Debt Aversion: Anomalous in Theory, Advantageous in Practice

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Abstract

In three laboratory studies we measure individual differences in debt aversion, and show that this measure may help explain three well-established classes of anomalous behavior in the intertemporal choice literature. In particular, individuals high in debt aversion also exhibit: (1) negative interest rates for losses; (2) greater patience for losses compared to gains (the gain-loss asymmetry); and (3) greater patience for borrowing compared to saving (the borrowing-saving asymmetry). Meanwhile, in a field study we find that individuals who report higher levels of debt aversion also tend to have better credit scores, suggesting that a stronger preference to avoid debt may have benefits outside the laboratory. We conclude with a discussion in which we advance an interpretation that reconciles the laboratory and field results.

Keywords: Debt Aversion, Intertemporal Discounting, Borrowing, Saving, Credit Score

Casual observation suggests that people display varying attitudes towards debt. Some people appear comfortable with debt, for instance financing purchases whenever appealing terms are available. Others appear uncomfortable with debt, for instance paying in full rather than taking advantage of zero percent financing.

While aversion to debt may appear natural to some people, it is inconsistent with standard economic analysis. Social scientists have typically invoked the assumption that people discount future outcomes, affording less weight to upcoming gains and losses the further away they are in time. Such a perspective is intuitive: Because we live in the present, the future has less impact on us, especially when it is more distant. Yet, if outcomes are discounted more the further they are in the future, then people should generally prefer to make payments as late as possible—a manifestation of *debt tolerance*. In fact, debt tolerance is predicted by any model in which discounting is positive and monotonically increasing with time, whether discounting is treated as exponential (Samuelson, 1937), (quasi-) hyperbolic (Angeletos et al., 2001; Laibson, 1997; Loewenstein & Prelec, 1992), arithmetic (Killeen, 2009), or a direct tradeoff between "more later" and "less sooner" (Dai & Busemeyer, 2014; Ericson et al., 2015; Scholten & Read, 2010).

In this paper we assert that debt tolerance may not be as universal as standard discounting models predict. Even if people take on debt in practice due to liquidity constraints, they may treat "debt" as inherently unappealing. For instance, in laboratory studies, people are more reluctant to accept the option of gaining money now and losing money later if that option is labeled as a "loan" than if it is labeled as a "contract" (Caetano, Patrinos, & Palacios, 2011). In the field, many people avoid using a credit card whose balance they are able to pay down in full each month, even though using it is tantamount to an interest free loan (Cho & Rust, 2013). Likewise, large numbers of (especially young) people do not have any credit cards, possibly because they

are reluctant to experience even momentary indebtedness (Bankrate.com, 2014). Moreover, numerous studies have found that people substantially underreport their degree of indebtedness (Gross & Souleles, 2002; Karlan & Zinman, 2008; Zinman, 2009), suggesting debt is viewed as socially undesirable.

In this paper we discuss behavioral implications of variations in debt attitude, and specifically show that debt aversion can help to explain the following three well-studied intertemporal anomalies:

Negative discounting for losses: Many people prefer to incur a loss as soon as possible, and therefore require a premium to postpone making payments (Hardisty, Appelt, & Weber, 2013; Scholten et al., 2016; Yates & Watts, 1975). This finding might also be interpreted as an expression of debt aversion.

Gain-loss asymmetry (Loewenstein & Prelec, 1992): Most people are more patient when choosing between future losses at different time periods than when choosing between future gains. Our interpretation is that delayed losses or payments tend to be construed as debts, since they are obligations to pay money in the future, and that people who are debt averse will generally prefer to incur the loss as soon as possible (for a related argument, see Loewenstein & Thaler, 1989).

Borrowing-saving asymmetry: People's discount rates are typically lower for borrowing than saving (Prelec & Loewenstein, 1998; Meissner, 2016). If people with more debt averse attitudes discount future losses less than gains, then they will generally be more willing to give up a smaller amount of money today (in exchange for gaining a larger

amount of money in the future) than they would be to give up a larger amount of money in the future (in exchange for gaining smaller amount of money today).

Although debt averse individuals may tend to exhibit "anomalous" behavior, meaning behavior at odds with standard economic analysis, it may nevertheless provide some benefit to people when making every day financial decisions. It is well known that people tend to be impatient, and seek to take immediate over deferred gratification. One way to fund that gratification is by taking on more debt. Debt aversion may act to constrain people's tendency to fund myopic consumption through over-borrowing. Consequently, we predict that people who are debt averse are likely to have higher credit scores, as these scores provide a composite measure of an individual's financial situation with higher scores indicating that a person is less likely to default on his or her payment obligations. In short, whereas debt aversion may be associated with anomalous behavior in the laboratory, it may also promote more disciplined financial behavior in the outside world.

STUDY 1: NEGATIVE DISCOUNTING FOR LOSSES

In Study 1, we examine the relationship between debt aversion and time preference for losses. Debt aversion is expressed on a four-item scale, which we call the Debt Attitude Scale (DAS). We test the hypothesis that greater debt aversion is associated with a greater tendency to prefer making payments sooner rather than later, and thus exhibit a negative discount rate for losses. We examine these effects while controlling for loss aversion, impulsiveness and spendthriftiness. We also compare the predictive validity of the DAS with that of a widely used

scale developed to assess debt attitudes among students (Davies & Lea, 1995, which we will refer to as the Davies and Lea debt scale--DLDS).

Participants

We recruited 372 participants on Amazon Mechanical Turk to participate in a brief study in exchange for $0.60 each. Their average age was 35 years, and 57% were male. We dropped 31 participants (9.0%) who failed to converge on a discount rate in either trial of our titration task, suggesting they misunderstood the task or were not paying attention. We further planned in advance to drop participants whose discount rate, averaged across both trials, exceeded 500%, because this degree of discounting appeared non-credible and we surmised that it reflects misunderstanding of the task. We note that prior studies of discounting have usually capped discount rates, generally at 200% to 800% (e.g., Hardisty, Appelt & Weber, 2013; Meier & Sprenger, 2012; Read, 2001; Weber et al., 2007). In our case no participant expressed a discount rate above 500% and so none were dropped from the sample.

Procedure

Participants completed six tasks: A titration task to measure discount rates for monetary losses, the DLDS, the DAS, a titration task to measure loss aversion, the Barratt Impulsiveness Scale (Patton & Stanford, 1995), and the Spendthrift-Tightwad scale (Rick, Cryder, & Loewenstein, 2008). Because it was our key dependent measure, we always presented the loss-discounting task first, and then presented all other measures in random order.

Loss discounting task. Participants completed two trials in which they chose between making a payment today and making a different payment in twelve months. For Trial 1 the

payment today was fixed at $50 and for Trial 2 it was fixed at $500. The order of these trials was randomized. For each trial, participants answered a series of questions like the following:

> *You are scheduled to make a payment of $50 today. You can pay $50 today as planned, or instead choose to pay $100 in 12 months.*
>
> *Would you accept this option to delay? (Yes/No)*

Each time a participant rejected an offer to delay, the next offer entailed a smaller future payment (e.g., $75 in 12 months). Each time a participant accepted an offer to delay, the next offer entailed a larger future payment (e.g., pay $125 in 12 months). These adjustments in the later amount allowed us to establish an indifference point, by following the PEST algorithm (Parameter Estimation by Sequential Testing, Taylor & Creelman, 1967; Findlay, 1978): (1) The step size was reduced each time the direction of change was reversed; (2) the step size remained the same for the second step in a given direction; (3) for each step beyond the second in a given direction, the step size was doubled. The advantage of the PEST procedure is that the early choices do not constrain the range of possible indifference points, as is the case with other titration methods.

All trials began with a choice between paying $50 sooner or $100 later in Trial 1 and between paying $500 sooner or $1,000 later in Trial 2. The first step size was $25 for Trial 1 and $250 for Trial 2, and the trial was judged to converge when the step size dropped below $20 for Trial 1 and $200 for Trial 2. We calculated the final amount as the midpoint between the last delayed payment rejected and the last delayed payment accepted. We estimated the discount rate by subtracting the fixed sooner amount from the final later amount and dividing by the fixed sooner amount. For example, if a participant expressed indifference between paying $500 today or $750 in 12 months, the discount rate was calculated to be ($750-$500)/$500 = 50%. If a participant failed to converge after 15 choices, the trial data were excluded from our analysis.

Debt Attitude Scale (DAS). This is a short, 4-item scale (see Table 1) of our own construction. These four items were selected based on face validity similar to the development procedure of other financial attitude scales (see Rick, Cryder, & Loewenstein, 2008). The scale only includes statements about "debt," more specifically, about holding and paying debt. It does not refer to decision theoretic constructs such as losses and gains, discount rates, or intertemporal tradeoffs. Furthermore, it does not refer to specific kinds of debt, like student debt or consumer debt. Finally, it does not refer to debt-generating vehicles like credit or loans, and credit cards. Our intention is to get a "clean" assessment of debt attitude, undistracted by other financial or psychological content, along a single evaluative dimension ranging from high in debt aversion (a higher score along the single dimension) to low in debt aversion (a lower score along the single dimension).

Table 1.

The Debt Attitude Scale (DAS)

1. I like to pay my debts as soon as possible.
2. I prefer to delay paying my debts if possible, even if it means paying more in total.
3. Having debt makes me feel uncomfortable.
4. Having debt doesn't bother me.

Responses given on a 7-point rating scale from "Does not describe me at all" to "Perfectly describes me". Items 2 and 4 reverse-coded.

Davies & Lea Debt Scale (DLDS). In addition to the DAS, we also administered the most widely used measure of debt attitudes previously reported in the literature. Davies and Lea's (1995), scale includes 14 items about "debt," "student debt," "borrowing," "overdrafts," and "credit cards," and thus combines attitude toward debt with attitude toward credit or loans. This scale has been used to examine a variety of issues, including debt attitudes and impulsive buying

(Boddington & Kemp, 1999), cultural difference in debt attitudes (Tang, 2004), debt decisions and regret (Lea, Webley & Bellamy, 2001), willingness to take on student loans (Callender & Johnson, 2005), and dependency on student loans (Scott & Lewis, 2001).

Loss-aversion task. Participants made choices to either accept or reject a series of lotteries that offered the prospect of gaining money or else losing money depending on the outcome of a coin flip. All trials began with the prospect of gaining $50 or losing $25, as shown in Figure 1. In Trial 1, the gain amount was fixed at $50 while the loss amount varied, whereas in Trial 2 the loss amount was fixed at $25 while the gain amount varied; the order of these trials was randomized. We obtained an indifference point by titrating the loss in Trial 1 and the gain in Trial 2, using a PEST procedure similar to that used for the time preference elicitation. If a participant rejected the prospect in the Trial 1 offer (e.g., Gain $50; Lose $25), the loss amount was reduced in the next round (e.g., Gain $50; Lose $12.50). If the participant accepted the prospect, the loss amount was increased in the next round (e.g., Gain $50; Lose $37.50).

The first step size was $12.50, and the trial was judged to converge when the step size dropped below $5. We calculated the final amount as the midpoint between the most recent up step and down step. We estimated the loss aversion coefficient by dividing the final gain amount by the final loss and averaging these values over both trials. We then normalized this measure by taking its logarithm. All results reported below hold whether the logarithm or the raw loss aversion coefficient is used.

Fig. 1
Loss Aversion Task (Study 1)

Other control variables. As additional control variables we assessed individual differences in impulsivity using the Barratt Impulsiveness Scale (BIS; Patton & Stanford, 1995) and spendthriftiness using the Spendthrift-Tightwad Scale (STS; Rick, Cryder, & Loewenstein, 2008). Our analysis thus establishes the discriminant validity of debt aversion with respect to these constructs.

Results

Reliability and Validity of the DAS. The DAS exhibited high reliability (Cronbach's $\alpha = .706$). We further examined the psychometric properties of the DAS with an exploratory factor analysis. This analysis yielded one factor with an eigenvalue greater than one. Confirmatory factor analysis subsequently suggested that a single-factor model fit the DAS well, with a Bentler's Comparative Fit Index of .856 and a standardized root mean squared residual of .055. The factor loading estimates (item 1, .687; item 2, .732; item 3, .612, item 4, .446) were all significant (all $p < .001$).

The DLDS exhibited similar reliability to the DAS (Cronbach's $\alpha = .649$). However, an exploratory factor analysis yielded three eigenvalues greater than 1 even though the scale was designed to capture debt attitude as representing a single evaluative dimension.[1] Further, a confirmatory factor analysis suggested that a single-factor model does not fit the DLDS well with a Bentler's Comparative Fit Index of .435 and a standardized root mean squared residual of .116. Three of the items had non-significant factor loadings (item 1, .067; item 2, .092; item 8, -.051.).

Based on the above analysis we conclude that DAS fit a single factor of debt aversion relatively well whereas the DLDS did not. We therefore took DAS as our primary measure of debt aversion. The histogram in Figure 2 displays the distribution of DAS scores, revealing a negatively skewed distribution with most responses reporting debt-averse attitudes. The average score was 5.9, with 91.5% of participants expressing attitudes above the midpoint of the scale (i.e., expressing aversion to debt), and 24.6% expressing maximally debt averse attitudes for all four items.

We next examined the correlation between debt attitudes and other measured variables (Table 2). We note that the DAS was strongly correlated with the DLDS. Both scales were positively correlated with loss aversion and negatively correlated with discount rate for losses, the BIS, and the STS.

[1] Other researchers have also found that the DLDS loads on multiple factors (Haultain, Kemp, & Chernyshenko, 2010).

Table 2.
Correlations between Study 1 Measures

		1	2	3	4	5	6
1	Discount Rate	1					
2	DAS	-0.295	1				
		p<.001					
3	The Davies and Lea's debt scale	-0.188	0.451	1			
		p<.001	*p<.001*				
4	Loss Aversion	-0.153	0.142	0.234	1		
		p=.053	*p=.010*	*p<.001*			
5	Spendthrift-Tightwad- Scale	0.199	-0.256	-0.253	-0.143	1	
		p<.001	*p<.001*	*p<.001*	*p=.050*		
6	Barratt Impulsivity Scale	0.161	-0.416	-0.268	-0.085	0.416	1
		p=.003	*p<.001*	*p<.001*	*p=.123*	*p<.001*	

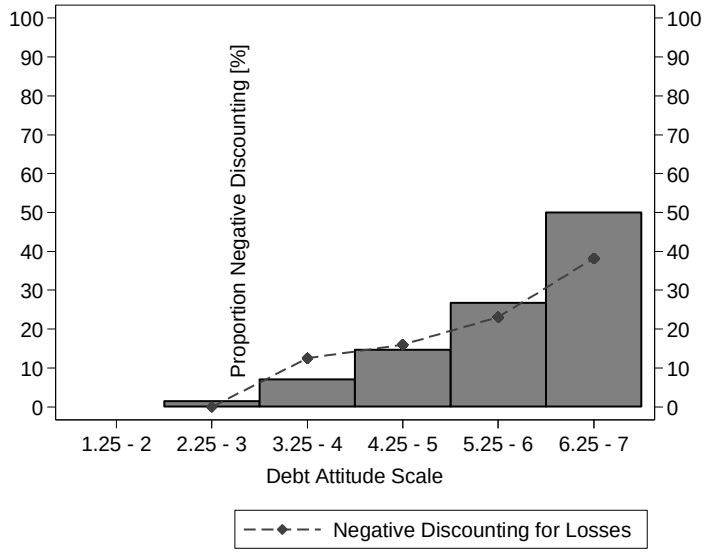
Debt averse attitudes and discount rates. We next examined whether debt aversion as measured on the DAS is associated with lower discount rates for losses when controlling for other measures. We conducted a linear regression in which we predicted discount rate for losses from DAS scores, the DLDS, loss aversion, the BIS, and the STS. This analysis confirmed that debt aversion, as measured by the DAS, is associated with greater patience for losses, b = -.12, 95% CI [-.19, -.06], p < .001. Greater loss aversion was also related to greater patients for losses, b = -.05, 95% CI [-.10, .00], p = .045, whereas discounting was unrelated to debt aversion as measured by the DLDS, b = -.00, 95% CI [-.09, .09], p = .983, impulsivity as measured by the

BIS, b = .01, 95% CI [-.20, .21], p = .957, and spendthriftiness as measured by the STS, b = .02, 95% CI [-.00, .04], p = .081.[2]

Debt averse attitudes and negative discount rates for losses. We next examined whether more debt averse attitudes on the DAS predict whether or not a person displays a negative discount rate for losses (i.e., binarizing the discount rate). The dashed line in Figure 2 tracks the proportion of participants expressing a negative discount rate at different levels of debt aversion for losses. As can be seen in the Figure, negative discount rates were more likely the higher the DAS score. We ran a logistic regression in which we predicted whether or not individuals expressed a negative discount rate for losses from their DAS score, DLDS score, loss aversion coefficient, BIS score, and STS score. This analysis confirmed our prediction that debt averse attitudes, as measured on the DAS, are associated with greater likelihood of negative discounting, b = .44, 95% CI [.10, .77], p = .010, whereas there was a weaker relationship between negative discounting and DLDS score, b = .41, 95% CI [-.01, .82], p = .054, and no relationship with the loss aversion coefficient, b = .08, 95% CI [-.13, .30], p = .446, BIS score, b = -.08, 95% CI [-1.06, .89], p = .862, or STS score, b = -.04, 95% CI [-.13, .06], p = .433.

[2] As a robustness check we re-ran all analyses in this study with a modified version of the DLDS where we removed all of the items mentioning students (items 2, 3, 7, 8, 13). Results were unchanged.

Fig. 2
Histogram of debt attitudes (Study 1)



Discussion

Study 1 confirms our prediction that people expressing more debt averse attitudes are also more likely to exhibit negative discount rates for losses. Our primary measure of debt attitude was the four-item DAS which we propose as an efficient and easy-to-administer instrument, having better reliability and predictive validity than the debt scale advanced by Davies and Lea (1995), which is the most widely used prior measure of debt aversion. We further demonstrate that the DAS well predicts time preferences when controlling for measures of loss aversion, impulsivity, and spendthriftiness.

STUDY 2: GAIN-LOSS ASYMMETRY

In Study 2 we investigate whether high levels of debt aversion also predict the gain-loss asymmetry, specifically, we test whether the difference in discount rates for gains and losses increases with debt aversion.

Participants

We recruited 168 participants on Amazon Mechanical Turk and paid $0.30 each. Their average age was 34.7 years, and 57.5% were male. We excluded 20 participants (11.8%) who failed to converge on a discount rate in our titration task for both loss or both gain trials so that we could not calculate a discount rate. As in Study 1, we planned in advance to drop participants whose discount rate in the gain or the loss domain, averaged across both trials, exceeded 500%. This resulted in dropping an additional 11 participants (6.5%).

Procedure

Participants completed three tasks: the Debt Attitude Scale (DAS), a time preference measure for losses, and a time preference measure for gains. We randomized the order of the loss and gain blocks and the DAS was presented between the two blocks.

Time preference for losses. Participants made the same two series of choices between making a payment today or in 12 months as in Study 1.

Time preference for gains. We presented participants with two trials involving choices to either receive money today or in 12 months. The amounts offered and the titration procedure were the mirror image of those in the loss task. The amount to be received today was held constant at $50 for Trial 1 and $500 for Trial 2, and participants were offered a larger amount at

the later date if they *rejected* a delayed option, and a smaller amount if they accepted it. The PEST procedure was followed.

Debt Attitude Scale. Participants completed the DAS, as in Study 1.

Results

Debt Attitude Scale. As in Study 1, the DAS exhibited high reliability (Cronbach's $\alpha = .770$). The average score was 5.9, with 89.8% of participants expressing attitudes above the midpoint of the scale (i.e., aversion to debt), and 21.2% expressing maximally debt averse attitudes across all four items.

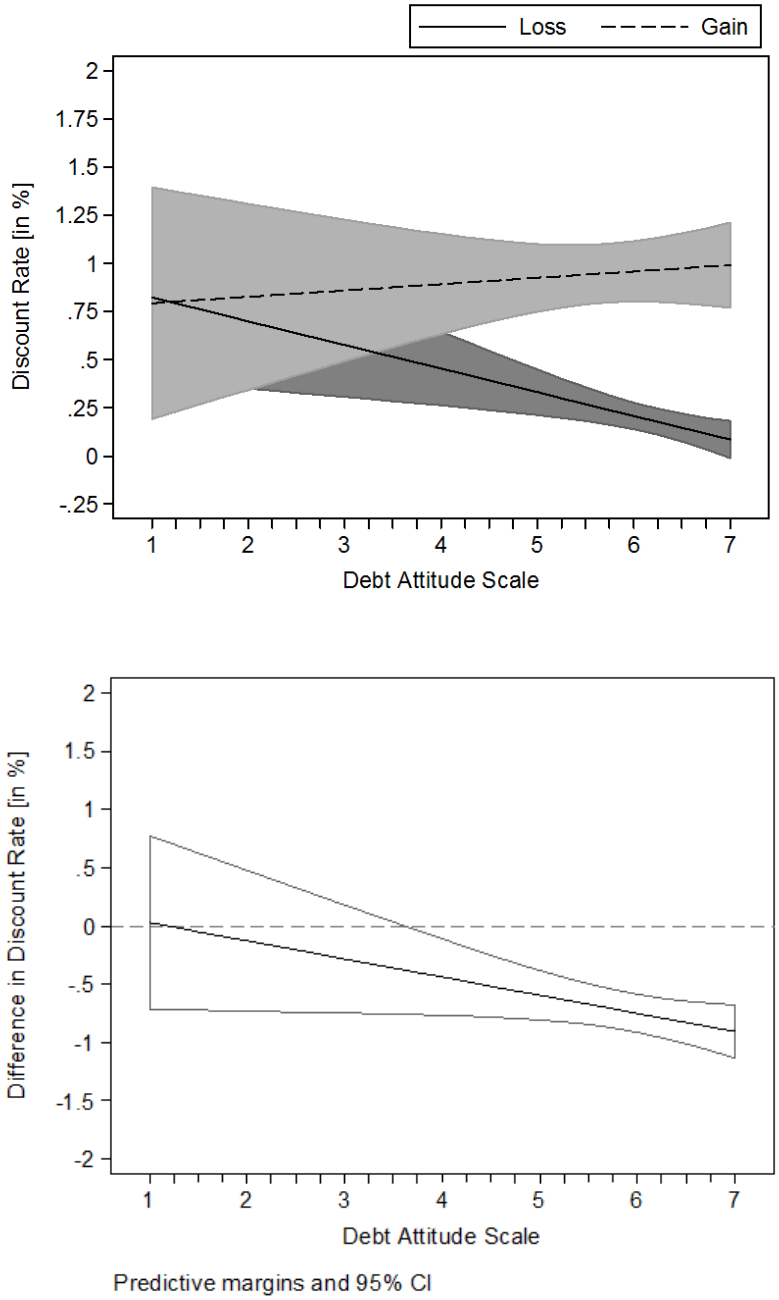
Debt averse attitudes and negative discount rates for losses. We next tested our prediction that people expressing negative debt averse attitudes would be likely to show negative discounting for losses, but not gains. Negative discount rates were rare for gains (0.7% of participants) and much more common for losses (28.5%). We conducted a logistical regression with negative discounting as the dependent variable, and DAS score, a dummy indicating whether the trial was in the gain or loss domain, and the interaction of these two variables; using clustered robust standard errors. We find that debt aversion is only related to negative discounting for losses, the interaction between DAS score and outcome sign was statistically significant: $b = .79$, 95% CI [.090, 1.492], $p = .027$. Moreover, replicating Study 1, we found that higher DAS scores are related to a greater likelihood of negative discounting for losses, $b = 1.02$, 95% CI [.48, 1.55], $p < .001$, but are unrelated to the likelihood of negative discounting for gains, $b = 1.81$, 95% CI [-3.24, 6.85], $p = .483$.

Gain-loss asymmetry and debt aversion. Replicating findings from prior studies, we observed a strong gain-loss asymmetry, with participants being much more patient for losses

than gains. For losses, the mean discount rate was .226, 95% CI [.150, .301], while for gains it was .953, 95% CI [.799, 1.107], difference = -.728, 95% CI [-.894, -.561], $p < .001$. Overall, a large majority (85.4%) expressed a lower discount rate for losses than for gains ($p < .001$).

We next tested our prediction that the gain-loss asymmetry is associated with variation in debt averse attitudes on the DAS. We regressed discount rate on DAS score, a dummy indicating whether the discount rate was from the gain or loss domain, and the interaction of these two variables; using clustered robust standard errors. Results are displayed in Figure 3, with the discount rates for losses and gains plotted in two lines as a function of DAS score. As predicted, gain-loss asymmetry decreased with debt tolerance, with those participants expressing the highest debt tolerance displaying no gain-loss asymmetry. Confirming this, the interaction between DAS score and outcome sign was statistically significant: $b = .156$, 95% CI [.007, .305], $p = .041$. Moreover, also as predicted, we found that higher DAS scores are related to lower discount rates for losses, $b = -.123$, 95% CI [-.206, -.040], $p = .004$, but are unrelated to discount rates for gains, $b = .033$, 95% CI [-.092, .158], $p = .603$.

Fig. 3
Discount rates for losses and gains as a function of debt attitudes (Study 2)



Discussion

Overall, Study 2 shows that debt attitude is systematically related to time preference for losses, but not for gains. Greater debt aversion increases the likelihood of negative discounting for losses, and increases the size of the gain-loss asymmetry.

STUDY 3: BORROWING-SAVING ASYMMETRY

In Study 3 we test for an association between the Debt Attitude Scale (DAS) and preferences for borrowing and saving, which involve tradeoffs between gaining and losing money at different points in time. We measure borrowing preference as the interest rate at which people are indifferent to saving and borrowing. We predict that higher DAS scores will be associated with lower discount rates for borrowing (which requires one to postpone a payment) but not saving (in which a payment is made right away). Thus, we predict that a stronger borrowing-saving asymmetry will be observed among participants expressing more debt averse attitudes on the DAS.

Participants

We recruited 313 participants on Amazon Mechanical Turk to complete a short study in exchange for $0.30 each. Average participant age was 34 years, and 50% were male. We excluded from analysis 42 participants (13.4%) who violated dominance in their responses (e.g., rejecting an interest rate of 10% and then accepting a rate of 15% when borrowing, or accepting a rate of 15% then rejecting a rate of 20% when saving) in both debt and/or both saving trials. One additional participant (0.3%) was dropped due to incomplete responses on the DAS.

Procedure

Borrowing-saving asymmetry. The borrowing-saving asymmetry is that people's discount rates are typically lower for borrowing than saving (Prelec & Loewenstein, 1998; Meissner, 2016). Although any individual will naturally prefer to save at the highest possible rate, and borrow at the lowest, there should be one rate, for each individual, where they are indifferent between saving and borrowing. At that rate, a person will not care whether they save or spend, or borrow or forego borrowing. However, the interest rate making people indifferent between savings rates is typically lower than that corresponding to borrowing rates. This is the borrowing-saving asymmetry, the magnitude of which is indexed by the spread between the savings and borrowing indifference rates. That is, imagine someone who is indifferent between accepting and rejecting a savings opportunity offering 10%. The borrowing-saving asymmetry is that this same person is likely to be indifferent for a borrowing opportunity at a lower rate, say 8%. The spread is the difference between these, or 2% in this case. If people with more debt averse attitudes discount future losses less than gains, they will generally be more willing to give up money today (in exchange for gaining more money in the future) than they would be to give up money in the future (in exchange for gaining money today).

To measure the borrowing-saving asymmetry participants first completed intertemporal choice tasks for borrowing and saving, followed by the DAS. In the borrowing task, participants evaluated a receipt (gain) today and a payment (loss) in 12 months whereas in the saving task participants evaluated a payment (loss) today and a receipt (gain) in 12 months. Participants were randomized to receive either the borrowing or saving elicitations first. The options were not framed as borrowing and savings, to avoid any effects due to labelling – for instance, those who have high scores on the DAS could be particularly averse to options explicitly framed in terms of

borrowing, or particularly favorable toward options framed in terms of saving (e.g., Caetano, Patrinos, & Palacios, 2011).

Borrowing task. In the borrowing task participants were presented with the following scenario:

> *You will next choose to accept or reject offers where you can receive some amount of money from your bank today (i.e., you are given money today), and in exchange you will have to pay your bank some amount in 12 months.*
>
> *Please assume that in all of these choices that you must pay the bank the full amount you promise on time. In addition, please imagine the transaction will be drawn from and directly deposited in your bank account so you will not be inconvenienced in any way.*

Participants were then presented with choices to accept or reject 11 offers involving a $200 receipt today and a repayment in 12 months that varied from $1,000 to $0, in increments of $100. To enhance the resolution of our measure, we followed this first phase with a second round of choices that varied between the most attractive option accepted and the least attractive offer rejected. For instance, if a participant accepted a $200 receipt today and a $300 payment in 12 months, but rejected a $200 receipt today and a $400 payment in 12 months, then the following round would consist of 11 offers involving a $200 receipt today and a repayment in 12 months that varied from $400 to $300 in increments of $10. We followed this second phase with a third round of choices that allowed us to narrow the resolution to $1 increments. Participants completed two trials: in the first trial, the receipt offered today was $200 and the payments ranged from $0 to $1,000 (described above), and in the second trial the receipt was $1,000 and the payments ranged from $0 to $5,000 (i.e., possible range from -100% to +500%). The price list structure in both trials was identical and both trials yielded a discount rate estimation within ± 0.25%.

Saving task. In the saving task, participants were first presented with the following scenario:

> *You will next choose to accept or reject a series of offers from your bank where you can pay your bank some amount of money today, and in exchange you will receive some amount from your bank in 12 months (i.e., you will be paid back).*
>
> *Please imagine that in all of these choices you can be absolutely certain that your bank will pay you the full amount promised on time. In addition, please imagine the transaction will be drawn from and directly deposited in your bank account so you will not be inconvenienced in any way.*

Participants then completed two trials during which the amount to be paid to the bank today was held at $200 in the first trial and $1,000 in the second trial. The price list structure mirrored the borrowing elicitation with 3 phases and 11 choices on each phase, yielding estimations within ± 0.25% in both trials, and a possible range of receipt values of $0 to $1,000 in the first trial and $0 to $5,000 in the second trial (i.e., possible range from -100% to +500%).

Debt Attitude Scale. Finally, participants completed the DAS, as in Studies 1 and 2.

Results

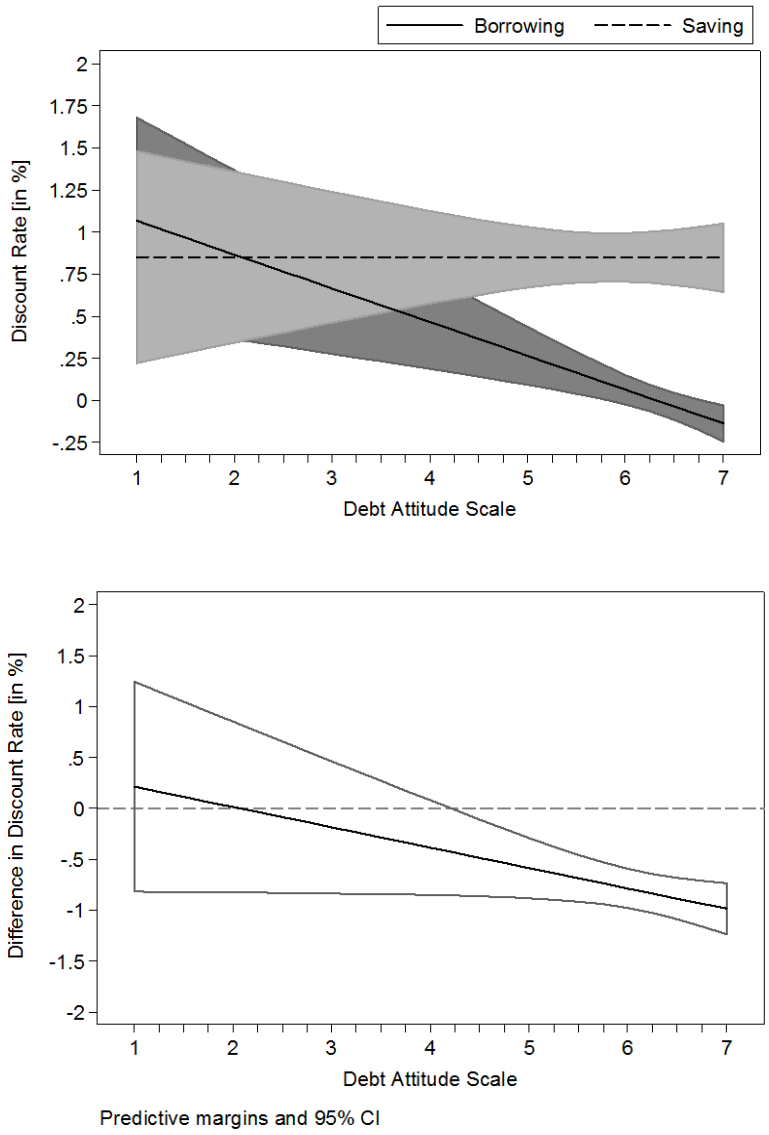
Debt Attitude Scale. The DAS again exhibited high reliability (Cronbach's $\alpha = .725$). The average score was 5.8, with 87.8% of participants reporting debt attitudes above the midpoint of the scale and 25.6% reporting scores of 7, echoing results of the previous studies.

Debt Attitude Scale and the borrowing-saving asymmetry. Replicating prior findings, participants exhibited a robust borrowing-saving asymmetry, expressing greater patience for borrowing, mean discount rate = .106, 95% CI [.002, .211], than for saving, mean discount rate = .849, 95% CI [.705, .993], difference = -.743, 95% CI [-.948, -.538], $p < .001$. A large majority of participants (71.1%) expressed a lower discount rate for borrowing than for saving ($p < .001$).

To test our prediction that the borrowing-saving asymmetry is driven by those with more debt averse attitudes, we regressed discount rates on DAS score, a dummy indicating the borrowing or saving domain, and the interaction of these variables; using clustered robust standard errors.

Figure 4 displays the result of this regression, which echoes the primary result of Study 2 (shown in Figure 3). Discount rates for borrowing and saving are plotted in two lines as a function of DAS score. Respondents with highly debt averse attitudes exhibited a strong borrowing-saving asymmetry, whereas respondents who expressed debt tolerant attitudes exhibited no such asymmetry, interaction: b = .200, 95% CI [.002, .398], p = .047. Also as predicted, we find that respondents who expressed more debt averse attitudes expressed lower discount rates for borrowing, b = -.201, 95% CI [-.315, -.086], p = .001, whereas debt attitudes were not significantly related to discount rates for saving, b = -.000, 95% CI [-.127, .126], p = .994.

Fig. 4
Discount rates for borrowing and saving as a function of debt attitudes (Study 3)



Discussion

In short, the borrowing-saving asymmetry increases with debt aversion. Specifically, higher debt aversion does not affect how much people demand to save money, but rather reduces the amount they are willing to pay to borrow it.

STUDY 4: DEBT AVERSION IN THE FIELD

We have already established a robust association between debt attitudes, as measured with the DAS, and anomalous behaviors reflected in various laboratory measures of time discounting. In Study 4, we examine whether debt attitudes are also related to financial outcomes outside the laboratory. To that end, we included the Debt Attitude Scale as part of a larger study (Erner et al., 2016) in which the authors also obtained credit scores. The credit score is designed to predict the likelihood of defaulting on a loan, and is based on measures of past repayment behavior, including number and types of accounts, current balances, and other variables (VantageScore Solutions, 2011). Having good credit is vital to an individual's financial well-being as credit scores are taken into account across a wide range of transactions, from terms and availability of credit cards and bank loans to insurance premiums and even to whether a landlord accepts an individual as a tenant (Consumer Financial Protection Bureau, 2012; Federal Reserve Board of Governors, 2007). We hypothesized that those who express more debt averse attitudes will have better credit scores, because they will tend to avoid debt and postponed payments, and would therefore be less likely to have missed past payment obligations.

Participants

We included the DAS in the second wave of an extensive two-wave survey of consumer financial behaviors, and the following analyses are based on the 152 participants for whom valid credit scores were obtained. A market research company recruited participants by telephone. The demographic distribution of the sample roughly coincided with U.S. population statistics from the 2010 U.S. Census. Participants provided informed consent to participate in the study and to release their credit report to the researchers, receiving a $30 Amazon.com gift card as compensation.

Procedure

Debt Attitude Scale. Participants completed the DAS, as in the previous three studies.

Credit Score. For each participant, the VantageScore credit score (version 2.0) was obtained from TransUnion, a consumer reporting agency. The VantageScore was introduced in 2006 by the three major consumer reporting agencies (TransUnion, Experian, and Equifax; VantageScore Solutions, 2011). VantageScores (version 2.0) range from 501 to 990, with higher numbers indicating lower credit risk. The credit score range was partitioned into ten equally sized bins with a width of 49 points each, and each participant was assigned their relevant bin, from 1 (credit scores between 501 and 549) to 10 (credit scores between 942 and 990). Binning of credit scores was done to satisfy a contractual obligation with the data provider.

Demographics. To control for factors that influence financial situation, we included the following demographic variables: gender (female, male), age (continuous [in years]), ethnicity (Caucasian, African American, Hispanic, Asian, Other), marital status (married, living with

significant other, single, divorced, widowed), education (some college or less, college graduate or more), and income (continuous [in $1,000]).

Individual Difference Measures. To compare the predictive power of the DAS with established scales measuring attitudes towards financial planning and decision making, we considered two individual difference measures: The Spendthrift-Tightwad Scale (STS; Rick, Cryder, & Loewenstein, 2008) and the Propensity to Plan scale (Lynch, Netemeyer, Spiller, & Zammit, 2010).

Results

Debt Aversion and Credit Score. We first examined whether debt attitudes are related to credit score by regressing credit score on DAS score and demographic control variables. The Debt Attitude Scale was significantly related to higher credit scores, indicating better creditworthiness (b = .45, 95% CI [.14, .76], p = .004).

Debt Attitudes versus alternate individual difference measures. We also compared the predictive power of the DAS to established individual difference measures. Table 3 lists the pairwise correlations between binned credit scores and the individual difference measures used. Additionally, we re-ran the linear regression predicting binned credit scores from DAS while also including the Spendthrift-Tightwad and Propensity to Plan scales. In this model, only the DAS is a significant predictor of binned credit scores (b = .40, 95% CI [.08, .71], p = .013) while the other scales are not significantly related: STS (b = -.07, 95% CI [-.17, .03], p = .163), short run propensity to plan (b = -.33, 95% CI [-.72, .07], p = .107), long run propensity to plan (b = .22, 95% CI [-.13, .56], p = .212).

We note that Lynch, Netemeyer, Spiller, & Zammit (2010) found a statistically significant relationship between FICO credit score and a very long-run variant (1-2 years) of the Propensity to Plan scale. The lack of significance in the present case may be due to our use of the shorter-run variants and/or the use of a different credit score measure.

Table 3.
Correlations between Study 4 Measures

		1	2	3	4	5
1	Credit Score	1				
2	DAS	0.281	1			
		p<.001				
3	Spendthrift-Tightwad Scale	-0.276	-0.213	1		
		p<.001	*p=.009*			
4	Propensity to Plan Scale (short run)	-0.226	-0.046	0.053	1	
		p=.005	*p=.574*	*P=.520*		
5	Propensity to Plan Scale (long run)	0.018	0.059	-0.130	0.655	1
		p=.824	*p=.467*	*p=.109*	*p<.001*	

Discussion

In Study 4 we extended the predictive validity of the DAS from laboratory measures of time preferences (Studies 1, 2 and 3) to a measure of objective financial outcomes in the field (credit score). Moreover, the DAS exhibited a stronger association with binned credit scores than two previously developed measures of financial attitudes. We surmise that individuals who express more debt averse attitudes will have better credit scores, because they will tend to avoid taking on excessive debt and postponing payments and would therefore be less likely to have missed past payment obligations. However, we cannot rule out other explanations, for example,

people who have lots of debt—and lower credit scores—may grow to be more comfortable with debt and therefore express less debt aversion.

CONCLUSION

Standard intertemporal choice models assume the fungibility of money over time: money received later can be transformed into money received earlier (and vice versa) by means of borrowing and lending. This assumption is inconsistent with an intrinsic aversion to carrying and delaying debt. But this aversion can help explain three widely discussed "anomalies" that violate assumptions of standard models of intertemporal choice. The tendency to discount the future more for gains that losses (the gain-loss asymmetry) can be explained by a preference for avoiding debt by making payments (i.e., incurring losses) as soon as possible. This can lead to negative discounting when people are willing to pay a premium to close out debts sooner rather than later. Likewise, the tendency to discount the future more when saving than borrowing (the borrowing-saving asymmetry) can be explained by an aversion to debt. Supporting all three conjectures we find that greater debt aversion measured using a novel four-item scale (the DAS) predicts greater prevalence of each of these anomalies.

Interestingly, whereas debt aversion predicts anomalous behaviors in the laboratory, it predicts an important advantageous outcome (higher credit scores) in practice. It may be that debt aversion provides a useful heuristic since debt tolerance can result in asymmetrically negative consequences compared to debt aversion, including insolvency, bankruptcy, and both credit score impairment and the associated increase in future household cost of capital. Although debt aversion may often be advantageous because it reduces the likelihood of falling into debt or staying in debt, we assert that it could also be problematic in practice. For instance, individuals

with debt averse attitudes may sometimes forego attractive financial opportunities (e.g., passing on zero-interest financing on a car that would have allowed for a safe investment with a positive return), or commit financial mistakes (e.g., accelerate the payment of a debt that costs less than the prevailing savings rate, resulting in a loss of risk-free capital—see Amar et al., 2011). Likewise, to the extent that debt aversion holds people back from making advantageous long-term investments, it may have negative consequences. For instance, debt aversion has been proposed as a barrier to higher education, with many students reluctant to borrow even if the increased earnings from education outweigh the costs of taking out a loan (Callender & Jackson, 2005). Future research might further map out the relationships between debt attitudes, specific financial behaviors, and financial outcomes in the field.

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Author Contributions

All of the authors contributed to the development of the study concept and the study designs for Studies 1-3. Data collection and analysis were performed by D. J. Walters and C. Erner on Studies 1-3. C. Erner, C. Trepel, and C.R. Fox designed, collect data on, and analyzed Study 4. All authors contributed to the interpretation of the data for all studies. D.J. Walters drafted the manuscript and all authors provided critical revisions and re-writings. All authors approved the final version of the manuscript for submission.

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For all experiments we have reported all measures, conditions, and data exclusions. We determined our sample sizes based on expected effect size before running the experiments presented here. We did not add data to our sample after determining our sample size and only examined the results after the full samples had been collected.