suggested reciprocity as a stimulus to the social virtues, he did not develop the idea further. Indeed, it is unclear whether he was considering dyadic reciprocity or reciprocity facing the group, although his use of the plural—"fellow-*men*"—

suggests the latter. If so, there would be a connection with social altruism. This is further emphasized with his second stimulus, "the praise and the blame of our fellow-men" (Darwin 1874:135). Darwin does not make the connection to social status, but does mention esteem in a related context.

Reciprocal altruism has been fruitful in generating related theories of altruism. One is termed *indirect reciprocity* (Alexander 1987), with individuals establishing reputations as exchange partners based on their past behaviors with third parties. This allows inter-actants to adjust their behaviors according to the others' reputation, being generous to those likely to be generous, and stingy to, or avoiding, those likely to be stingy. This is important in commercial trading systems, since reputation can facilitate trade even when legal contract enforcement is weak (e.g., Greif 1989). Indirect reciprocity has parallels with the status side of social altruism, since altruistic behaviors lead to both status and reputation as an exchange partner. However, status and reputation are distinct concepts. The former is primitive, being derived from our vertebrate ancestors with many associated behaviors and psychological processes. The latter is specific to the type of exchange, and each individual has a reputation for many different traits that may appear in conflict—the bully who always keeps his word, for example. In many instances, status derives from exchange that is unreciprocated, with the asymmetry of benefits from the exchange leading to a status differential. For example, in Blau's (1963) classic study of agents in a federal enforcement agency, status accrued to those providing informal advice to others with no expected gain other than the pleasure of enhanced prestige. It can also be that high status individuals will have poor reputations as exchange partners, since they often expect and receive preferential terms in dyadic interactions (e.g., Glaeser et al. 2000). For example, trading with medieval princes was more risky than with merchants since the higher status princes had less concern for others' property rights (DeLong and Shleifer 1993).

Another related theory has been termed *strong reciprocity* (Gintis 2000; Bowles and Gintis 2004), with punishment being used to deter individuals from cheating (Trivers 1971; Boyd and Richerson 1992; Clutton-Brock and Parker 1995). This is similar to the punishment incentives utilized in social altruism, although strong reciprocity is generally considered as a dyadic strategy, while social altruism involves punishments being applied collectively by the group. This is a significant distinction, allowing strong reciprocators to establish a reputation for their punishments, while socially altruistic groups lower the cost to punish by acting collectively.

2.5.5   Costly Signaling

The final theory that is relevant to social altruism is costly signaling (Spence 1973), which has also been termed the handicap principle (Zahavi 1975). Since the two theories are easily confused, I will compare them in more detail. The basic idea of costly signaling is that high-quality types can more easily afford to pay a costly signal than low-quality types, and the cost of the signal increases until an equilibrium develops in which an interactant can observe the signal and know it is reliable. The benefit of the interaction makes paying the cost of the signal worthwhile for the high-quality types but not for the low-quality types. The theory was initially applied to the investment in education by potential employees (Spence 1973) and the investment in intersexual displays to attract mates (Zahavi 1975). It has now been widely applied, explaining such behaviors as gazelles' stotting, with individuals pursued by predators jumping high to signal their fitness, which deters the predators from a chase that would be energetically costly to both sides (FitzGibbon and Fanshawe 1988). Within anthropology, it helps explain such diverse behaviors as the artistic elaboration of craft objects, the growing of large inedible yams, and the construction of monumental architecture (Bliege Bird and Smith 2005). While the research has generally focused on wasteful displays, Zahavi (1977, 1995) and other authors (e.g., Gintis, Smith, and Bowles 2001) have postulated that costly signals could be directed towards altruistic acts. For example, in a forager setting, good hunters may signal their hunting ability by providing meat for the group (Hawkes 1991; Hawkes and Bliege Bird 2002).

To distinguish social altruism from costly signaling, it is helpful to consider the context of education and employment. As Michael Spence (1973) explains, employers face a problem of not observing a worker's productivity until after the person is hired. One solution is for employers to implement a contract in which they pay more to workers with higher education. Since highly productive workers are assumed to face a lower cost of investing in this education—perhaps their ability makes education easier, or they subsequently receive pay rises that offset the educational cost—they find this investment worthwhile, whereas the less productive workers do not. The education signal then perfectly reveals the quality of the applicant, since only the high-productivity workers invest in education. But note this solution is necessarily wasteful, in the sense that the high- and low-quality types could be made strictly better-off if an honest non-costly signal existed. This waste occurs because costly signaling is a second-best solution—it is utilized only when the first-best solution, an honest non-costly signal, is not available. In contrast, social altruism is a first-best solution with incentives applied by the group to reward desired traits that are displayed by individuals. It is analogous to the rewards that employers use to incentivize employees once they are hired and their productivity

observed.

In real, as opposed to theoretical, settings we often do not observe a strict dichotomy between displays which (a) are signals of an unobserved trait and involve waste; and (b) are rewarded for their inherent value and do not involve waste. Hence it can be difficult to determine the relative importance of costly signaling and social altruism in many contexts. However, some general criteria can help us assess their relative importance, with social altruism the more plausible explanation when: (i) The behaviors occur frequently, since repeated signals have diminishing information content; (ii) The participants are very familiar with one another, since familiarity increases information accessibility; (iii) The behaviors benefit one's own group, in accordance with social altruism; and (iv) There is little or no obvious waste from the behaviors, implying a first-best rather than second-best solution.[2] Costly signaling will be the more plausible explanation when the obverse criteria hold.[3] As canonical examples of this approach, we can compare large game hunting by the Ju/'hoansi (!Kung Bushmen) with Meriam (Torres Strait, Australia) turtle hunting. The meat from large game hunting provides an important part of the Ju/'hoansi diet, especially during periods of nutritional stress when it may comprise more than 80% of the diet (reviewed in Wiessner 2002). Most meat is shared within the camp, with smaller amounts being given to kin outside the camp, exchange partners, or traded with Bantu pastoralists. Any leftovers are dried to avoid wastage. The good hunters gain the benefit of high status and the ability to control band composition, while the poor hunters lose status but gain valued meat in return. There is no obvious waste in the exchange, consistent with a first-best solution and the social altruism explanation. In contrast, Meriam turtle hunting is an infrequent activity to provide meat for funerary feasts (Bleige Bird and Smith 2005). The hunt is a dangerous activity that is undertaken even during the nesting season, at which time egg-laying turtles could alternatively be harvested with minimal risk and effort. The feasts are arranged by the deceased's patrilineage, with both allies and competitor groups being invited. By providing a lavish feast, the patrilineage provides a reliable signal of its strength and cohesion. Waste is optimal for the patrilineage since the direct fitness gain granted to competitor groups is then minimized.

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[2]This fourth criterion provides a simple prediction to distinguish costly signaling from social altruism. A wasteful display will reduce status under the social altruism hypothesis, but increase status under the costly signaling hypothesis. For example, a hunter could return with just the head of a killed animal, so signaling hunting ability but providing no food for the group. Under costly signaling the hunter's status would increase, while under social altruism the hunter's status would decrease.

[3]Indeed, a prediction of a joint costly signaling / social altruism theory is that the first three criteria will be negatively correlated with the fourth criterion. I.e., displays that are more frequent, among familiar participants, and benefit one's own group, will involve less waste.

2.6   Conclusion

Through this article I have highlighted the connection between social incentives and the evolution of traits that are uniquely exaggerated in humans. I have focused on social status as the incentive that is least investigated and may be the most important for our evolution, finding that it is awarded for prosocial traits and has inclusive fitness implications. Together with other social incentives, status thus generates an evolutionary force, one that I have termed prosocial selection. The prosocial behavior that results from prosocial selection has been termed social altruism. In reviewing the social bases of these processes, I have found differences with the societies of other apes that could have allowed prosocial selection to have become a transformative force in human evolution. In reviewing the psychological bases of the processes, I have found that an awareness of the processes is not necessary and that "true" altruism may result with behaviors having an expected inclusive fitness cost. Social altruism has been discussed in slightly more detail to provide a contrast with existing theories of altruism.

In closing, I suggest prosocial selection requires serious consideration as a theory that generates a consistent and coherent account of the evolution of human intelligence, language, altruism, and society, and allowed our ancestors to achieve a major evolutionary transition (Maynard Smith and Szathmáry 1995). As a broad theory it provides both a more elegant description of our evolution and nature than the usual piecemeal approach.

Bibliography

[1] Alexander, R.D. 1987. *The biology of moral systems.* New York: Aldine de Gruyter.

[2] Anderson, C., O.P. John, D. Keltner, and A.M. Kring. 2001. Who attains social status? Effects of personality and physical attractiveness in social groups. *Journal of Personality and Social Psychology* 81:116-32.

[3] Ball, S., C. Eckel, P.J. Grossman, and W. Zame. 2001. Status in markets. *Quarterly Journal of Economics* 116:161-88.

[4] Barkow, J.H. 1989. *Darwin, sex and status: Biological approaches to mind and culture.* Toronto: University of Toronto Press.

[5] Barkow, J.H., L. Cosmides, and J. Tooby. 1992. *The adapted mind: Evolutionary psychology and the generation of culture.* Oxford: Oxford University Press.

[6] Barrett, L., R. Dunbar, and J. Lycett. 2002. *Human Evolutionary Psychology.* Princeton: Princeton University Press.

[7] Berger, J., B.P. Cohen, and M. Zelditch, Jr. 1966. Status characteristics and expectation states, in *Sociological theories in progress*: Vol. 1, eds. J. Berger, M. Zelditch, Jr., and B. Anderson, 29-46. Boston: Houghton-Mufflin.

[8] —. 1972. Status characteristics and social interaction. *American Sociological Review* 37:241-255.

[9] Berger, J., M. Webster Jr., C. Ridgeway, and S.J. Rosenholtz. 1986. Status cues, expectations, and behavior, in *Advances in group processes*: Vol. 3, ed. E.J. Lawler, 1-22. Greenwich: JAI Press.

[10] Berndt, R.M., and C.H. Berndt. 1988 [1964]. *The world of the first Australians*, 5th Ed. Sydney: Ure Smith.

[11] Betzig, L.L. 1986. *Despotism and differential reproduction. A Darwinian view of history.* New York: Aldine.

[12] Bickman, L. (1971) The effect of social status on the honesty of others. *Journal of Social Psychology* 85:87-92.

[13] Bierhoff, H.-W. 2002. *Prosocial behaviour.* East Sussex: Psychology Press.

[14] Bingham, P.M. 1999. Human uniqueness: A general theory. *Quarterly Review of Biology* 74:133-169.

[15] Blau, P.M. 1960. Patterns of deviation in work groups. *Sociometry* 23:245-61.

[16] —. 1963. *The dynamics of bureaucracy,* Revised Ed. Chicago: University of Chicago Press.

[17] Bliege Bird R.L. and E.A. Smith. 2005. Signaling theory, strategic interaction, and symbolic capital. *Current Anthropology* 46:221-48.

[18] Boehm, C. 1993. Egalitarian behavior and reverse dominance hierarchy. *Current Anthropology* 34:227-54.

[19] —. 1999. *Hierarchy in the forest: The evolution of egalitarian behavior.* Cambridge: Harvard University Press.

[20] —. 2007. Conscience origins, sanctioning selection, and the evolution of altruism in Homo sapiens. Unpublished manuscript.

[21] Bowles, S. 2009. Did warfare among ancestral hunter-gatherers affect the evolution of human social behaviors? *Science* 324:1293-1298.

[22] Bowles, S. and H. Gintis. 2004. The evolution of strong reciprocity: cooperation in heterogeneous populations. *Theoretical Population Biology* 65:17-28.

[23] Boyd, R., and P.J. Richerson. 1982. Cultural transmission and the evolution of cooperative behavior. *Human Ecology* 10:325-51.

[24] —. 1985. *Culture and the evolutionary process.* Chicago: University of Chicago Press.

[25] —. 1992. Punishment allows the evolution of cooperation (or anything else) in sizable groups. *Ethology and Sociobiology* 13:171-95.

[26] Burling, R. 1986. The selective advantage of complex language. *Ethology and Sociobiology* 7:1-16.

[27] —. 2005. *The talking ape: How language evolved.* Oxford: Oxford University Press.

[28] Caldwell, H.K., et al. 2008. Vasopressin: Behavioral roles of an "original" neuropeptide. *Progress in Neurobiology* 84:1-24.

[29] Campbell, A. 2008. Attachment, aggression and affiliation: The role of oxytocin in female social behavior. *Biological Psychology* 77:1-10.

[30] Cavalli-Sforza, L. L. and M.W. Feldman. 1981. *Cultural transmission and evolution.* Princeton: Princeton University Press.

[31] Chagnon, N.A. 1997. *Yąnomamö*, 5th Ed. New York: Thomson Learning.

[32] Chance, M.R.A. 1967. Attention-structure as the basis of primate rank orders. *Man* 2:503-18.

[33] Chance, M.R.A. and C. Jolly. 1970. *Social groups of monkeys, apes and men.* London: Jonathan Cape.

[34] Choi, J.K., and S. Bowles. 2007. The coevolution of parochial altruism and war. *Science* 318:636-640.

[35] Clutton-Brock, T.H. and G.A. Parker. 1995. Punishment in animal societies. *Nature* 373:209-16.

[36] Cosmides, L., and J. Tooby. 1987. From evolution to behavior: Evolutionary psychology as the missing link, in *The latest and the best: Essays on evolution and optimality*, ed. J. Dupre, 277-306. Cambridge: MIT Press.

[37] Damasio, A.R. 1994. *Descarte's error: Emotion, reason, and the human brain.* New York: Putnam Berkley.

[38] Darwin, C. 1859. *The origin of species by means of natural selection.* London: John Murray.

[39] —. 1874. *The descent of man, and selection in relation to sex*, 2nd Ed. London: John Murray.

[40] Deacon, T.W. 1997. *The symbolic species: The co-evolution of language and the brain.* New York: Norton.

[41] DeLong, J.B. and A. Shleifer. 1993. Princes and merchants: European city growth before the industrial revolution. *Journal of Law & Economics* 36:671-702.

[42] Depue, R.A. and J.V. Morrone-Strupinsky. 2005. A neurobehavioral model of affiliative bonding: Implications for conceptualizing a human trait of affiliation. *Behavioral and Brain Sciences* 28:313-50.

[43] Dessalles, J-L. 1998. Language and hominid politics, in *The evolutionary emergence of language: Social function and the origins of linguistic form*, eds. C. Knight, M. Studdert-Kennedy, and J. Hurford, 62-80. Cambridge: Cambridge University Press.

[44] Diekmann, A.M. et al. 1996. Social status and aggression: A field study analyzed by survival analysis. *Journal of Social Psychology* 136:761-68.

[45] Dittes, J.E. and H.H. Kelley. 1956. Effects of different conditions of acceptance upon conformity to group norms. *Journal of Abnormal and Social Psychology* 53:100-7.

[46] Domes, G. et al. 2007. Oxytocin improves "mind reading" in humans. *Biological Psychiatry* 61:731-33.

[47] Doob, A.N. and A.E. Gross. 1968. Status of frustrator as an inhibitor of horn-honking responses. *Journal of Social Psychology* 72:213-18.

[48] Dovidio, J.F. et al. 2006 *The Social Psychology of Prosocial Behavior*. Mahwah: Lawrence Erlbaum Associates.

[49] Dugatkin, L.A. 2007. Inclusive fitness theory from Darwin to Hamilton. *Genetics* 176:1375-80.

[50] Dunbar, R.I.M. 1993. Social organization of the gelada, in *Theropithecus: The Rise and Fall of a Primate Genus*, ed. N.G. Jablonski, 425-39. Cambridge: Cambridge University Press.

[51] Durham, W.H. 1991. *Coevolution: Genes, culture, and human diversity*. Stanford: Stanford University Press

[52] Eibl-Eibesfeldt, I. 1989. *Human ethology*. New York: Aldine.

[53] —. 1996. The evolution of nurturant dominance, in *Food and the status quest: An interdisciplinary perspective*, eds. P. Wiessner and W. Schiefenhovel, 171-91. Providence: Berghahn Books.

[54] Elkin, A.P. 1964 [1938]. *The Australian Aborigines*. New York: Natural History Library.

[55] Ellis, L. 1995. Dominance and reproductive success among nonhuman animals: A cross-species comparison. *Ethology and Sociobiology* 16:257-333.

[56] Emerson, R.M. 1962. Power-dependence relations. *American Sociological Review* 27:31-41.

[57] Faunce, W.A. and M.J. Smucker. 1966. Industrialization and community status structure. *American Sociological Review.* 31:390-99.

[58] Fehr, E. and S. Gächter. 2002. Altruistic punishment in humans. *Nature* 415:137-40.

[59] Fershtman, C. and Y Weiss. 1998. Social rewards, externalities, and stable preferences. *Journal of Public Economics* 70:53-73.

[60] FitzGibbon, C.D. and J.H. Fanshawe. 1988. Stotting in Thomson's gazelles: An honest signal of condition. *Behavioral Ecology and Sociobiology* 23:69-74.

[61] Flynn, F.J. 2003. How much should I give and how often? The effects of generosity and frequency of favor exchange on social status and productivity. *Academy of Management Journal* 46:539-53.

[62] Geary, D.C. 2004. *The origin of mind: Evolution of brain, cognition, and general intelligence.* Washington: American Psychological Association.

[63] Ginsburg, H.J., and S.M. Miller. 1981. Altruism in children: A naturalistic study of reciprocation and an examination of the relationship between social dominance and aid-giving behavior. *Ethology and Sociobiology* 2:75-83.

[64] Gintis, H. 2000. Strong reciprocity and human sociality. *Journal of Theoretical Biology* 206:169-79.

[65] Gintis, H., E.A. Smith, and S. Bowles. 2001. Costly signaling and cooperation. *Journal of Theoretical Biology* 213:103-19.

[66] Glaeser, E.L. et al. 2000. Measuring trust. *Quarterly Journal of Economics* 115:811-46.

[67] Goodall, J. 1986. *The chimpanzees of Gombe.* Cambridge: Harvard University Press.

[68] —. 1988. *In the shadow of man*, revised edition. New York: Houghton Mufflin.

[69] Goode, W.J. 1979. *The celebration of heroes: Prestige as a social control system.* Berkeley: University of California Press.

[70] Goodman, M.D., and K.C. Gareis. 1993. The influence of status on decisions to help. *Journal of Social Psychology* 133:23-31.

[71] Gordon, A.D., D.J. Green, and B.G. Richmond. 2008. Strong postcranial size dimorphism in Australopithecus afarensis: Results from two new resampling methods for multivariate data sets with missing data. *American Journal of Physical Anthropology* 135:311-328.

[72] Greenspan, S.I. and S.G. Shanker. 2004. *The first idea: How symbols, language, and intelligence evolved from our primate ancestors to modern humans.* Cambridge: Da Capo Press.

[73] Greif, A. 1989. Reputation and coalitions in medieval trade: Evidence on the Maghribi traders. *Journal of Economic History* 49:857-882.

[74] Guéguen, N. 2003. The effect of shoplifter's status on reporting a crime: An evaluation in a natural setting. *Studia Psychologica* 45:221-28.

[75] Guéguen, N. and N. Pichot. 2001. The influence of status on pedestrians' failure to observe a road-safety rule. *Journal of Social Psychology* 141:413-15.

[76] Gurven, M. 2004. To give and to give not: The behavioral ecology of human food transfers. *Behavioral and Brain Sciences* 27:120-155

[77] Gurven, M. et al. 2000. "It's a Wonderful Life": signaling generosity among the Ache of Paraguay. *Evolution and Human Behavior* 21:263-82.

[78] Hamilton, W.D. 1964. Genetical evolution of social behavior I. *Journal of Theoretical Biology* 7:1-16.

[79] Hammerstein, P. 2003. Why is reciprocity so rare in social animals? In *Genetic and cultural evolution of cooperation*, ed. P. Hammerstein, 83-93. Cambridge: MIT Press.

[80] Hammock, E.A.D. and L.J. Young. 2005. Microsatellite instability generates diversity in brain and sociobehavioral traits. *Science* 308:1630-34.

[81] Harbaugh, W.T. 1998. The prestige motive for making charitable transfers. *American Economic Review* 88:277-82.

[82] Hardy, C.L., and M. Van Vugt (2006) Nice guys finish first: The competitive altruism hypothesis. *Personality and Social Psychology Bulletin* 32:1402-13.

[83] Hauser, M.D. and P. Marler. 1993. Food-associated calls in rhesus macaques (Macaca mulatta): II. Costs and benefits of call production and suppression. *Behavioral Ecology* 4:206-12.

[84] Hawkes, K. 1991. Showing off: Tests of a hypothesis about men's foraging goals. *Ethology and Sociobiology* 12:29-54.

[85] Hawkes, K. and Bliege Bird, R.L. 2002. Showing off, handicap signaling, and the evolution of men's work. *Evolutionary Anthropology* 11:58-67.

[86] Henrich, J. and F. Gil-White. 2001. The evolution of prestige: Freely conferred status as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior* 22:165–96

[87] Hiatt, L.R. 1996. *Arguments about Aborigines: Australia and the evolution of social anthropology.* Cambridge: Cambridge University Press.

[88] Hill, J. 1984. Prestige and reproductive success in man. *Ethology and Sociobiology* 5:77-95

[89] Hirsch, F. 1976. *The social limits to growth.* Cambridge: Harvard University Press.

[90] Hold-Cavell, B.C.L. 1996. The ethological bases of status hierarchies, in *Food and the status quest*, eds. P. Wiessner and W. Schiefenhövel, 19-31. Providence: Berghahn.

[91] Homans, G.C. 1950. *The human group.* New York: Harcourt, Brace & Company.

[92] —. 1961. *Social behavior: Its elementary forms.* New York: Harcourt, Brace & World.

[93] Howitt, A.W. 1904. *The native tribes of south-eastern Australia.* London: Macmillan.

[94] Hughes, E.C. 1946. The knitting of racial groups in industry. *American Sociological Review* 11:512-19.

[95] Hunt, K. 2006. Sex differences in chimpanzee foraging behavior and tool use: Implications for the oldowan, in *The Oldowan: Case studies into the earliest Stone Age*, eds. N. Toth and K. Schick, 243-66. Gosport: Stone Age Institute Press.

[96] Inoue, S. and T. Matsuzawa. 2007. Working memory of numerals in chimpanzees. *Current Biology* 17:R1004-5.

[97] Jablonka, E. and M.J. Lamb. 2005. *Evolution in Four Dimensions: Genetic, Epigenetic, Behavioral, and Symbolic Variation in the History of Life.* Cambridge: The MIT Press.

[98] Janos, B. 1990. Social status as a function of violence among recidivists in prison. *Aggressive Behavior* 16:118-19.

[99] Johanson, D.C. and T.D. White. 1979. A systematic assessment of early African hominids. *Science* 203:321-30.

[100] Keltner, D. et al. 2001. Just teasing: A conceptual analysis and empirical review. *Psychological Bulletin* 127:229-48.

[101] Kirsch, P. et al. 2005. Oxytocin modulates neural circuitry for social cognition and fear in humans. *Journal of Neuroscience* 25:11489-93.

[102] Kosfeld, M. et al. 2005. Oxytocin increases trust in humans. *Nature* 435:673-76.

[103] Laland, K.N. and G.R. Brown. 2002. *Sense and nonsense: Evolutionary perspectives on human behavior.* Oxford: Oxford University Press.

[104] Lee-Thorp, J. and M. Sponheimer. 2006. Contributions of biogeochemistry to understanding hominin dietary ecology. *Yearbook of Physical Anthropology* 49:131-48.

[105] Lieberman, P. 2006. *Toward an evolutionary biology of language.* New York: Belknap Press.

[106] Lim, M.M. and L.J. Young. 2006. Neuropeptidergic regulation of affiliative behavior and social bonding in animals. *Hormones and Behavior* 50:506-17.

[107] Lim, M.M. et al. 2004. Enhanced partner preference in a promiscuous species by manipulating the expression of a single gene. *Nature* 429:754-57.

[108] Linton, R. 1936. *The Study of Man.* New York: D. Appleton-Century Co.

[109] Lourandos, H. 1997. *Continent of hunter-gatherers: New perspectives in Australian prehistory.* Cambridge: Cambridge University Press.

[110] Lovejoy, C.O. 2009. Reexamining human origins in light of Ardipithecus ramidus. *Science* 326:74.

[111] Mace, R., C. Holden, and S. Shennan. (Eds.) 2005. *The Evolution of Cultural Diversity: A Phylogenetic Approach.* London: University College London Press.

[112] Manuck, S.B. et al. 2004. Socio-economic status covaries with central nervous system serotonergic responsivity as a function of allelic variation in the serotonin transporter gene-linked polymorphic region. *Psychoneuroendocrinology* 29:651-68.

[113] Mayard Smith, J. 1964. Group selection and kin selection. *Nature* 201:1145-47.

[114] —. 1999. Conflict and cooperation in human societies, in *Levels of selection in evolution*, ed. L. Keller, 197-208. Princeton: Princeton University Press.

[115] Maynard Smith, J. and E. Szathmáry. 1995. *The major transitions in evolution.* Oxford: Oxford University Press.

[116] Mazur, A. 1973. A cross-species comparison of status in small established groups. *American Sociological Review* 38:513-30.

[117] —. 2005. *Biosociology of dominance and deference.* Lanham: Rowman & Littlefield.

[118] Mazzella, R. and A. Feingold. 1994. The effects of physical attractiveness, race, socioeconomic status, and gender of defendants and victims on judgments of mock jurors: A meta-analysis. *Journal of Applied Social Psychology* 24:1315-44.

[119] McAdams, R.H. 1997. The origin, development, and regulation of norms. *Michigan Law Review* 96:338-433.

[120] Medin, D.L., B.H. Ross, and A.B. Markman. 2005. *Cognitive psychology.* New York: John Wiley.

[121] Mesoudi A., A. Whiten, and K.N. Laland. 2004. Is human cultural evolution Darwinian? Evidence reviewed from the perspective of The Origin of Species. *Evolution* 58:1-11

[122] Miller, G.F. 2000. *The mating mind: How sexual choice shaped the evolution of human nature.* New York: Doubleday.

[123] Morgan, J. 1980 [1852]. *The life and adventures of William Buckley: Thirty-two years a wanderer amongst the Aborigines of the unexplored country round Port Phillip.* Canberra: Australian National University Press.

[124] Moore, J. 1984. The evolution of reciprocal sharing. *Ethology and Sociobiology* 5:5-14.

[125] Mulvaney, J., and J. Kamminga. 1999. *Prehistory of Australia.* St. Leonards: Allen and Unwin.

[126] Nadler, R. 1976. Rann vs. Calabar: A study of gorilla behavior. *Yerkes Newsletter* 13:11-14.

[127] Nishida, T. and K. Hosaka. 1996. Coalition strategies among adult male chimpanzees of the Mahale Mountains, Tanzania, in *Great ape societies*, eds. W.C. McGrew, L.F. Marchant, and T. Nishida, 114-34. Cambridge: Cambridge University Press.

[128] Ostrower, F. 1995. *Why the wealthy give: The culture of elite philanthropy.* Princeton: Princeton University Press.

[129] Pandey, J. 1979. Effects of benefactor and recipient status on helping behavior. *Journal of Social Psychology* 108:171-76.

[130] Parker, K. L. 1905. *The Euahlayi tribe: A study of Aboriginal life in Australia.* London: A. Constable.

[131] Pettit, P. 1990. Virtus normativa: Rational choice perspectives. *Ethics* 100:725-55.

[132] Phillips, D.J., and E.W. Zuckerman. 2001. Middle-status conformity: Theoretical restatement and empirical demonstration in two markets. *American Journal of Sociology* 107:379-429.

[133] Plavcan, J.M., et al. 2005. Sexual dimorphism in Australopithecus afarensis revisited: How strong is the case for a human-like pattern of dimorphism? *Journal of Human Evolution* 48:313-320.

[134] Plavcan, J.M., and C.P. van Schaik. 1997. Intrasexual competition and body weight dimorphism in anthropoid primates. *American Journal of Physical Anthropology* 103:37-67.

[135] Price, M.E. 2003. Pro-community altruism and social status in a Shuar village. *Human Nature: An Interdisciplinary Biosocial Perspective* 14:191-208.

[136] Pusey, A., J. Williams, and J. Goodall. 1997. The influence of dominance rank on the reproductive success of female chimpanzees. *Science* 277:828-31.

[137] Reiman, J. 2003. *The rich get richer and the poor get prison: Ideology, class, and criminal justice*, 7th Ed. New York: Allyn & Bacon.

[138] Reno, P.L., et al. 2003. Sexual dimorphism in Australopithecus afarensis was similar to that of modern humans. *Proceedings of the National Academy of Sciences* 100:9404-9409.

[139] Richards, R.J. 1987. *Darwin and the emergence of evolutionary theories of mind and behavior.* Chicago: University of Chicago Press.

[140] Richerson, P.J. and R. Boyd. 2005. *Not by genes alone: How nature transformed human evolution.* Chicago: University of Chicago Press

[141] Ridgeway, C.L. 1982. Status in groups: The importance of motivation. *American Sociological Review* 47:76-88.

[142] —. 1983. *The dynamics of small groups.* New York: St. Martin's Press.

[143] —. 1991. The social construction of status value: Gender and other nominal characteristics. *Social Forces* 70:367-86.

[144] —. 2000. The formation of status beliefs: Improving status construction theory, in *Advances in group processes* 17, eds. S.R. Thye et al., 77-102. Stamford: JAI Press.

[145] Ridgeway, C.L. and D. Diekema. 1989. Dominance and collective hierarchy formation in male and female task groups. *American Sociological Review* 54:79-93.

[146] Roberts, G. and T.N. Sherratt. 1998. Development of cooperative relationships through increasing investment. *Nature* 394:175-79.

[147] Rosenfeld, E. 1951. Social stratification in a "classless" society. *American Sociological Review* 16:766-74.

[148] Von Rueden, C., M. Gurven, and H. Kaplan. 2008. The multiple dimensions of male social status in an Amazonian society. *Evolution and Human Behavior* 29:402-415

[149] Russon, A.E. and B.E. Waite. 1991. Patterns of dominance and imitation in an infant peer group. *Ethology and Sociobiology* 12:55-73.

[150] Schjelderup-Ebbe, T. 1922. Soziale Verhaltnisse bei Vogeln, *Zeitschrift fur Psychologie* 90:106-7.

[151] Schrag, C. 1954. Leadership among prison inmates. *American Sociological Review* 19:37-42.

[152] Smith, E.A. 2004. Why do good hunters have higher reproductive success? *Human Nature* 15:343-64.

[153] Sober, E. and D.S. Wilson. 1998. *Unto others: The evolution and psychology of unselfish behavior.* Cambridge: Harvard University Press.

[154] Solomon, H. and L. Herman. 1977. Status symbols and prosocial behavior: The effect of the victim's car on helping. *Journal of Psychology* 97:271-73.

[155] Soltis, J., R. Boyd, and P. J. Richerson. 1995. Can group-functional behaviors evolve by cultural group selection? An empirical test. *Current Anthropology* 36:473-494

[156] Spence, M. 1973. Job market signaling. *Quarterly Journal of Economics* 87:355-74.

[157] Sponheimer, M. et al. 2006. Do "savanna" chimpanzees consume C-4 resources? *Journal of Human Evolution* 51:128-33.

[158] Stein, R.T. 1982. High status group members as exemplars: A summary of field research on the relationship of status to congruence conformity. *Small Group Behavior* 13:3-21.

[159] Strodtbeck, F.L., R.M. James, and C. Hawkins. 1957. Social status in jury deliberations. *American Sociological Review* 22:713-19.

[160] Sugiyama L.S. and M.S. Sugiyama. 2003. Social roles, prestige, and health risk: Social niche specialization as a risk-buffering strategy. *Human Nature: An Interdisciplinary Biosocial Perspective* 14:165-90.

[161] Trivers, R.L. 1971. The evolution of reciprocal altruism. *Quarterly Review of Biology* 46:35-57.

[162] Tutin, C.E.G., W.C. McGrew, and P.J. Baldwin. 1983. Social organization of savanna-dwelling chimpanzees, Pan troglodytes verus, at Mt. Assirik, Senegal. *Primates* 24:154-73.

[163] Veblen, T. 1934 [1899]. *The theory of the leisure class.* New York: The Modern Library.

[164] De Waal, F.B.M. 1996. *Good natured: The origins of right and wrong in humans and other animals.* Cambridge: Harvard University Press.

[165] —. 1998. *Chimpanzee politics: Power and sex among apes,* Revised ed. Baltimore: John Hopkins University Press.

[166] Walum, H. 2008. Genetic variation in the vasopressin receptor 1a gene (AVPR1A) associates with pair-bonding behavior in humans. *Proceedings of the National Academy of Sciences* 105: 14153-14156.

[167] Warner, W. L. 1937. *A black civilization: A social study of an Australian tribe.* New York: Harper.

[168] Weber, M. 1968 [1922]. *Economy and society*, trans. E. Fischoff et al. New York: Bedminster Press.

[169] Webster, M. Jr. 2003. Working on status puzzles, in *Advances in group processes 20*, eds. S.R. Thye and J. Skvoretz, 173-215. Oxford: Elsevier.

[170] Webster, M. Jr. and S.J. Hysom. 1998. Creating status characteristics. *American Sociological Review* 63:351-78.

[171] Whitmeyer, J.M. 2007. Prestige from the provision of collective goods. *Social Forces* 85:1765-86.

[172] Wiessner, P. 1996a. Introduction, in *Food and the status quest*, eds. P Wiessner and W Schiefenhövel, 1-18. Providence: Berghahn.

[173] —. 1996b. Leveling the hunter: Constraints on the status quest in foraging societies, in *Food and the status quest*, eds. P Wiessner and W Schiefenhövel, 171-91. Providence: Berghahn.

[174] —. 2002. Hunting, healing, and hxaro exchange: A long-term perspective on !Kung (Ju/'hoansi) large-game hunting. *Evolution and Human Behavior* 23:407-36.

[175] —. 2005. Norm enforcement among the Ju/'hoansi Bushmen - A case of strong reciprocity? *Human Nature: An Interdisciplinary Biosocial Perspective* 16:115-45.

[176] Willer, R. 2006. *A status theory of collective action.* Ph.D. dissertation, Cornell University Sociology Dept.

[177] Williams, G.C. 1966. *Adaptation and Natural Selection: A Critique of Some Current Evolutionary Thought.* Princeton, N.J.: Princeton University Press.

[178] Wilson, D.S. and L.A. Dugatkin. 1997. Group selection and assortative interactions. *American Naturalist* 149:336-51.

[179] Wilson, D.S. and E.O. Wilson. 2007. Rethinking the theoretical foundation of sociobiology. *Quarterly Review of Biology* 82:327-348.

[180] Woodburn, J. 1982. Egalitarian societies. *Man* 17:431-51.

[181] Wynne-Edwards, V.C. 1962. *Animal Dispersion in Relation to Social Behavior.* Edinburgh: Oliver and Boyd.

[182] York, E. and B. Cornwell. 2006. Status on trial: Social characteristics and influence in the jury room. *Social Forces* 85:455-77.

[183] Young, L.J. et al. 1999. Increased affiliative response to vasopressin in mice expressing the V1a receptor from a monogamous vole. *Nature* 400:766-68.

[184] Zahavi, A. (1975) Mate selection: Selection for a handicap. *Journal of Theoretical Biology* 53:205-14.

[185] —. 1977. Reliability in communication systems and the evolution of altruism, in *Evolutionary Ecology*, eds. B. Stonehouse and C. M. Perrins, 253-59. London: Macmillan.

[186] —. 1995. Altruism as a handicap: The limitations of kin selection and reciprocity. *Journal of Avian Biology* 26:1-3.

[187] Zak, P.J., R. Kurzban, and W.T. Matzner. 2005. Oxytocin is associated with human trustworthiness. *Hormones and Behavior* 48:522-27.

Chapter 3

Explaining the Cross-Section of Income and Savings: The Status and Impulsiveness Hypothesis

Key Words: Consumer Finance; Household Finance; Household Savings; Social Status; Hyperbolic Discounting; Retirement Planning

JEL Classification: D1, D91, E21

3.1 Introduction

Why are low-income households less likely to save than high-income households? The question has long been considered in economics (e.g., Fisher 1930) and a more recent literature has developed in the field of household finance (e.g., Huggett & Ventura 2000). The existing theories fall broadly into two camps. On one side are the rationalists, led by Milton Friedman, who argue the relationship is due to households saving when their income is high and dissaving when their income is low. In the cross-section, the high income group appears more likely to save because it includes more households whose income is temporarily high (Friedman's 1957 Permanent Income Hypothesis, PIH) or whose income is at a high stage relative to their lifetime (the Life Cycle Hypothesis, LCH, of Modigliani & Brumberg 1954). On the other side are the behavioralists, led by James Duesenberry who argues that the consumption of the rich generates desires in the poor for immediate consumption at the expense of savings and future consumption (Duessenberry's 1949 Relative Income Hypothesis).

In this chapter I propose and test an alternate psychological explanation, the Status and Impulsiveness Hypothesis (SIH). The SIH is based on two recent psychological findings. The first is that people have an immediacy bias, discounting payoffs over short horizons at much greater rates than over long horizons (Thaler 1981). Laibson (1997) argues these discount factors can be approximated by βe^{-rt}, where β is an immediacy factor applied to all delayed payoffs and r is an exponential rate.[1] In this chapter, I use the psychological term *impulsiveness* (Ainslie 1975) to denote the extent to which β is less than unity. The second psychological finding is that impulsiveness is negatively correlated with social status. Indeed, in Chapter I, I find that a relatively low social status assignment causes a relatively high level of impulsiveness. Hence there is not merely correlation, but also causation, between social status and impulsiveness.

In summary, the Status and Impulsiveness Hypothesis states that low-income households have difficulty in saving due to the following causal chain: low income implies low social status; low social status implies high impulsiveness; and high impulsiveness implies difficulty in saving.[2] The three links in the chain are discussed in more detail in the next section. In brief, the evidence for income and social status being correlated comes from occupational prestige scores (reviewed in Hauser & Warren 1997), surveys (e.g., Faunce & Smucker 1966), and people's use of money for "conspicuous consumption" (Veblen

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[1]Laibson actually uses the equivalent $\beta\delta^t$, which is less consistent with standard finance notation.

[2]Although the theory is presented and tested in the cross-section, it is also consistent with the time-series observation that the aggregate propensity to save does not increase as general income levels increase. Since status is a relative concept, increasing the incomes of all has no impact on individual status levels and so no impact on impulsiveness.

1899) and the purchase of positional goods (Hirsch 1976). The evidence for status and discounting being correlated include time-series data (e.g., Lawrance 1991), natural experiments (e.g, Warner & Pleeter 2001), and large laboratory experiments (e.g., Reimers et al. 2009). Specific causation from discounting preference to later status outcomes has been demonstrated with children (Mischel 1996), and I have demonstrated causation from status to impulsiveness experimentally in Chapter I. High impulsiveness implying lower saving is almost true axiomatically (e.g., Phelps & Pollak 1968), and much of the recent literature has focused on the use of commitment devices by consumers to reduce current consumption and increase saving (e.g., Laibson 1997)–devices that are especially valuable to the more impulsive consumers (Ashraf, Karlan & Yin 2006). Hence each of the three links in the causal chain appears robust. However, there could be confounding factors that undermine the hypothesis, and so empirical support is required.

My testing strategy is to decompose log income for each household into four components: (i) Transitory income; (ii) Income that derives from life cycle factors; (iii) Income that derives from the household's status position; and (iv) Idiosyncratic income. The first three components are identified by regressing household income and demographic variables on log income, and then using the regression coefficients to project back to the components. The variables used for the first three components are: (i) The household's stated "normal income" level relative to the prior year's income; (ii) The household head's age, age-squared, and number of dependent children; (iii) The household head's occupation, education, and race. The fourth component is the regression residual after accounting for the other three elements and control variables. The four components and control variables are then regressed on an indicator function of whether the household saved during the last year. The dataset is the commonly used Survey of Consumer Finances for the period 1995-2007.

The principal findings are: (a) Income derived from status more stongly predicts savings behavior than idiosyncratic income. This is consistent with the SIH, since income derived from status has a double effect on impulsiveness: the status characteristic leads to impulsiveness directly, and the implied income level leads to further status that also leads to impulsiveness. Interestingly, in the savings regressions, the coefficient for income derived from status is typically double the coefficient for idiosyncratic income; (b) Transitory income more strongly predicts savings behavior than idiosyncratic income, consistent with the Permanent Income Hypothesis;[3] (c) Income derived from lifecycle factors only weakly predicts savings behavior and in most specifications is not significant. This finding is inconsistent with the Life Cycle Hypothesis. To evaluate whether the lack

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[3]As discussed in the next section, this finding is actually consistent will all the hypotheses.

of power for the LCH is due to mis-specification, I use multiple specifications with: log income per person in the household; log income of the whole household; only households with the head's age below 65; and all households. In all cases the lifecycle variables are highly significant in the first stage but are only weakly predictive in the second stage.

The income decomposition also allows a natural decomposition of the regression sum of squares in the second stage–the contribution of each component is simply the product of the component coefficient and the covariance of the component and savings (see Maddala 1992:131-132). In common parlance, this indicates the extent to which each component "explains" the cross-sectional relationship between income and savings. This exercise implies the following explanatory powers: (i) Transitory income, about 14%; (ii) Life cycle factors, about 1%; (iii) Income derived from social status, about 50%; and (iii) Idiosyncratic income, about 35%. Since the last two components are consistent with the SIH, it appears the SIH has more than five times the explanatory power than the PIH and more than forty times the power of the LCH. Later in this chapter, alternate explanations for the third and fourth components are considered, none of which are consistent with the bulk of the evidence. Hence the SIH provides the best explanation for the cross-sectional relationship between income and savings behavior.

This chapter builds on the literature related to discounting, social status, and savings. It has long been noted that discount rate heterogeneity will lead to wealth inequality. Theoretically, in an endowment economy with infinitely lived agents, wealth flows to those with the lowest discount rate (Ramsey 1928; Becker 1980). Becker & Mulligan (1997) construct a model in which agents devote resources towards "imagining" the future, with the result that wealthier agents have lower discount rates. However, differences in exponential rates are unlikely to explain the cross-sectional relationship between income and savings. As Dynan, Skinner & Zeldes (2004) argue, if the rich have lower exponential rates then they would save more when young and working, and dissave more when old and retired. But this saving pattern reversal does not occur–instead, the rich are more likely to save at all ages. Tobacman (2009) uses the quasi-hyperbolic discounting framework to investigate wealth inequality. His agents have identical preferences, in contrast to my setting with heterogenous impulsiveness.

The Status and Impulsiveness Hypothesis has public policy implications. Low status households are more impulsive and their unconstrained intertemporal preferences result in over-consumption in the short-term and under-consumption in the long-term (Phelps & Pollak 1968). Such households are unlikely to save adequately for expected income shocks (e.g., retirement), for unexpected income shocks (e.g., unemployment), or for expenditure shocks (e.g., health care costs). Public policy must allow commitment devices in order for households to bind their future selves to better consumption profiles. Unfortunately, most

commitment devices are not renegotiation proof and many consumers do not voluntarily participate. Hence there is a role for legislation to force compliance, either through mandatory personal savings and insurance schemes, or through the tax system where benefits may be pooled. Indeed, the structure of the welfare state in modern industrial democracies can be seen as addressing the under-saving of low status households through compulsory retirement provision, unemployment insurance, health insurance, etc.

The rest of this chapter is organized as follows. Section 2 presents the foundation for the hypothesis and builds a framework to compare the alternate hypotheses. Section 3 presents the data and formally tests the hypotheses. Section 4 discusses the results.

3.2   Foundation

In this section, I present the Status and Impulsiveness Hypothesis in more detail, discuss the supporting evidence, and construct a framework to allow comparison with alternate theories.

The SIH starts with the observation that status level, L, can be written as a function of permanent income, Y_p, transitory income, Y_{tr}, other status characteristics, X, and characteristics that impact income but not status, Z:

$$L = L\left(Y_p, Y_{tr}, X, Z\right) \tag{3.1}$$

That status is a function of income should come as no surprise. Thorstein Veblen (1899) highlighted the need for members of the leisure class to consume conspicuously in order to maintain their status position, with the consumption providing an honest signal of wealth. Similarly, Fred Hirsch (1976) discussed the increasing importance of positional goods as societies become richer. In both cases, money grants the holder social status through the consumption or ownership of status goods. This connection between money and status is also reflected in occupational prestige scores, with the prestige of an occupation depending on both the education and income its the members (reviewed in Hauser & Warren 1997). The same pattern emerges when the members of modern societies are surveyed to find the determinants of individual social status, with income, occupational prestige, and education all being strongly predictive (Faunce & Smucker 1966).

I have divided income into permanent and transitory components in Eq.(3.1). Transitory income will have a smaller effect than does permanent income on social status, partly because it is less effective in purchasing durable positional goods, and partly because other members of society will likely realize the transitory nature of the income and discount its importance accordingly. Other status characteristics in Eq.(3.1) include

education, occupation, and race. The first two have already been discussed as status characteristics, and the third is well established in the sociology literature as a determinant of status in the United States (e.g., Berger, Cohen & Zelditch 1972). The term Z, characteristics that impact income but not status, is required because some income changes may have only a small impact on status. In particular, income changes due to life cycle progression are likely to have less of an impact than income changes due to education or occupation.

The second element of the SIH is the assertion that status and impulsiveness are correlated. Most existing literature is concerned with status and discounting in general, rather that impulsiveness specifically. For example, Warner & Pleeter (2001) use the U.S. military downsizing program of the 1990s as a natural experiment, with departing personnel being given a choice between a lump-sum payment and an annuity. The personnel choosing the lump-sum payment, and by implication having a higher discount rate, were more likely to be enlisted (versus officers), less educated, less intelligent, Black, younger, and have dependent children. Using time series data, Lawrance (1991) estimates consumption Euler equations and finds poorer, less educated, and ethnic minority households have higher discount rates. Reimers et al (2009) use an internet-based laboratory experiment with over 40,000 participants to determine the correlates of people choosing a smaller immediate reward over a larger delayed reward. They find people choosing the smaller immediate reward are more likely to be less educated, lower paid, younger, obese, and smokers. These studies are unable to distinguish between impulsiveness and the exponential rate in our discount form βe^{-rt} but, as already mentioned, differences in exponential rates cannot explain the relationship between income and saving. The implication is that the impulsiveness component, rather than the exponential rate, must be varying with social status.

There is also evidence for causation between status and impulsiveness. The evidence from impulsiveness to status is strongest among children. For example, in the 1960s, a group of children were given the choice between one treat immediately (e.g., a marshmallow) and two treats after a delay of several minutes (Mischel 1996). Those consistently choosing the delayed reward were more likely to subsequently perform well as teenagers and young adults. Similarly, Duckworth & Seligman (2005) find that a composite measure of psychological impulsiveness is twice as important as I.Q. for predicting end-of-year grades among eighth grade children.[4] In Chapter I, I use experimental methods to demon-

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[4]This is based on the correlation between GPA and impulsiveness and IQ. If we follow usual practice and take the square of this (analogous to R^2) then impulsiveness is four times as important as IQ. They also present evidence that impulsiveness at the beginning of the year predicts GPA change from the first semester to the second semester, while IQ does not.

strate causation from status to impulsiveness, with subjects assigned a high-status role becoming relatively less impulsive compared to subjects assigned a low-status role.

The final element of the SIH is the assertion that high impulsiveness implies difficulty in saving. This assertion means that many people's savings are lower than optimal due to self-control problems, a common theme in the discounting and savings literatures (Laibson 1998; Gul & Pesendorfer 2004), and one that is consistent with the large fall in the consumption of most households around the time of retirement (Bernheim, Skinner & Weinberg 2001). It is also consistent with the use of commitment devices by households to reduce current consumption and increase saving (Laibson 1997).

If the second two assertions are combined, then saving is a function of social status. The propensity to save, S, can be written as a function of status level, L, transitory income, Y_{tr}, and other factors, W:

$$S = S(L, Y_{tr}, W) \tag{3.2}$$

Transitory income is included separately from the other factors to be consistent with Eq.(3.1) and to highlight its relative importance. Note that permanent income is not included directly in Eq.(3.2), although it is included in Eq.(3.1) Since status is a relative concept, this implies the relative level of permanent income is important for saving, rather than its absolute level. This is consistent with the rich having a higher propensity to save than the poor, but as societies become richer the overall propensity to save does not increase.

Combining Eqs.(3.2) and (3.1) provides the following cross-sectional relationship for savings:

$$S = S\left(Y_p, Y_{tr}, X, W, Z\right) \tag{3.3}$$

And the corresponding income function can be written as:

$$Y = Y_p(X, W, Z, \varepsilon) + Y_{tr} \tag{3.4}$$

where ε is the idiosyncratic component of permanent income.

Eqs.(3.3) and (3.4) provide a generalized setting for the SIH, but for testing I need to impose more structure. For the income function, I redefine so that total income is the product of permanent and transitory income. This allows me to follow the standard practice of considering the logarithm of income. I next assume log income is a linear function of the other factors, and so write:

$$y = \beta_x x + \beta_z z + y_{tr} + \beta_w w + \varepsilon \tag{3.5}$$

where, to recap: x are status characteristics; z are characteristics impacting income but not social status; w are other factors; and ε is idiosyncratic income. In the analysis that follows, z will be restricted to the life cycle characteristics of age and family size.

For the savings function, I again assume linear form and write:

$$s = \alpha y + \gamma_x x + \gamma_z z + \gamma_{tr} y_{tr} + \gamma_w w + \epsilon_1$$

For analysis, it will be helpful to restrict the parameter space of γ_x and γ_z so they are parallel to the estimated coefficients from Eq.(3.5). The savings function is then:

$$s = \alpha y + \delta_x \hat{\beta}_x x + \delta_z \hat{\beta}_z z + \delta_{tr} y_{tr} + \delta_{1w} w + \epsilon_2 \tag{3.6}$$

Where α, δ_x, δ_z, and δ_{tr} are all scalars. Substituting income from Eq.(3.5) into Eq.(3.6) and grouping terms provides:

$$s = \alpha_x \hat{\beta}_x x + \alpha_z \hat{\beta}_z z + \alpha_{tr} y_{tr} + \alpha\varepsilon + \delta_w w + \epsilon \tag{3.7}$$

where $\alpha_x \equiv \alpha + \delta_x$, $\alpha_z \equiv \alpha + \delta_z$, and $\alpha_{tr} \equiv \alpha + \delta_{tr}$. Note that α is the coefficient on idiosyncratic income, ε, in Eq.(3.7) and also the coefficient on total income, y, in Eq.(3.6). The coefficients from Eq.(3.7) can be used to compare the various hypotheses for the cross-sectional relationship between income and savings. In particular, each of the hypotheses makes predictions about the relative magnitudes of the coefficients. These predictions are presented below.

Status and Impulsiveness Hypothesis Predictions: $\alpha_x > \alpha$, $\alpha_z \approx 0$, and α_{tr} (no prediction)

The SIH argues that low income implies low social status, which implies high impulsiveness, which implies difficulty in saving. Status characteristics that positively predict income should therefore positively predict saving after controlling for income. This implies $\delta_x > 0$ in Eq.(3.6) and $\alpha_x > \alpha$. Life cycle characteristics that have a large impact on income but only a small impact on social status should have only a small effect on savings. This implies $\alpha_z \approx 0$. The effect of transitory income is slightly more complex. A positive shock to transitory income will have a smaller impact on status than the same positive shock to permanent income. So such a shock should generate a relatively small reduction in impulsivness. This would imply a lower propensity to save from transitory than idiosyncratic income and $\alpha_{tr} < \alpha$. But going against this effect, transitory income is a separate component of our basic saving equation (Eq.3.2), recognizing that consumers will want to smooth consumption in the face of income volatility. This would imply a higher propensity to save transitory income and $\alpha_{tr} < \alpha$. Clearly, the two effects

counteract and the SIH does not predict which will dominate.

Permanent Income Hypothesis Predictions: $\alpha_x \approx 0$, α_z *(no prediction), and* $\alpha_{tr} >$ α

The PIH argues that transitory income volatility with consumption smoothing causes the cross-sectional correlation between income and savings. High income households are more likely to have had positive transitory income shocks which they save to smooth life time consumption and, conversely, low income consumers are likely to have had negative shocks which leads to dis-saving. This results in a purely mechanical cross-sectional correlation between income and savings. Friedman (1957) suggests the income shocks have a duration of about three years. Since status characteristics lead to permanent income differences, consumption should immediately and fully adjust to this income, implying no correlation with the propensity to save. Hence $\alpha_x \approx 0$. Since total income includes permanent and transitory components, the propensity to save out of total income will be lower than out of transitory income. Hence $\alpha_{tr} > \alpha$. To differentiate the PIH from the LCH, no prediction is made for life cycle income.

Life Cycle Hypothesis Predictions: $\alpha_x \approx 0$, $\alpha_z > \alpha$, *and* α_{tr} *(no prediction)*

The LCH argues that households smooth consumption over their lifetime. In the cross-section, high income households are more likely to be at a high earning phase of their life cycle, which results in their saving, and low income households are more likely at a low earning phase, which results in dis-saving. Hence the cross-sectional correlation between income and savings. Similarly with the PIH, status characteristics lead to permanent income differences, which should be fully consumed in the household's budget. Hence there should be no relation between saving and income derived from status characteristics, and $\alpha_x \approx 0$. Since total income includes permanent and life cycle components, the propensity to save out of total income will be lower than out of life cycle income. Hence $\alpha_z > \alpha$. To differentiate the LCH from the PIH, no prediction is made for transitory income.

Often the PIH and LCH are combined for analysis into a Life Cycle / Permanent Income Hypothesis, with consumption smoothing of lifetime and transitory income variability. Under such a LCPIH, the predictions are: $\alpha_x \approx 0$, $\alpha_z > \alpha$, *and* $\alpha_{tr} > \alpha$.

Relative Income Hypothesis Predictions: $\alpha_x < \alpha$, $\alpha_z < \alpha$, *and* $\alpha_{tr} > \alpha$

Duesenberry's RIH argues that consumption and saving are dependent on: (i) the consumption of households one interacts with, since their consumption of superior quality goods provokes a desire to consume similar goods at the expense of saving; and (ii) one's previous level of consumption through habit formation. People are more likely

to interact with others who have similar demographic characteristics, implying there is a smaller demonstration effect between demographic groups than within demographic groups. Hence $\alpha_x < \alpha$ and $\alpha_z < \alpha$. Transitory income determines the deviation of income from habit level and directly impacts the level of saving. Hence $\alpha_{tr} > \alpha$.

These predictions are tested in the next section.

3.3 Data and Results

The dataset is the Federal Reserve Board's Survey of Consumer Finances, which is a triennial survey of the balance sheet, pension, income and other demographic characteristics of U.S. families. The surveys included in the analysis are the ones from 1995 to 2007. The data is purely cross-sectional since households are not tracked over time. Wealthy households are over-represented in the survey and weights are provided to adjust for this.[5] The variables used in the analysis are presented in the Appendix and summary statistics are presented in Table 1. Of note:

1) The savings measure is an indicator of whether the household saved in the last year. This ties in with the concept of successfully saving.

2) The main income measure is log income per person in the household. When dealing with household income researchers often use logarithms. Income is normalized by household size in order to give economic significance to the number of children–when a family increases in size, income per person falls and the family becomes less likely to save. Alternate specifications with only log income are also presented. In this case, family size has less economic significance and it is included as a control variable.

3) Transitory income is separated into positive and negative components in the first stage regression and the coefficients are then used for a combined measure in the second stage regression. This corrects for bias in respondent's answers and increases the power of transitory income in the second stage. While the first stage coefficient on Low Income is close to unity, the coefficient on High Income is less than unity.[6] This may reflect some households being slow to increase their "normal income" estimate in the face of a generally rising income level.

4) Employment status is not included in the analysis. Unemployment impacts both social status and transitory income, and retirement impacts both social status and life

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[5]All the analysis uses the supplied weights. The survey data also include 5 implicates for each observation. Consistent with many authors (reviewed in Lindamood, Hanna & Bi 2007), I just use the first implicate. The results are not materially different when using other implicates.

[6]Significantly so at the 5% level in two of four specifications.

cycle income. The transitory income measure should capture the income effect of employment status for workers, but the effects on social status and among retirees are not captured. Including employment status as a social status variable increases the power of social status in all specifications, but it is not included due to the possible confounding effect on transitory income and life cycle income.

5) Single parenthood is a confound since it is related to number of children, it may lead to status loss, and it may result from impatience. Hence it is included as a control variable. Interestingly, when the analysis is restricted to single parents, the results are consistent with the other specifications.[7]

The empirical method is to estimate Eq.(3.5) in the first stage and Eq.(3.7) in the second stage, with slight adjustment for the decomposition of transitory income into positive and negative components. The first stage regression is presented in Table 2 and the second stage in Table 3. All standard errors are robust and clustered by year. Four cases are presented, with the first and third only including households where the household head is aged below 65, and the second and fourth including households irrespective of age. The first two cases use Log Income per Person as the dependent variable in the first stage regression and include Kids as a life cycle variable. The second two cases use Log Income as the dependent variable in the first stage and include Kids as a control variable.

Table 2 highlights that there is no lack of power associated with any of the independent variables–all are strongly predictive of the dependent variables. Table 3 highlights the relative strength of the different income components, with Status Income appearing strongest, followed by Transitory Income, Idiosyncratic Income, and finally Life Cycle Income which is not significantly different from zero in three of the four specifications.

The next step is to formally compare the coefficients in Table 3. One-sided tests are necessary to test the hypotheses from the previous section. This is presented in Table 4. The test findings are:

a) Reject $\alpha_x \leq \alpha$ at the 1% level in all four specifications. Status Income is significantly more predictive of savings than Idiosyncratic Income.

b) Reject $\alpha_z \geq \alpha$ at the 1% level in three specifications and at the 5% level in the fourth specification. Life Cycle Income is significantly less predictive of savings than Idiosyncratic Income.

c) Reject $\alpha_{tr} \leq \alpha$ at the 5% level in all four specifications. Transitory Income is significantly more predictive of savings than Idiosyncratic Income.

The Status and Impulsiveness Hypothesis is the only theory consistent with finding (a), which is also the strongest of the three findings. The SIH correctly predicts finding

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[7]Results not shown.

(b), but is silent on finding (c). The Permanent Income Hypothesis correctly predicts finding (c) but fails on finding (a). The Life Cycle Hypothesis fails on findings (a) and (b). The combined Life Cycle / Permanent Income Hypothesis correctly predicts finding (c) but fails on findings (a) and (b). Finally, the Relative Income Hypothesis correctly predicts findings (b) and (c) but fails on finding (a).[8]

The next step is to determine the relative contribution of each component of income towards explaining the income-savings relationship. I utilize a natural method based on a property of the coefficient of determination, R^2 (see Maddala 1992:131-132). In particular, for an OLS regression of the form:

$$y_i = \beta x_i + \varepsilon_i$$

the coefficient of determination can be written:

$$R^2 = \sum_j \hat{\beta}_j \frac{Cov\,(x_j, y)}{Var\,(y)}$$

This allows a decomposition of R^2 into the contribution from each independent variable. This analysis is presented for the four components of income in Table 5.[9]

Status Income makes the strongest contribution towards the Income-Savings relationship, followed by Idiosyncratic Income, Transitory Income, and Life Cycle Income. Under the SIH, both Status Income and Idiosyncratic Income predict savings behavior. Hence if we combine these two measures, then the SIH explains about 85% of the Income-Savings relationship, the PIH about 14% of the relationship, and the LCH about 1% of the relationship.

3.4   Discussion

Since the 1950s, the Life Cycle and Permanent Income Hypotheses have dominated economic thought concerning the reasons why the poor are less likely to save.[10] These two theories appear highly plausible from the standard economic perspective, especially when one considers the higher precautionary savings motive of the poor–they have higher income volatility and medical expense risk (Hubbard, Skinner, & Zeldes 1995). Slight

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[8]If the reader would like a pseudo-scientific score (with correct prediction = +1, incorrect prediction = -1 and no prediction = 0), then the SIH wins 2 points, the RIH 1 point, the PIH 0 points, the combined LCPIH -1 point, and the LCH -2 points.

[9]The remainder of R^2 in Table 3 derives from the control variables.

[10]See, for example, Romer (2005).

modifications of these theories have been suggested over the years. For example, Carroll (1992, 1997) and Deaton (1991) argue that consumers hold a small target buffer stock of savings to hedge against minor income and expenditure shocks. While such a buffer stock model may be accurate for some households, it does not explain the extremely small savings stock of the poor, nor the extremely large savings stock of the rich.

An alternate approach, and one represented here, is to view savings as a self-control problem–an issue of impulsiveness. I have provided evidence that impulsiveness and social status are correlated, including tantilizing evidence for causation in both directions. The high status, rich households have the least problem with self control and so their level of saving is closest to their ideal. For other households, and especially the low status, poor households, the level of saving falls far short of their ideal. With this approach, almost everyone wants more savings, in a similar way that they want a pay rise. Unfortunately, most people are unable to achieve this.

The evidence in this chapter is that status characteristics and idiosyncratic income stongly predict savings behavior, consistent with the Status and Impulsiveness Hypothesis. Transitory income predicts savings behavior more weakly, which is consistent with most theories of savings and income. Life cycle income has a very weak impact on savings, which undermines the LCH.

The rejection of the LCH is consistent with much of the literature (reviewed in Browning & Crossley 2001). For most households, income tracks consumption closely over the life cycle, including a large fall in consumption around the time of retirement. This pattern is difficult to reconcile with a strict interpretation of Modigliani & Brumberg (1954).

The weak evidence in favor of the PIH is also consistent with the literature (reviewed in Browning & Lusardi 1996). Households are more likely to save out of transitory income than permanent income, implying income smoothing over short time horizons. However, this finding is also consistent other theories, including the Relative Income Hypothesis and the SIH. A strict interpretation of Friedman's (1957) PIH is not supported since transitory income explains only a small part of the cross-section of income and savings.

Due to similarities between the RIH and the SIH, the evidence to distinguish them is more subtle. Both theories are based on the social comparisons of households, with the RIH based on social comparison in the consumption of positional goods, and the SIH based on social comparison in terms of social status. The SIH is the broader theory, recognizing that positional goods are but one facet of social status determination. It is the broader elements of social status, including education, profession, and race, that allow us to distinguish the RIH from the SIH. In particular, the RIH implies these broader elements should be less significant than idiosyncratic income since people tend

to interract with others with similar status characteristics.[11] In contrast, the SIH implies these broader elements should be more significant since they lead to status both directly and indirectly through their effect on income. In this regard, the SIH finds empirical support while the RIH does not.

Alternate arguments consistent with the presented evidence must also be considered. Most of these arguments focus on either status characteristics or idiosyncratic income and so they are less elegant than the SIH.

The first argument is that the structure of the welfare state discourages saving by low income groups, and if this negative incentive were removed then the savings behavior would be consistent with the standard economic perspective (e.g., Hubbard, Skinner, & Zeldes 1995). For example, many assistance programs have maximum savings limits as part of their eligibility requirements This argument can be challenged on several grounds: (i) Recent welfare reforms that have removed or increased savings limits appear to have had very little impact on the savings of the poor (Hurst & Ziliak 2006; McKernan & Ratcliffe 2007); (ii) The relationship between income and savings predates the establishment of the welfare state (Fisher 1930; James, Palumbo & Thomas 2007). Indeed, the welfare state was established partly in response to the failure of the poor to save adequately to cover unemployment risk, retirement, or health care costs; and (iii) The argument does not recognize that middle income groups, who are unlikely welfare recipients, are much less likely to save than high income groups.

The second argument is that education, profession, and race indicate that people have a "taste" for more or less savings (Mayer 1972), including savings that are passed on to future generations as bequests. This approach is based on the revealed preference paradigm, effectively arguing that many people have no taste for savings because they are observed not to save. Unfortunately this approach precludes inconsistent preferences like quasi-hyperbolic discounting. It also suggests that low status people could just as easily have a high taste for savings, while the evidence for causality in both directions implies this is not correct. Also, in contrast to the bequest argument, Hurd (1987) finds the existence of adult children does not affect the savings pattern of elderly households.[12]

The third argument is that low status individuals tend to die younger and so should rationally save less.[13] This builds on the social gradient in health literature (reviewed in

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[11]If other over-educated people are buying new cars, that will provoke more envy in me than the purchases of under-educated people. I am less likely to interract with the latter group, and I am also less concerned about our relative consumption of positional goods since our different education levels already creates a status differential.

[12]Furthermore, from Table 3, the presence of dependent children makes non-elderly households somewhat less likely to save.

[13]For this argument among retirees, see De Nardi, French & Jones (2009).

Marmot 2004). Going against this argument is: (i) The difference in the wealth-income ratio of different educational groups is much larger than the difference in life expectancy (Hubbard, Skinner & Zeldes 1995); and (ii) The lower status groups should then follow a shorter life cycle path of saving but, as demonstrated earlier, life cycle considerations have little impact on savings decisions.

The final argument is that education causes people to focus more on the long term or to become better at retirement planning.[14] In support of this, people who are more financially literate are more likely to save (Hilgert, Hogarth & Beverly 2003). However going against this argument, as education levels in the developed world have increased there is little evidence for aggregate savings levels increasing. Instead, the relative level of education appears to predict savings in the cross-section, consistent with its role as a status characteristic. Also, one would expect people who save to devote effort towards becoming financially literate, suggesting causation from savings to financial literacy.

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[14]For example, Becker & Mulligan (1997) argue that education improves people's ability to "imagine" the future.

3.5   Appendix

The variables used in the analysis are:

Saved. A binary variable coded as: 1 = After adjusting for durables purchases / investments, the household's spending was less than income in the past year; 0 = Otherwise.

Income. The natural logarithm of the houshold's total income for the previous calendar year. It includes wages, self-employment and business income, taxable and tax-exempt interest, dividends, realized capital gains, food stamps and other support programs provided by the government, pension income and withdrawals from retirement accounts, Social Security income, alimony and other support payments, and miscellaneous sources of income. Households with total income less than $1,000 are excluded from the analysis (215 observations).

Income per Person. The household's income divided by household size, expressed as a logarithm. Household size is calculated as household head plus partner plus dependent children.

Profession. The highest current or past occupation of the household head and the partner. For both the household head and the partner, their profession is coded as: 3 = Managerial/professional (4-digit occupation codes: 10-200, 220-1530, 1600-1860, and 2000-3650); 2 = Office/sales/technical (4-digit occupation codes 1540-1560, 1900-1960, 4700-5930, and 7900); and 1 = Other. The *Profession* variable is the highest profession code of household head and partner for: current job (if working full-time), longest full-time job ever had (if working full-time or part-time), and last full-time job (if not working). If a profession code is not recorded on any of these measures, the household is excluded from the analysis (664 observations).

Education. The highest educational level achieved by the household head and the partner. Coded as: 4 = Post-graduate degree; 3 = Bachelor's degree; 2 = Associate's and other junior college degree; 1 = Completed 12th grade; 0 = Other.

Minority. The respondent's self-rated ethnicity. Coded as 1 = black, African-American, Hispanic or Latino; 0 = Other. Note ethnicity information was not collected for the respondent's partner.

Age. The household head's age.

Age2. Age-squared.

Kids. Number of dependent children.

Normal Income. The natural logarithm of the household's stated normal level of income. Households with a normal level of income less than $1,000 are excluded from the analysis (6 observations).

Transitory Income. Calculated as: *Income - Normal Income*, Winsorized at the (0.99,0.01) level.

High Income. Positive transitory income: max(0, *Transitory Income*).

Low Income: Negative transitory income: max(0, -*Transitory Income*).

Single Parent. Coded as: 1 = Respondent is living with dependent children and without a partner; 0 = Otherwise.

Education Loan. Coded as: 1 = Household has outstanding education loans; 0 = Otherwise.

Bibliography

[1] Ainslie, George, 1975, Specious reward: A behavioral theory of impulsiveness and impulse control, *Psychological Bulletin* 82(4): 463-496

[2] Ashraf, Nava, Dean Karlan & Wesley Yin, 2006, Tying Odysseus to the mast: Evidence from a commitment savings product in the Philippines, *Quarterly Journal of Economics* 121(2): 635–672

[3] Becker, Robert A., 1980, On the long-run steady state in a simple dynamic model of equilibrium with heterogeneous households, *Quarterly Journal of Economics* 95, 375-382

[4] Becker, Gary S. & Casy B. Mulligan, 1997, The endogenous determination of time preference, *Quarterly Journal of Economics* 112, 729-758

[5] Berger, Joseph, Bernard P. Cohen & Morris Zelditch, Jr, 1972, Status characteristics and social interaction, *American Sociological Review* 37: 241-255

[6] Bernheim, B. Douglas, Jonathan Skinner & Steven Weinberg, 2001, What accounts for the variation in retirement wealth among US households? *American Economic Review* 91(4): 832-857

[7] Browning, Martin & Thomas F. Crossley, 2001, The life-cycle model of consumption and saving, *Journal of Economic Perspectives* 15(3): 3-22

[8] Browning, Martin & Annamaria Lusardi, 1996, Household saving: Micro theories and micro facts, *Journal of Economic Literature* 34(4): 1797-1855

[9] Carroll, Christopher D., 1992, The buffer-stock theory of saving: Some macroeconomic evidence, *Brookings Papers on Economic Activity* 2(1992): 61-135

[10] Carroll, Christopher D., 1997, Buffer-stock saving and the life cycle/permanent income hypothesis, *Quarterly Journal of Economics* 112(1): 1-55

[11] Deaton, Angus, 1991, Saving and liquidity constraints, *Econometrica* 59(5): 1221-1248

[12] De Nardi, Mariacristina, Eric French & John Bailey Jones, 2009, Life expectancy and old age savings, *American Economic Review* 99(2): 110-115

[13] Duckworth, Angela L. & Martin E.P. Seligman, 2005, Self-discipline outdoes IQ in predicting academic performance in adolescents, *Psychological Science* 16, 939-944

[14] Duesenberry, James S., 1949, *Income, Saving, and the Theory of Consumer Behavior*, Cambridge: Harvard University Press

[15] Dynan, Karen E., Jonathan Skinner & Stephen P. Zeldes, 2004, Do the rich save more? *Journal of Political Economy* 112, 397-444

[16] Faunce, William A.& M. Joseph Smucker, 1966, Industrialization and community status structure, *American Sociological Review* 31(3): 390-399

[17] Fisher, Irving, 1930, *The Theory of Interest*, New York: Macmillan

[18] Friedman, Milton, 1957, *A Theory of the Consumption Function*, Princeton: Princeton University Press

[19] Gul, Faruk & Wolfgang Pesendorfer, 2004, Self-control and the theory of consumption, *Econometrica*, 72(1): 119-158

[20] Hauser, Robert M. & John Robert Warren, 2007, Socioeconomic indexes for occupations: A review, update, and critique, *Sociological Methodology* 27: 177-298

[21] Hilgert, Marianne A., Jeanne M. Hogarth & Sondra G. Beverly, 2003, Household financial management: The connection between knowledge and behavior, *Federal Reserve Bulletin* 89: 309-322

[22] Hirsch, Fred, 1976, *The Social Limits to Growth*, Cambridge: Harvard University Press

[23] Hubbard, R. Glenn, Jonathan Skinner & Stephen P. Zeldes, 1995, Precautionary saving and social insurance, *Journal of Political Economy* 103(2): 360-399

[24] Hurd, Michael D., 1987, Savings of the elderly and desired bequests, *American Economic Review* 77(3): 298-312

[25] Hurst, Erik & James P. Ziliak, 2006, Do welfare asset limits affect household saving? Evidence from welfare reform, *Journal of Human Resources* 41(1): 46-71

[26] Huggett, Mark & Gustavo Ventura, 2000, Understanding why high income households save more than low income households, *Journal of Monetary Economics* 45(2), 361-397

[27] James, John A., Michael G. Palumbo & Mark Thomas, 2007, Consumption smoothing among working-class American families before social insurance, *Oxford Economic Papers* 59(4): 606-640

[28] Laibson, David, 1997, Golden eggs and hyperbolic discounting, *Quarterly Journal of Economics* 112, 443-477

[29] Laibson, David, 1998, Life-cycle consumption and hyperbolic discount functions, *European Economic Review* 42(3-5): 861-871

[30] Lawrance, Emily C., 1991, Poverty and the rate of time preference: Evidence from panel data, *Journal of Political Economy* 99, 54-77

[31] Maddala, G.S., 1992, *Introduction to Econometrics*, New York: Macmillan

[32] Marmot, Michael, 2004, *The Status Syndrome: How Social Standing Affects our Health and Longevity*, New York: Times Books, Henry Holt and Company

[33] Mayer, Thomas, 1972, *Permanent Income, Wealth, and Consumption: A Critique of the Permanent Income Theory, the Life-Cycle Hypothesis, and Related Theories*, Berkeley: University of California Press

[34] McKernan, Signe-Mary & Caroline Ratcliffe, 2007, The effects of welfare and IDA program rules on the asset holdings of low-income families, *Urban Institute Working Paper*

[35] Mischel, Walter, 1996, From good intentions to willpower, in *The Psychology of Action: Linking Cognition and Motivation to Behavior*, eds. P.M. Gollwitzer and J.A. Bargh, 197-218. New York: Guilford Press

[36] Modigliani, Franco & Richard Brumberg, 1954, Utility analysis and the consumption function: An interpretation of cross section data, in *Post-Keynesian Economics*, ed. K. Kurihara, New Brunswick: Rutgers University Press

[37] Phelps, E. S. & R. A. Pollak, 1968, On second-best national saving and game-equilibrium growth, *The Review of Economic Studies* 35(2): 185-199

[38] Ramsey, Frank P., 1928, A mathematical theory of saving, *The Economic Journal* 38, 543-559

[39] Reimers, Stian, Elizabeth A. Maylor, Neil Stewart & Nick Chater, 2009, Associations between a one-shot delay discounting measure and age, income, education and real-world impulsive behavior, *Personality and Individual Differences* 47(8): 973-978

[40] Romer, David, 2005, *Advanced Macroeconomics*, New York: McGraw-Hill

[41] Thaler, Richard, 1981, Some empirical evidence on dynamic inconsistency, *Economics Letters* 8(3): 201-207

[42] Tobacman, Jeremy, 2009, Endogenous effective discounting, credit constraints, and wealth inequality, *American Economic Review*, 99(2): 369–373

[43] Veblen, Thorstein, 1899, *The Theory of the Leisure Class*, New York: The Modern Library

[44] Warner, John T. & Saul Pleeter, 2001, The personal discount rate: Evidence from military downsizing programs, *American Economic Review* 91, 33-53

Table 3.1: Summary Statistics

This table presents summary statistics for the dataset. The source is the Survey of Consumer Finances, years 1995-2007, first imputation, weighted. See the Appendix for the definition of variables.

Households	Age <65 Yrs		All Ages	
Variable	Mean	Std Deviation	Mean	Std Deviation
Saved	0.585	0.493	0.578	0.494
Income per Person	9.84	0.97	9.83	0.95
Income	10.66	0.95	10.57	0.97
Profession	2.26	0.82	2.22	0.83
Education	1.89	1.28	1.80	1.30
Minority	0.222	0.415	0.201	0.401
Age	42.40	11.52	48.98	16.86
Age2	1931	987	2683	1793
Kids	1.016	1.208	0.834	1.149
High Income	0.0412	0.1528	0.0424	0.1576
Low Income	0.0911	0.2501	0.0793	0.2345
Single Parent	0.118	0.323	0.104	0.305
Education Loan	0.160	0.367	0.130	0.336
Number of Observations	16,824	16,824	21,098	21,098

Table 3.2: First Stage Regressions

This table presents the first stage regressions. The status variables x_i are Profession, Education, and Minority. The life cycle variables z_i are Age, Age2, and, for Cases I and II, Kids. The transitory income variables $y_{tr,i}$ are High Income and Low Income. The controls w_i are Single Parent, Education Loan, Year, and, for Cases III and IV, Kids. The regressions are weighted, robust t-statistics clustered by year are shown in parentheses, and 2-tailed significance levels are *=5%; **=1%.

$$y_i = \beta_x x_i + \beta_z z_i + \beta_{tr} y_{tr,i} + \beta_w w_i + \varepsilon_i$$

Case	I	II	III	IV
Households	Age <65 Yrs	All Ages	Age <65 Yrs	All Ages
Dependent Variable	Log(Income per Person)		Log(Income)	
Profession	0.195**	0.204**	0.244**	0.250**
	(38.15)	(45.08)	(28.81)	(35.35)
Education	0.209**	0.209**	0.215**	0.219**
	(20.41)	(24.53)	(17.31)	(21.66)
Minority	-0.188**	-0.200**	-0.217**	-0.232**
	(-14.80)	(-14.64)	(-12.99)	(-16.20)
Age	0.079**	0.056**	0.081**	0.065**
	(17.30)	(32.00)	(15.17)	(30.22)
Age2	-0.001**	-0.001**	-0.001**	-0.001**
	(-16.74)	(-34.24)	(-14.17)	(-32.12)
Kids	-0.321**	-0.308**	0.086**	0.098**
	(-60.30)	(-63.93)	(21.10)	(21.38)
High Income	0.769**	0.790**	0.760**	0.807**
	(9.14)	(10.41)	(9.10)	(11.11)
Low Income	-0.991**	-0.953**	-1.058**	-1.015**
	(-40.77)	(-51.29)	(-42.56)	(-50.53)
Single Parent	-0.308**	-0.285**	-0.454**	-0.425**
	(-9.11)	(-9.10)	(-12.88)	(-12.65)
Education Loan	-0.131**	-0.127**	-0.115**	-0.113**
	(-9.08)	(-8.89)	(-6.92)	(-7.12)
Constant	7.495**	7.900**	7.748**	8.011**
	(83.24)	(174.00)	(72.09)	(166.99)
Year Dummies	Yes	Yes	Yes	Yes
Number of Observations	16,824	21,098	16,824	21,098
R2	55.77%	52.11%	49.97%	49.53%

Table 3.3: Second Stage Regressions

This table presents the second stage regressions using the estimated β coefficients and ε_i from Table 2. The dependent variable is an indicator of whether the households saved in the previous year. For Status Income, the variables x_i are Profession, Education, and Minority. For Life Cycle Income, the variables z_i are Age, Age2, and, for Cases I and II, Kids. For Transitory Income, the variables $y_{tr,i}$ are High Income and Low Income. The controls w_i are Single Parent, Education Loan, Year, and, for Cases III and IV, Kids. The regressions are weighted, robust t-statistics clustered by year are shown in parentheses, and 2-tailed significance levels are *=5%; **=1%.

$$s_i = \alpha_x \hat{\beta}_x x_i + \alpha_z \hat{\beta}_z z_i + \alpha_{tr} \hat{\beta}_{tr} y_{tr,i} + \alpha \varepsilon_i + \delta_w w_i + \epsilon_i$$

Case	I	II	III	IV
Households	Age <65 Yrs	All Ages	Age <65 Yrs	All Ages
1st Stage Dep Variable	Log(Income per Person)		Log(Income)	
Status Income	0.263**	0.268**	0.241**	0.238**
	(52.43)	(47.25)	(52.11)	(40.02)
Life Cycle Income	0.028	0.036	-0.043	0.061*
	(1.60)	(2.29)	(-0.74)	(3.06)
Transitory Income	0.197**	0.194**	0.191**	0.186**
	(11.66)	(14.58)	(10.83)	(14.24)
Idiosyncratic Income	0.136**	0.133**	0.145**	0.143**
	(15.28)	(19.42)	(22.05)	(32.43)
Kids			-0.012*	-0.009
			(-2.88)	(-1.96)
Single Parent	-0.108**	-0.094**	-0.105**	-0.098**
	(-7.44)	(-8.13)	(-8.70)	(-9.08)
Education Loan	-0.090**	-0.083**	-0.095**	-0.082**
	(-6.11)	(-4.73)	(-7.64)	(-4.70)
Constant	0.380**	0.360**	0.502**	0.312**
	(13.90)	(20.74)	(4.79)	(11.10)
Year Dummies	Yes	Yes	Yes	Yes
Number of Observations	16,824	21,098	16,824	21,098
R2	11.02%	10.87%	11.86%	11.68%

Table 3.4: Testing Differences in Second Stage Coefficients

This table tests the difference between coefficient estimates from Table 3. The regressions are weighted, robust t-statistics clustered by year are shown in parentheses, and 1-tailed significance levels are *=5%; **=1%.

Case	I	II	III	IV
Households	Age <65 Yrs	All Ages	Age <65 Yrs	All Ages
Dependent Variable	Log(Income/Person)		Log(Income)	
Status Inc - Idsyn Inc	0.13**	0.14**	0.10**	0.10**
	(13.82)	(11.17)	(12.99)	(9.24)
Life Cycle Inc - Idsyn Inc	-0.11**	-0.10**	-0.19*	-0.08*
	(-4.69)	(-5.04)	(-3.04)	(-3.81)
Transitory Inc - Idsyn Inc	0.06*	0.06*	0.05	0.04*
	(3.22)	(3.37)	(2.64)	(2.78)

Table 3.5: Explanatory Power of Each Income Measure

This table presents the contribution of each Income measure towards the regression R^2 in Table 3. For each income measure $\hat{\beta}_j x_j$ the contribution is calculated as:

$$\hat{\alpha}_j \frac{Cov\left(\hat{\beta}_j x_j, y\right)}{Var\left(y\right)}$$

Case	I	II	III	IV
Households	Age <65 Yrs	All Ages	Age <65 Yrs	All Ages
Dependent Variable	Log(Income per Person)		Log(Income)	
Panel A. Contribution of each Income measure towards R^2				
Status Income	4.97%	5.34%	5.07%	5.30%
Life Cycle Income	0.14%	0.16%	0.05%	0.13%
Transitory Income	1.56%	1.31%	1.60%	1.33%
Idiosyncratic Income	3.17%	3.16%	3.92%	3.93%
Total	9.85%	9.98%	10.64%	10.70%
Panel B. Relative Contributions				
Status Income	50.5%	53.5%	47.6%	49.5%
Life Cycle Income	1.4%	1.6%	0.4%	1.2%
Transitory Income	15.9%	13.2%	15.1%	12.5%
Idiosyncratic Income	32.2%	31.7%	36.8%	36.8%
Total	100.0%	100.0%	100.0%	100.0%