Money and Happiness: Rank of Income, not Income, Affects Life Satisfaction

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Abstract

Does money buy happiness, or does happiness come indirectly from the higher rank in society that money brings? Here we test a *rank hypothesis*, according to which people gain utility from the ranked position of their income within a comparison group. The rank hypothesis contrasts with traditional *reference income* hypotheses, which suggest utility from income depends on comparison to a social group reference norm. We find that the ranked position of an individual's income predicts general life satisfaction, while absolute income and reference income have no effect. Furthermore, individuals weight upward comparisons more than downward comparisons. According to the rank hypothesis, income and utility are not directly linked: Increasing an individual's income will only increase their utility if ranked position also increases and will necessarily reduce the utility of others who will lose rank.

Is there a true causal relation between money and happiness? According to conventional economics, there is: Money can buy happiness because it can be exchanged for goods that will increase an individual's utility. Thus money and happiness are assumed to be causally linked, and higher incomes should lead to greater happiness. In line with this *absolute income hypothesis* richer people are happier than those less well off within the same society (Diener, 1984). The correlation between money and happiness is often small, but effect sizes are larger in low-income developing economies (Howell & Howell, 2008) and even small correlations can reflect substantial real differences in happiness (Lucas & Schimmack, 2009). Such results, however, do not necessarily reflect a simple causal relation between money and happiness. The idea that absolute income leads to increased happiness is unable to account for the Easterlin paradox – that income and happiness are positively associated within a country at a given time, but not (or less well) correlated within a country over time (Easterlin, 1974).

Furthermore, being amongst people richer than oneself can be detrimental to wellbeing variously measured (Blanchflower & Oswald, 2004; Clark, Frijters, & Shields, 2008; Clark & Oswald, 1996; Ferrer-i-Carbonell, 2005; Luttmer, 2005), consistent with income comparison. Self-rated happiness and satisfaction scores have been shown to act as valid and reliable proxies for utility (e.g. Lepper, 1998; Sandvik, Diener, & Seidlitz, 1993). The data have therefore been taken to suggest that an individual's utility is influenced not by absolute level of income but instead by their income relative to that of their peers.

The *reference income hypothesis* is the dominant model of income comparison and suggests that individuals care about how their income compares to the norm, or reference income, of a socially constructed comparison group. Again, a direct causal link is assumed: Increased income will lead to increased utility for an individual if all

else is held constant. Individuals gain utility to the extent that their income exceeds the average or reference income of people in their comparison set, and lose it to the extent that their own income falls below the reference level. The average income of an assumed reference group typically negatively and significantly predicts a number of variables related to well-being, consistent with the reference income approach (e.g. Clark & Oswald, 1996).

Here we suggest instead that utility is based on an individual's ranked position within a comparison group – the *rank income* hypothesis. According to the rank-based model, people gain utility from occupying a higher ranked position within an income distribution rather than from either absolute income or their position relative to a reference wage (Brown, Gardner, Oswald, & Qian, 2008; Clark, Kristensen, & Westergard-Nielsen, 2009; Clark, Masclet, & Villeval, in press; Hagerty, 2000; Smith, Diener, & Wedell, 1989). For example, people might care about whether they are the second most highly paid person, or the eighth most highly paid person, in their comparison set (which might contain fellow workers of a similar age and qualification level, neighbors, friends from college, etc). The ranked position of an income will be highly correlated with the position of that income relative to a mean, so evidence previously taken to support reference income accounts may be consistent with a rank income account. Not only do rank and reference based models predict very different savings and consumption behavior (Bilancini & Boncinelli, 2007) but also, according to the rank income hypothesis, there is no simple causal relationship between money and happiness: An increase in income need not increase ranked position and hence need not increase happiness.

A rank based approach to judgment is independently motivated by the fact that judgments about items within a context of other items are known to be influenced by the ranked position of the item along the dimension of interest. This perspective

originated within psychophysics in the judgment of quantities like weight or pitch, but has since been extended to economic and social phenomena (e.g. Mellers, 1986; Niedrich, Sharma, & Wedell, 2001; Parducci, 1995; Stewart, Chater, & Brown, 2006). Subjective judgments of utility may be governed by context just like judgments of other quantities (Parducci, 1995).

There is already some evidence that rank income rather than reference or absolute income may be important, although previous large scale studies have looked only at satisfaction with economic conditions and not overall life satisfaction. In a study of 16,000 British workers wage satisfaction depended on the ordinal rank of an individual's wage within a workplace (Brown et al., 2008). Further, a study of 9,000 small neighborhoods researchers found that satisfaction with economic conditions increased with ranked position within a neighborhood (Clark et al., 2008). Other studies have considered rank in the broader context of range-frequency theory (Hagerty, 2000; Smith et al., 1989). However no large-scale study has examined the effect of income rank on self reported general life satisfaction. Here we use data from 12,000 British adults to examine this question. We also examine whether upward comparison (the number of people earning more than oneself) has a greater influence on life satisfaction than downward comparison (Duesenberry, 1949).

Method

We test a simple rank-based model according to which the individual compares themself to a sample of other people in their reference group and assesses whether each sampled individual earns more or less than themselves (Stewart et al., 2006). Those assigned "worse than" (i-1) are compared to the total number within the reference group (n-1). The ratio gives the individual a relative rank (R_i) normalized between 0 and 1:

(1) $R_i = \frac{i-1}{n-1}$

We use R_i to predict life satisfaction in a multiple regression after the influence of other relevant variables have been partialled out. Data are taken from seven years of the British Household Panel Survey (BHPS), which is a representative longitudinal sample of British households. All adults, from 1997 to 2004, who answered a life satisfaction question, are included in the analysis[1] (n= 86679). Life satisfaction is the respondent's answer on a 1 to 7 scale to the question: "how dissatisfied or satisfied are you with your life overall?" and is taken here to proxy for an individual's utility and standardized. Household incomes were adjusted for regional living cost differences and number of individuals in the household: Total household income was divided by 2004 regional living costs and weighted by household size (adults = 1 unit; each child = 0.5 units). After such adjustment those with children, or those that may stay at home in the presence of a big income earner, will have comparable spending powers. Demographic characteristics were controlled for in all analyses.

We first report analyses comparing rank income and income in the overall sample, then divide the sample into reference groups to test the rank income hypothesis against the reference income hypothesis. Finally, we look for evidence of asymmetric (upward) comparison.

Results

First, the ranked position of each individual's income within the entire sample in a given year was compared to the individual's absolute income as a predictor of life satisfaction. Table 1 compares absolute income (logarithmically transformed[2]) and rank income variables. Each is significant when entered as the only income-related predictor after controls (columns 1 and 2). The coefficient from column 1 suggests

that, once controlling for other factors, the life satisfaction difference between the highest and lowest earners is 0.29 standard deviations. Alternatively, the coefficient on the logarithm of household income shown in column 2 suggests that on average an individual will be 0.1 standard deviations higher in life satisfaction than someone earning about half as much. However, rank explains significantly more of the overall variation (R^2) in life satisfaction. Furthermore, when both income variables are entered simultaneously, rank income dominates and absolute income accounts for no additional variance (column 3) consistent with a role for ranked position of income, not income per se, in determining life satisfaction.[3]

Next, we compared the rank and reference income hypotheses. To do this we constructed various reference groups to explore the possibility that people compare their income to others in the same geographical region (of which there were 19 in the BHPS), of the same gender and education (three levels: graduate, college and neither) giving six groups in total, or of the same age (we used 12 different age groupings: all less than 20 years old, 20-24, 25-29, 30-24, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69 and all older than 70). In each case we computed the relative rank of each individual's income within the reference group and also the mean income of all individuals within the reference group. We then predicted each individual's life satisfaction from (a) their relative rank within the reference group, (b) their absolute income (logarithmically transformed), and (c) mean reference group income (logarithmically transformed).

We were then able to test the rank income hypothesis against both absolute income and reference income hypotheses. Results are shown in Table 2 and the t-statistics are adjusted for clustering (Moulton, 1990). In all cases the rank position of an individual's income within their reference group dominated the explanation of life satisfaction. When geographically-defined reference groups were assumed, rank

income was significant whilst absolute income was not (column 1). An R-squared comparison further reveals that rank income also explained more of the variation in life satisfaction than the reference group income model (column 2). Neither reference income nor absolute income explained any additional variance over rank income (column 3). Similar results were found when individuals were assumed to compare themselves to others of the same education level and gender (columns 4, 5 and 6) or to others of similar age (columns 7, 8 and 9).

The final analyses examined whether upwards comparisons were weighted more heavily. It is commonly suggested that comparison is asymmetric, being made mostly to those above oneself (Blanchflower & Oswald, 2004; Duesenberry, 1949; Ferrer-i-Carbonell, 2005). Does the model improve when upward comparison is accommodated? The relative rank measure can be adapted in a way such that higher ranked others have greater (or lesser) impact on the individual's assessment of their own income than those below (above). We refer to this as subjective income rank (*SR*) (Brown et al., 2008):

$$(2)\quad SR_i = 0.5 + \frac{(i-1) - \eta(n-i)}{2\left[(i-1) + \eta(n-i)\right]}$$

Here, η captures the degree of upward comparison and increases the weight given to those who earn more. If η = 1, equation 2 can be re-written as equation 1. When η > 1, individuals earning more than *i* influence perception of the individual's rank more than those earning less. If η = 2, for example, the number of individuals that earn more than *i* matters twice as much as those that earn less. Subjective rank, based on the whole sample for each wave according to equation 2 with a given value of η, was compared to the simple relative rank income variable (η = 1). With η set to 1.75 (the optimal value) significant additional variance is accounted for [$F(1, 86641) = 8.75$; $p < 0.01$]. The coefficient on the rank variable that incorporates this degree of

upward comparison is 0.394 and significant, whereas the coefficient on the absolute income variable is -0.03 and insignificant. This result supports Duesenberry's (1949) claim that comparison is primarily upwards and shows further that people compare to those above themselves one and a three-quarter times more than those below.

Discussion

In analysis of more than 80,000 observations the relative rank of an individual's income predicts the individual's general life satisfaction, and removes the effect of absolute income. In analyses assuming that individuals compare themselves to smaller reference groups, relative rank of income continues to dominate life satisfaction. Results suggest that individuals sample from a reference group and compare their own income with sampled incomes ordinally – satisfaction is gained from each "better than" comparison and lost for each "worse than" comparison. No calculation of mean reference group income is required. We note that rank could be influencing either an "underlying internal utility", or an individual's interpretation of their own utility. On the latter interpretation, individuals will score themselves as more happy to the extent that they perceive themselves as ranking higher in happiness than others. Although this possibility is difficult to exclude, we note considerable evidence for relative effects in neuroscience (e.g. Fliessbach et al., 2007) along with the observation that subjective wellbeing ratings correlate well with observable behavioral measures (Ekman, Friesen, & Davidson, 1990; Koivumaa-Honkanen et al., 2001). We also note that income rank may well act as a proxy for more general social rank (Powdthavee, in press), with the analyses then showing that social rank is key to wellbeing. The rank hypothesis carries several implications. First, it assumes no direct causal relationship between income and wellbeing. Unless the individual's ranked position were perceived to change, income could increase without increasing utility.[4] Rank income also predicts a concave utility function when comparison incomes are

positively skewed, because an increasing income at the lower end of the income distribution will increase rank faster (Brown et al., 2008; Kornienko, 2004; Stewart et al., 2006). Finally, to the extent that there are effects only of rank, income distribution cannot affect society's income-derived utility. However, dissatisfaction could still result from inequality per se (Alesina, Di Tella, & MacCulloch, 2004).

Our study underlines concerns regarding the pursuit of economic growth. There are fixed amounts of rank in society – only one individual can be the highest earner. Thus pursuing economic growth, although it remains a key political goal, might not make people any happier. The rank hypothesis may explain why increasing the incomes of all may not raise the happiness of all, while at the same time wealth and happiness are correlated within a society at a given point in time.

References

Alesina, A., Di Tella, R., & MacCulloch, R. (2004). Inequality and happiness: are Europeans and Americans different? *Journal of Public Economics, 88*(9-10), 2009-2042.

Bilancini, E., & Boncinelli, L. (2007). Ordinal vs cardinal status: Two examples. University of Siena.

Blanchflower, D. G., & Oswald, A. J. (2004). Well-being over time in Britain and the USA. *Journal of Public Economics, 88*(7-8), 1359-1386.

Brown, G. D. A., Gardner, J., Oswald, A. J., & Qian, J. (2008). Does wage rank affect employees' well-being? *Industrial Relations, 47*(3), 355-389.

Clark, A. E., Frijters, P., & Shields, M. A. (2008). Relative income, happiness, and utility: An explanation for the Easterlin paradox and other puzzles. *Journal of Economic Literature, 46*(1), 95-144.

Clark, A. E., Kristensen, N., & Westergard-Nielsen, N. (2009). Economic satisfaction and income rank in small neighbourhoods. *Journal of the European Economic Association, 7*(2-3), 519-527.

Clark, A. E., Masclet, D., & Villeval, M. C. (in press). Effort and comparison income: Experimental and survey evidence *Industrial & Labor Relations Review*.

Clark, A. E., & Oswald, A. J. (1996). Satisfaction and comparison income. *Journal of Public Economics, 61*(3), 359-381.

Diener, E. (1984). Subjective well-being. *Psychological Bulletin, 95*(3), 542-575.

Duesenberry, J. S. (1949). *Income, saving, and the theory of consumer behavior*: Harvard University Press.

Easterlin, R. A. (1974). Does economic growth improve the human lot? Some empirical evidence. In P. A. David & M. W. Reder (Eds.), *Nations and Households in Economic Growth: Essays in Honour of Moses Abramovitz*. New York: Academic Press.

Ekman, P., Friesen, W. V., & Davidson, R. J. (1990). The Duchenne smile - emotional expression and brain physiology - 2. *Journal of Personality and Social Psychology, 58*(2), 342-353.

Ferrer-i-Carbonell, A. (2005). Income and well-being: an empirical analysis of the comparison income effect. *Journal of Public Economics, 89*(5-6), 997-1019.

Fliessbach, K., Weber, B., Trautner, P., Dohmen, T., Sunde, U., Elger, C. E., et al. (2007). Social comparison affects reward-related brain activity in the human ventral striatum. *Science, 318*(5854), 1305-1308.

Hagerty, M. R. (2000). Social comparisons of income in one's community: Evidence from national surveys of income and happiness. *Journal of Personality and Social Psychology, 78*(4), 764-771.

Howell, R. T., & Howell, C. J. (2008). The relation of economic status to subjective well-being in developing countries: A meta-analysis. *Psychological Bulletin, 134*(4), 536-560.

Koivumaa-Honkanen, H., Honkanen, R., Viinamaki, H., Heikkila, K., Kaprio, J., & Koskenvuo, M. (2001). Life satisfaction and suicide: A 20-year follow-up study. *American Journal of Psychiatry, 158*(3), 433-439.

Kornienko, T. (2004). A cognitive basis for cardinal utility. University of Stirling.

Lepper, H. S. (1998). Use of other-reports to validate subjective well-being measures. *Social Indicators Research, 44*(3), 367-379.

Lucas, R. E., & Schimmack, U. (2009). Income and well-being: How big is the gap between the rich and the poor? *Journal of Research in Personality, 43*(1), 75-78.

Luttmer, E. F. P. (2005). Neighbors as negatives: Relative earnings and well-being. *Quarterly Journal of Economics, 120*(3), 963-1002.

Mellers, B. A. (1986). Fair allocations of salaries and taxes. *Journal of Experimental Psychology: Human Perception and Performance, 12*(1), 80-91.

Moulton, B. R. (1990). An Illustration of a pitfall in estimating the effects of aggregate variables on micro units. *Review of Economics and Statistics, 72*(2), 334-338.

Niedrich, R. W., Sharma, S., & Wedell, D. H. (2001). Reference price and price perceptions: A comparison of alternative models. *Journal of Consumer Research, 28*(3), 339-354.

Parducci, A. (1995). *Happiness, Pleasure, and Judgment: The Contextual Theory and Its Applications*. Mahwah, NJ: Lawrence Erlbaum Associates.

Powdthavee, N. (in press). How important is rank to individual perception of economic hierarchy? A within-community analysis. *Journal of Economic Inequality*.

Sandvik, E., Diener, E., & Seidlitz, L. (1993). Subjective well-being - the convergence and stability of self-report and non-self-report measures. *Journal of Personality, 61*(3), 318-342.

Smith, R. H., Diener, E., & Wedell, D. H. (1989). Intrapersonal and social-comparison determinants of happiness - a Range-Frequency analysis. *Journal of Personality and Social Psychology, 56*(3), 317-325.

Stewart, N., Chater, N., & Brown, G. D. A. (2006). Decision by sampling. *Cognitive Psychology, 53*(1), 1-26.

Vandestadt, H., Kapteyn, A., & Vandegeer, S. (1985). The relativity of utility - evidence from panel data. *Review of Economics and Statistics, 67*(2), 179-187.

Author notes

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Endnotes

[1] The 2001 wave included no life satisfaction question and was therefore excluded.

[2] The natural logarithm of income is the transformation typically used in income and happiness studies so provides a useful benchmark against which to test rank income. Higher order polynomials in income against rank income were also tested, but logarithm of income was a better specification.

[3] A fixed effect analysis, analyzing the within person variation, was also undertaken. The fixed effect analysis controls for unobservable heterogeneous factors. Again rank dominates: when entered simultaneously the coefficient on the rank variable is 0.06 and significant, whereas the coefficient on the absolute income variable is 0.02 and insignificant.

[4] We note the possibility that "previous self" may enter the comparison set (e.g. Vandestadt, Kapteyn, & Vandegeer, 1985), in which case any increase in income could lead to increased utility.

Table 1: Pooled OLS regression on life satisfaction comparing logarithm of absolute income and income rank by sample

	Dependent Variable: Life Satisfaction (standardized)		
Independent Variables:	1	2	3
Income Rank[a]	0.288 (21.46)**		0.302 (10.60)**
Log(Household Income[b])		0.10 (18.66)**	-0.006 (0.53)
R-Squared	0.0838	0.0826	0.0838
Observations	86679	86679	86679

Absolute value of t-statistics in parentheses

* significant at 5% level; ** significant at 1% level

All analyses included demographic controls: age, gender, education, marital status, children, housing ownership, labor force status and disabilities, and dummy variables identifying both region and wave. In all cases, these variables accounted for significant variation in life satisfaction.

a. Based on the individual's household income adjusted for household size and deflated by regional living costs

b. Adjusted for household size and deflated by regional living costs

Table 2: Pooled OLS regressions on life satisfaction comparing logarithm of mean income and income rank using various reference groups

	Dependent Variable: Life Satisfaction (standardized)								
Reference Group:	Region			Gender and Education			Age		
Independent Variables:	1	2	3	4	5	6	7	8	9
Log(Household Income[b])	-0.004 (0.38)	0.101 (16.30)**	-0.004 (0.38)	-0.007 (0.50)	0.101 (7.43)**	-0.007 (0.50)	0.003 (0.20)	0.103 (9.43)**	0.013 (0.76)
Income Rank[a]	0.294 (9.36)**		0.294 (9.46)**	0.289 (10.89)**		0.289 (11.07)**	0.270 (4.95)**		0.244 (3.68)**
Log(Mean Reference Group Income[b])		-0.050 (0.47)	0.011 (0.11)		-0.213 (0.79)	-0.130 (0.48)		-0.365 (2.10)**	-0.263 (1.34)
Observations	86679	86679	86679	86679	86679	86679	86679	86679	86679
R-Squared	0.0838	0.0826	0.0838	0.0839	0.0826	0.0839	0.0838	0.0831	0.0840

Absolute value of t-statistics in parentheses (adjusted to account for clustering as a result of aggregated variables (see Moulton, 1990).

* significant at 5% level; ** significant at 1% level

All analyses included demographic controls: age, gender, education, marital status, children, housing ownership, labor force status and disabilities, and dummy variables identifying both region and wave. In all cases, these variables accounted for significant variation in life satisfaction.

a. Based on the individual's household income adjusted for household size and deflated by regional living costs

b. Adjusted for household size and deflated by regional living costs