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Money, Well-being and Loss Aversion: Does an Income Loss have a Greater Effect on Well-being than an Equivalent Income Gain?

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Abstract
Higher income is associated with greater well-being, but do income gains and losses impact on well-being differently? Loss aversion, whereby losses loom larger than gains, is typically examined with relation to decisions about anticipated outcomes. Here, using subjective well-being data from Germany (N = 28,723) and the UK (N = 20,570), we find that experienced falls in income have a larger impact on well-being than equivalent income gains. The effect is not explained by the diminishing returns to well-being of income. Our findings show that loss aversion applies to experienced losses, counteracting suggestions that loss aversion is only an affective forecasting error. Longitudinal studies of the income/well-being relationship may, by failing to take account of loss aversion, have overestimated the positive effect of income for well-being. Moreover, societal well-being may be best served by small and stable income increases even if such stability impairs long-term growth.

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Money, Well-Being, and Loss Aversion: Does an Income Loss Have a Greater Effect on Well-Being than an Equivalent Income Gain?

A large literature shows that higher income is associated with greater life satisfaction (Easterlin, 1973, 1995) and less psychopathology (e.g., Wood, Boyce, Moore, & Brown, 2012). However, the methodology of previous studies has tended to treat increases in income as if they had as large an impact on well-being as equivalently sized losses. We test for the first time whether decreases in income have a disproportionately negative effect on well-being, defined as both life satisfaction and general psychological disorder, in two nationally representative samples in the UK and Germany.

Loss aversion is one of the most familiar biases in information processing and represents the idea that "losses loom larger than gains" (Kahneman & Tversky, 1979), such that anticipated losses have a greater influence on choice and predicted feelings about an outcome than anticipated gains of the same magnitude. The concept was originally motivated by the study of choice under uncertainty (Kahneman & Tversky, 1979), but it has since been shown to be applicable in a range of real-world contexts (Camerer, 2000). Understanding the role of loss aversion in the relationship between income and subjective well-being has theoretical and practical import.

Theoretically, there have been recent suggestions that loss aversion is a decision based error, such that when losses actually take place they have no greater impact than equivalently sized gains (Rick, 2011), and in accordance with this different regions of the brain have been implicated for reward anticipation and outcomes (Knutson, Fong, Adams, Varner, & Hommer, 2001). An established argument is that people are subject to "affective forecasting errors" such that they overestimate the intensity of the negative feelings they will experience when they suffer a loss. Consistent with an affective forecasting interpretation, loss aversion may not be apparent for outcomes that have been actually experienced rather than merely anticipated (Gilbert,

Morewedge, Risen, & Wilson, 2004; Kermer, Driver-Linn, Wilson, & Gilbert, 2006). In intuitive terms, people underestimate how well they will be able to rationalize, explain away, or simply not think about the loss after it has been experienced.

A key aim of the present study is therefore to establish whether loss aversion applies to actual losses and gains by examining whether the relationship between changes in income and changes in well-being differ according to whether the change in income was a loss or a gain. Some loss aversion may be apparent since higher incomes bring diminishing returns to well-being (i.e., a given income increase will benefit richer individuals less). Here and throughout, however, we examine effects of changes in log(income), not changes in untransformed income. Any gain/loss asymmetry due to diminishing returns of untransformed income will be removed by the logarithmic transformation (Stevenson & Wolfers, 2008), so that any remaining effects reflect "pure" loss aversion.

Studies of how changes in income relate to changes in subjective well-being data typically do not consider the possibility that the relationship may be influenced differently by losses and gains (e.g., Ferrer-i-Carbonell & Frijters, 2004; Frijters, Haisken-DeNew, & Shields, 2004; Layard, Nickell, & Mayraz, 2008). Under experimental conditions a loss is typically estimated to have twice the influence on decisions as equivalent gains (Novemsky & Kahneman, 2005). Applying this estimate to realized income changes, a drop in income from $50,000 to $45,000 would reduce well-being by around twice as much as an income gain from $45,000 to $50,000 would increase it. Thus longitudinal studies that fail to account for loss aversion may overestimate the positive effects of income for well-being, and this could carry important policy implications regarding raising individual and national income and well-being.

Two studies have considered the possibility of loss aversion using subjective well-being data, though neither provides a complete and clear test. Vendrik and Woltjer (2005) examine loss aversion in the context of relative income. They examine the extent to which a person's income

deviates from the average income of similar others and show that life satisfaction is more greatly influenced when an income is below, as compared with above, the average income of similar others. Although an important contribution to the literature on relative income, their approach does not assess income changes. Di Tella et al. (2010) do consider income losses and gains from one year to the next, but interestingly their assessment of loss aversion is with respect to anticipated income changes. That is they consider whether *expected future* income increases and decreases differentially relate to *current* life satisfaction and, although finding significant differences, such a test does not help establish whether loss aversion relates to the actual experience of a loss or is merely an affective forecasting error.

Methods

Participants

Sample One

Our first sample included participants from the German Socio-Economic Panel Study (GSOEP), a longitudinal study of German households. The dataset, begun in 1984 in West Germany, has since been expanded to include East Germany and maintain a representative sample of the entire German population (see Haisken-DeNew & Frick, 2005). We used nine waves from the German panel from 2001 to 2009 (the 2001 wave is used to calculate income changes in 2002) and includes 163,000 observations across 28,723 participants (52% female, age 19 to 100, M = 48.88, SD = 16.99) where two consecutive years of non-missing values for household incomes and life satisfaction were observed.

Sample Two

Our second sample included participants from the British Household Panel Study (BHPS), a longitudinal study of British households. The dataset began in 1991 but has since expanded the sample sizes from Scotland, Wales and Northern Ireland (see Taylor, Brice, Buck, & Prentice-Lane, 2010). We used ten waves of the British panel, i.e., 1998 to 2007 (the 1998

wave is used to calculate income changes in 1999) and includes 119,079 observations across 20,570 participants (55% female, age 18 to 100, M = 47.84, SD = 17.45) where two consecutive years of non-missing values for household incomes and general psychological disorder were observed.

Measures

Life satisfaction was measured in the GSOEP using a one-item scale across all years. Participants responded to the question "how satisfied are you with your life, all things considered?" on an 11-point scale, from 0 (totally unhappy) to 10 (totally happy). Participants scores (M = 6.92, SD = 1.77) were standardized with a mean of zero and standard deviation of one. Single-item scales, although typical for large data sets, may result in an underestimation of the true effect size. Lucas and Donnellan (2007), however, show that the reliability of the life satisfaction measure in the GSOEP is at least .67.

General psychological disorder was measured in the BHPS using the 12-item version of the General Health Questionnaire (GHQ-12; Goldberg & Williams, 1988). Items in the GHQ-12 (e.g., "thinking of self as worthless", "feeling unhappy and depressed") are coded as to whether the symptom is absent or present, with overall scores ranging from 0 to 12. We use this measure as a continuous measure of general psychological disorder (Bowling, 2001; Goldberg & Williams, 1988) with higher scores representing worsening distress. Participants scores (M = 1.88, SD = 3.02) were standardized with a mean of zero and standard deviation of one.

Household income: The principal predictor variable in this analysis was the individual's household income. In the GSOEP this is the net monthly income in euros of the household to which an individual belongs. In the BHPS this is the gross yearly income of the household in pound sterling to which an individual belongs. So that our income variable more accurately captures an individual's spending power we deflate by the yearly price level (2005 = 1) and by the size of the household to which an individual belongs (using the OECD equivalence scale - a

deflator equal to 1 + [no. of adults – 1]*0.6 + [no. of children]*0.4). To account for the diminishing marginal returns of having a higher income we take the natural logarithm of this variable.

Demographic characteristics: We controlled for a number of other variables that may confound the correlation between changes in well-being and changes in household income, including a change in employment, household formation or break up, and changing health. As covariates we therefore include a series of socio-demographic control variables as indicated in Table 1.

Analytic Strategy

To understand how income changes relate to changes in well-being we predicted well-being at T (SWB_T) controlling for well-being at T-1 (SWB_{T-1}). Our estimation therefore reflected the residualized changes in well-being and avoids issues surrounding regression to the mean (Allison, 1990). Our main independent dependent variable is the change in the logarithm of an individual's household income from the previous year ($logY_T - logY_{T-1} = \Delta logY_T$). To discern whether there are differences between losses and gains in income we construct a dummy variable to indicate that the change in income was due to a loss (L_T). We interact this loss dummy with the change in income variable ($\Delta logY_T * L_T$). Our regression model is depicted in Equation 1.

$$\text{Equation 1: } SWB_T = \beta_0 + \beta_1 SWB_{T-1} + \beta_2 \Delta logY_T + \beta_3 L_T + \beta_4 L_T * \Delta logY_T + \cdots + \varepsilon$$

$$\text{Where } \Delta logY_T = logY_T - logY_{T-1}; L_T = 1 \text{ if } Y_T < Y_{T-1}, 0 \; otherwise$$

We first estimate this model without incorporating loss aversion ($\beta_3 = \beta_4 = 0$). Next, we model loss aversion by allowing the intercept (β_3) and slope (β_4) coefficients to differ according to whether individuals experienced reductions or gains in their income over the previous year. Significance on β_3 would suggest that individuals who lose income regardless of the magnitude

will experience a change in well-being that differs from those who gain income or have no change. Significance on β_4 would indicate that there are slope differences between losses and gains implying differences in the way that equivalent increases and decreases in log(income) influence well-being. Each equation is first estimated with no controls and then with controls. Since individuals are observed at multiple time-points we carry out multilevel regressions.

Results

We begin our multilevel analysis by estimating the effect that changes to income have on residualized life satisfaction in the German panel. First, we establish a basic relationship without accounting for any differential impacts between gains and losses. When we carry out this estimation we obtain a positive relationship between changes in income and changes in life satisfaction (with controls: $b = 0.09$, $p < .01$; without controls: $b = 0.11$, $p < .01$), such that controlling for correlated factors, a one unit rise in log income (approximately a doubling of income) is accompanied by a 0.09 standard deviation rise in life satisfaction, and by assumption a one unit decrease in log income is accompanied by a 0.09 standard deviation decrease in life satisfaction. In contrast, the models in Table 1, however, differentiate between income changes that took place as a result of a loss and those that took place as a result of a gain.

Regression 1 shows that there are both intercept and slope differences in the way that losses and gains influence life satisfaction. The coefficients in Regression 1 suggest that just experiencing a loss, irrespective of size, will result in a drop in life satisfaction of 0.02 (β_3). The magnitude of the loss is also important. Overall a one unit increase in log income is accompanied by a 0.05 rise in life satisfaction (β_2), whereas a corresponding loss in log income would result in a 0.13 reduction in life satisfaction ($\beta_2 + \beta_3 + \beta_4$). The coefficients from Regression 2, which include a full set of controls for confounding factors, also support loss aversion. They suggest that a one unit rise in log income is accompanied by a life satisfaction rise of 0.05 (β_2) whereas an equivalent income reduction is accompanied by a life satisfaction reduction of 0.11 ($\beta_2 + \beta_3 +$

β_4). At this income change the ratio of the positive and negative effects is around 2, matching estimates of the anticipated loss aversion effect found under experimental conditions (Novemsky & Kahneman, 2005). In Figure 1 we use the results from Regression 2 to trace out an implied functional relationship.

We then carry out the same analyses for the BHPS using the GHQ-12. The results are even more striking. Not accounting for any differential impact between gains and losses results in a marginal relationship with higher income being associated with lower psychological disorder (b = -0.01, $p < .01$), which is non-significant with controls (b = -0.01, $p > .05$). However, there are differences in the way that income gains and income losses are associated with changes in psychological disorder (Regressions 3 and 4). Regression 4, which includes controls, suggests that income gains are not significantly positively associated with improved psychological disorder, but a one unit reduction in log income is associated with a significant rise in psychological disorder of 0.03 ($\beta_2 + \beta_3 + \beta_4$).

Discussion

We find evidence for loss aversion using two different measures of well-being[1] across two nationally representative longitudinal datasets. The results provide robust real-world evidence that loss aversion characterizes experienced as well as anticipated losses, with the magnitude of loss aversion being generally consistent with observations in a wide range of domains (Novemsky & Kahneman, 2005).

Our results suggest caution in the interpretation of previous studies that have examined the impact of changes in income on changes in well-being. Previous research has been interpreted as showing the size of the relationship between income increases and well-being. However, by not accounting for loss aversion, the apparent effect of income increases on well-being may be inflated by the higher impacting income losses. Based on our results, increases in

income may have a much lower impact on well-being than equal decreases in income, and treating each as if they were the same would lead to miss-specification.

Social scientists have long been interested in the question of why improvements to national well-being have not always accompanied economic growth (Easterlin, 2010). Loss aversion may provide part of the explanation. Lucas (2003) argues that removing all fluctuations of consumption in the economy would benefit well-being only as much as would an increase in consumption of one twentieth of 1%. However, if reductions in consumption are more detrimental to well-being than increases are positive, then the benefits of large national income increases may be wiped-out by relatively small economic declines. To the extent that a "national well-being index" might form an important target for policy-makers (Diener & Seligman, 2004; Stiglitz, Sen, & Fitoussi, 2009) stable lower incomes, at individual and national levels, may be preferable to the riskier pursuit of higher incomes overall.

Footnotes

1. Although there was generally a weak relationship between income and life satisfaction in the BHPS the results were supportive of our hypothesis.

References

Allison, P. D. (1990). Change scores as dependent variables in regression analysis. *Sociological Methodology, 20*, 93-114.

Bowling, A. (2001). *Measuring Disease* (2nd ed.). Buckingham, UK: Open University Press.

Camerer, C. (2000). Prospect theory in the wild: Evidence from the field. In D. Kahneman & A. Tversky (Eds.), *Choices, Values, and Frames.* (pp. 288-300). Cambridge: Cambridge University Press.

Di Tella, R., Haisken-De New, J., & MacCulloch, R. (2010). Happiness adaptation to income and to status in an individual panel. *Journal of Economic Behavior & Organization, 76*, 834-852.

Diener, E., & Seligman, M. E. P. (2004). Beyond money: Toward an economy of well-being. *Psychological Science in the Public Interest, 5*, 1-31.

Easterlin, R. A. (1973). Does money buy happiness? *Public Interest*, 3-10.

Easterlin, R. A. (1995). Will raising the incomes of all increase the happiness of all? *Journal of Economic Behavior and Organization, 27*, 35-48.

Easterlin, R. A. (2010). The happiness–income paradox revisited. *Proceedings of the National Academy of Sciences of the United States of America, 107,* 22463-22468.

Frijters, P., Haisken-DeNew, J. P., & Shields, M. A. (2004). Money does matter! Evidence from increasing real income and life satisfaction in East Germany following reunification. *American Economic Review, 94*, 730-740.

Gilbert, D. T., Morewedge, C. K., Risen, J. L., & Wilson, T. D. (2004). Looking forward to looking backward: The misprediction of regret. *Psychological Science, 15*, 346-350.

Goldberg, D. P., & Williams, P. (1988). *A User's Guide to the General Health Questionnaire*. Windsor: NFER.

Haisken-DeNew, J., & Frick, R. (2005). Desktop companion to the German Socio-Economic Panel Study (GSOEP). Berlin: DIW Berlin.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*, 263-291.

Kermer, D. A., Driver-Linn, E., Wilson, T. D., & Gilbert, D. T. (2006). Loss aversion is an affective forecasting error. *Psychological Science, 17*, 649-653.

Knutson, B., Fong, G. W., Adams, C. M., Varner, J. L., & Hommer, D. (2001). Dissociation of reward anticipation and outcome with event-related fMRI. *Neuroreport, 12*, 3683-3687.

Layard, R., Nickell, S., & Mayraz, G. (2008). The marginal utility of income. *Journal of Public Economics, 92*, 1846-1857.

Lucas, R. E. (2003). Macroeconomic priorities. *American Economic Review, 93*, 1-14.

Novemsky, N., & Kahneman, D. (2005). The boundaries of loss aversion. *Journal of Marketing Research, 42*, 119-128.

Rick, S. (2011). Losses, gains, and brains: Neuroeconomics can help to answer open questions about loss aversion. *Journal of Consumer Psychology, 21*, 453-463.

Stevenson, B., & Wolfers, J. (2008). Economic growth and subjective well-being: Reassessing the Easterlin Paradox, *Brookings Papers on Economic Activity, 39*, 1-102.

Stiglitz, J. E., Sen A., & Fitoussi J. P. (2009). Report of the commission on the measurement of economic performance and social progress (CMEPSP). Downloaded on 08th April 2013 from http://www.stiglitz-sen-fitoussi.fr/en/documents.htm.

Taylor, M. F., Brice, J., Buck, N., & Prentice-Lane, E. (2010). *British Household Panel Survey User Manual Volume A: Introduction, Technical Report and Appendices*. University of Essex.

Vendrik, M. C. M., & Woltjer, G. B. (2007). Happiness and loss aversion: Is utility concave or convex in relative income? *Journal of Public Economics, 91*, 1423-1448.

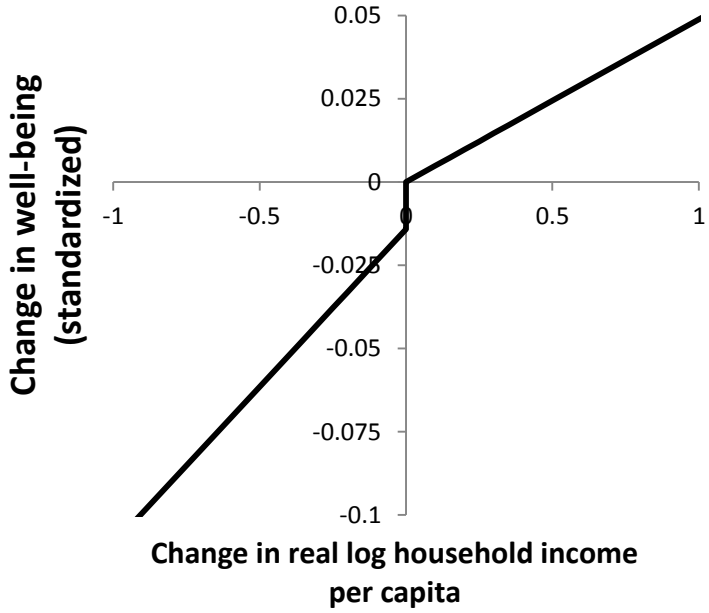
Wood, A. M., Boyce, C. J., Moore, S. C., & Brown, G. D. A. (2012). An evolutionary based social rank explanation of why low income predicts mental distress: A 17 year cohort study of 30,000 people. *Journal of Affective Disorders, 136*, 882-888

Table 1: *Multilevel regressions showing the effects of income changes on life satisfaction in the German Socio-Economic Panel (N = 163000) and general psychological disorder in British Household Panel Survey (N = 110079)*

	Outcome variable							
	Regression 1		Regression 2		Regression 3		Regression 4	
Independent variables:	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Subjective Well-Being at T-1 (β_1)	0.282	0.003**	0.227	0.003**	0.227	0.004**	0.219	0.004**
Change in log income from T-1 to T (β_2)	0.049	0.013**	0.053	0.012**	0.023	0.008**	0.014	0.008
Income loss dummy (β_3)	-0.019	0.005**	-0.014	0.005**	0.006	0.006	0.001	0.006
Negative change in log income from T-1 to T (β_4)	0.081	0.019**	0.045	0.018*	-0.073	0.012**	-0.045	0.012**
Additional control variables	No		Yes		No		Yes	

Notes: Regressions 1 and 2 use the life satisfaction variable from the GSOEP and regressions 3 and 4 use the General Health Questionnaire (12-item scale) from the BHPS. Both measures of well-being were standardized with a mean of zero and a standard deviation of 1 ($M = 0$, $SD = 1$). No additional controls are included in Regression 1 and Regression 3. Regression 2 and Regression 4 include the following control variables: Year dummy variables, age, gender, current education level (number of years in GSOEP, highest academic qualification in BHPS), current marital status, square root of current household size, current health, children present in the household, current disability status, current employment status, changes from T-1 to T in education level, changes from T-1 to T in marital status, changes from T-1 to T in the square root of household size, changes from T-1 to T in health (health satisfaction in GSOEP, subjective health status in BHPS), changes from T-1 to T in parental status, changes from T-1 to T in disability status, changes from T-1 to T in employment status. In instances where data was missing for the control variables we re-coded any missing values with sample-wide averages and included dummy variables to indicate that a variable with a previously missing value had been re-coded with sample-wide averages; *$p < .05$ **$p < .01$.

Figure 1: The relationship between life satisfaction and household income losses and gains based on estimates from the GSOEP (Table 1, Regression 2).



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