MICHAEL R. HAGERTY and RUUT VEENHOVEN

WEALTH AND HAPPINESS REVISITED – GROWING NATIONAL INCOME *DOES* GO WITH GREATER HAPPINESS[1]

(Accepted 2 April 2002)

ABSTRACT. "Will raising the incomes of all increase the happiness of all?" Intuition says 'yes' but theories of relative utility caution that the answer may be 'no'. The theory of relative utility holds that people's happiness depends on income relative to others (social comparisons), or on income relative to their own past income (adaptive expectations) – so that raising the incomes of all may not increase average long-term happiness. In contrast, the theory of absolute utility predicts that additional income allows each person to fill additional needs, thus increasing average long-term happiness. Previous tests among these theories have been plagued by low statistical power, which has been incorrectly interpreted as evidence against absolute utility models. The current study improves statistical power by including longer time series, by adding nine nations with low GDP/capita and (in some analyses) by pooling countries into income tiers. We also apply a dynamic model by Van Praag and Kapteyn (1973), which can estimate separate effects for social comparisons, adaptive expectations, and absolute utility theories. The results show no effect for social comparison across countries, but show support for *partial* adaptation to new income over a two-year period. Most importantly, increasing national income *does* go with increasing national happiness, but the short-term effect on happiness is larger than the long-term effect for a given rise in income.

1. INTRODUCTION

Twenty-five years ago, Easterlin (1974) posed an important question, "Will raising the incomes of all increase the happiness of all?" Though most citizens and economists have implicitly assumed that the answer is 'yes', theories of relative preference predict that the answer may be 'no'. Relative preference theories (Duesenburry, 1949; Michalos, 1985) state that an individual's utility for income is *relative* to other people (reference groups) or relative to the individual's own previous income stream (adaptive expectations). Under

Social Indicators Research **64:** 1–27, 2003.

these theories, raising the incomes of all will not change an individual's income *relative* to others, and individuals' expectations will adjust over time to the increased income, yielding no additional utility. Both of these relative utility theories would make it difficult or impossible to increase the happiness of all through economic growth. In contrast, absolute utility theories assume that greater income can fill more needs (Veenhoven, 1991) so that increasing the income of all will raise the happiness of all. In addition to the relative and absolute theories, some have proposed that further economic growth will actually harm happiness because of increased pollution, congestion, and stress (Cobb et al., 1995). All of these theories predict different patterns of happiness over time.

Evidence on these theories has been mixed up to this point, depending mainly on whether the data is cross-sectional or time-series. Cross-sectional research on over 40 countries supports the absolute utility theory, showing that national life satisfaction is strongly related to GDP/capita with a correlation of about r = 0.6 (Easterlin, 1995; Inkeles, 1993; Veenhoven, 1989, 1991; Diener and Oishi, 1999; Inglehart and Klingemann, 2000). But the limitations of cross-sectional research are well known. As Inkeles points out, higher happiness in developed nations may be due to cultural biases or to differences in social capital, which would imply that a developing nation could not expect economic growth alone to increase their own national happiness. Time series data is more informative for public policy because it can capture transitions in economic growth to observe any changes in happiness. (We should point out that micro-data time-series that follow *individuals* over time will provide even better evidence, but such studies have only just been initiated for a few developed countries.)

The time series data so far has led researchers to conclude that economic growth has *no effect on happiness*, supporting the predictions of relative utility models and contrary to the absolute theory. Easterlin (1974, 1995) first collected national time series of happiness and found no effect of GDP/capita. His early data continue to be cited by researchers Scitovsky (1992), Lane (1993), and Frank (1999), and has diffused to the popular press (Marshall, 1997). It is worrisome that Easterlin's original work has been accepted so easily, since he himself warned that his data were few and unre-

liable, so that accepting the null hypothesis of "no effect" from a test of such limited statistical power is risky (even Easterlin's latest review (1995) includes data from only 11 countries from 1972 to 1987, all from developed OECD nations). It is particularly worrisome because accepting the conclusion that economic growth has no effect on happiness would have sweeping implications for national policy, suggesting that a focus on economic growth will not benefit the long-run happiness of citizens.

In the remainder of this section, we critique previous studies on their data, interpretation of effect size, and models. We show that interpretation of results were biased downward because of low statistical power and incorrect effect-size estimation, and propose a unified model that can estimate both short-term and long-term effects for both absolute and relative utility theories. Section 2 then introduces new data that update the time series of each nation, and broadens the sample to include 9 low-income countries. Section 3 shows results from estimating the unified model and computes the correct effect sizes (both long-term and short-term). Section 4 considers implications for theory and for public policy.

Time Series of Happiness: Data, Effect Size, and Models

Four recent studies have reported the effects of GDP/capita on happiness, and are shown in Table II. Some have calculated the effect using time-series data (column 1), others using cross-sectional national data (column 2), and others using cross-sectional individual data. It should first be noted that all estimates are *positive*, contrary to the anti-growth theory that predicts a negative effect, and contrary to a pure adaptation model that predicts zero long-term effect. In the first time-series study, Diener and Oishi (2000, Table 8.3) found the slope of national happiness in 14 nations to average +0.007 per year per 1% increase in national GDP/capita. Converting their 4-point scales to a standardized 10-point scale, the effect-size shown in Table I is $0.007(10 - 1)/(4 - 1) = 0.021$ per 1% rise in national income per year. (Though Diener and Oishi did not report a significance test, they characterized such a small effect as "virtually flat" p. 11.) The second time-series study is Hagerty (2000, Table 4). He reported the change in happiness as 0.061 (on a 10-point scale) per $1000 change in GDP/capita. Converting his

TABLE I

Summary of Effect Sizes of Income on Happiness Found in Previous Research

Study	Effect of 1% rise in national income from time-series estimation	Effect of 1% rise in national income from cross-sectional estimation	Effect of 1% rise in individual's income from cross-sectional estimation
Diener and Oishi (2000)	0.022[a]	0.010[a]	0.005[a]
Hagerty (2000)[c]	0.009[b]	—	0.005[c]
Easterlin (1995)	—[d]	0.009[e]	—
Blanchflower and Oswald (1999)	—	—	0.002[f]

[a]Computation of estimates shown in text.
[b]Slope from Hagerty Table 4 is 0.061/$1000. Converting to a 1% GDP base yields: 0.061/$1000*$15326/100 = 0.0093.
[c]Slope from Hagerty Table 2 is 0.004/$1000. Converting to a 1% GDP base and to a 10-point scale yields: 0.004/$1000*$26 793/100*(10 – 1)/(3 – 1) = 0.0048.
[d]Denotes no estimates reported in paper.
[e]Slop estimated from Easterlin (1995 Figure 4) is 1.8/$14 000. Converting to a 1% GDP base yields: 1.8/$14000*$7000/100 = 0.009.
[f]Slope taken from Blanchflower and Oswald, Appendix 1 is 0.00000409/$1. Converting to a 1% GDP base and to 10-point happiness yields: 0.00000409*(100*(10 – 1)/(3 – 1) = 0.0021.

coefficient to percentage of GDP/capita (at the mean) yields an estimate of 0.061/$1000*$15326/100 = 0.0093 change in happiness per 1% change in GDP/capita. This estimate is less than that of Diener and Oishi, but was still significantly greater than zero.

Column 2 lists studies that calculate the same effect size using cross-sectional national data. Diener and Oishi (2000) and Easterlin (1995) both contribute studies, and both report a positive and significant effect. The table shows that Diener and Oishi's review of 42 nations show a change in happiness (converted to a 10-point scale) of 0.10 per 1% change in GDP/capita, while Easterlin's (1995) analysis of 24 nations calculates it as 0.009 (very similar to Diener and Oishi). The last column summarizes cross-sectional studies that estimate the effect of a 1% GDP/capita rise for an *individual*. Diener and Oishi estimate this as about one half the size of a 1% rise in

national GDP/capita, or about 0.005. Hagerty (2000, Table 2) calculated this as 0.0049 – quite close to Diener and Oishi's estimate. Blanchflower and Oswald (1999, Appendix 1) reported the linear coefficient of personal income as 0.00409/$1000 in the U.S., after controlling for sex, race, and a host of demographic variables. Evaluating this at the mean income of $11236 and adjusting their 3-point scale to a 10-point scale yields an effect size of 0.0021 per 1% rise in an individual's income.

The pattern of results in Table I is that the effect size of a 1% change in income tends to be *larger* in column 1 than in the other two columns, contrary to previous conclusions that time-series analyses yield "virtually flat" coefficients. How did this misunderstanding arise? Because the statistical power to detect an effect is limited in the time series data by the number of time-series observations (far fewer than the number of individuals in column 3), and is limited by the constrained range of GDP/capita, which is much higher in the cross-sectional estimates. (The standard deviation of GDP/capita in the cross-section from Diener and Oishi was about $8000, whereas the standard deviation in the Hagerty time-series was only about $\frac{1}{4}$ of that, or $2000 within a country over 25 years.) Therefore if one only evaluates the size of the t-statistic in the regression, one will find larger t-values for the cross-sectional regressions. But the t-statistics do not mirror actual effect sizes when the number of observations and ranges vary. Table I clarifies that the effect size of previous time-series estimates is not only greater than zero, but is *larger* than effect sizes reported from previous cross-sectional studies.

Moreover, the pattern of results across columns in Table I contradict the predictions of relative utility models. For example, if reference groups operate to reduce the effect of national GDP/capita, and to accentuate the effect of individual wealth, then we would expect coefficients in column 3 to be *greater* than those in columns 1 and 2. Instead, they are much *smaller* than those in other columns. Diener and Oishi (comparing the effects in columns 2 and 3), note this ordering of effect sizes, and propose an explanation for this, "poor people may receive some benefits of national wealth (e.g., parks and better health care) if they live in a wealthy nation, and even rich people may find it difficult to avoid certain problems if

they live in a poor society (e.g., poor roads)" (p. 10). Both of these effects would dilute any effect of relative income in favor of a needs-based theory (a rich society fills everyone's needs better for parks, health care, and roads).

Added to the concerns about effect sizes in previous research are concerns about the *models* used. The models are straightforward regressions that do not differentiate between long-term versus short-term effects of adaptation over time. Adaptation is a dynamic theory that predicts a short-term spike in happiness, then a decline to a longer-term steady state as citizens adapt to the increased income. In addition, the new steady state may be higher than the old. Separate estimates of long-term versus short-term effects are important in the dynamics of happiness.

We draw on an economic model of utility that provides a unified method for estimating both short-term and long-term effects on happiness of income (Van Praag and Kapteyn, 1973; Kapteyn and Wandsbeek, 1985; van de Stadt et al., 1985). It models utility (or happiness) as a function over time as income changes. At the current time (t = 0), happiness for an individual i is written as,

$$H_{i0} = [\ln(y_i^*) - \mu_{i0}] \tag{1}$$

where H_{i0} is utility or happiness of individual i at the current time 0, y_i^* is the individual's perceived "permanent" income at time 0, and μ_i^0 is their *expected* income at time 0. This formulation makes explicit that people consider *both* absolute income y_i^* and some reference level μ_{i0} that individuals expect at that time period.

They explicitly model μ_{i0} as depending both on the income of "relevant others" and the individual's own past income (van de Stadt et al., 1985: Eq. 9):

$$\mu_{i0} = \sum_{t=-\infty}^{0} a_t \quad \sum_{j=1}^{N} w_{ij} \ln(y_{ij}) + \varepsilon_{i0} \tag{2}$$

where a_t is the memory weight at time t to discount past income, w_{ij} is the importance that individual i places on person j in determing i's reference group, and ε_{i0} are identically and independently distributed error terms with zero mean. In order to estimate this model,

further constraints must be imposed. They simplify the time weights by assuming a lag structure (where a is defined between zero and one) and they simplify the person weights by assuming that all weights within each social reference group are equal (van de Stadt et al., 1985: Eq. 11):

$$a_t = (1 - a)/a^t$$
$$w_{ij} = k \quad \text{(when j is in i's reference group, else k = 0)} \quad (3)$$

This model allows tests of Easterlin's and Veenhoven's hypotheses about how happiness changes over time. If μ_{i0} does not change with time or with incomes of relevant others, then the data are consistent with the absolute need-based theory and relative theories are not supported. In contrasts, if $0 \leq a < 1$, then happiness depends on past incomes and people show adaptation effects. Finally, if $w > 0$, then happiness depends on relevant others, and preferences show social comparison effects.[2]

We will estimate their model, but because our data differ, our estimation method must differ in two ways.[3] First, the happiness data is aggregated to countries, whereas Van Praag and Kapteyn propose their model for individuals. The difficulty is that different countries seem to have quite different mean happiness, which may be due to extraneous factors such as culture and institutions. We therefore add "fixed effects" to (1–3), to estimate a separate intercept for each country to account for these.

The second problem in applying (2) is that in the present data "permanent income" y_i^* is an unobserved variable, whereas Van Praag and Kapteyn simply assume that the income volunteered by the respondent is permanent income. Therefore we take Friedman's (1957) original formulation of permanent income as the weighted average of income for all previous years, where the weights decline exponentially:

$$y_i^* = (1 - p) \sum_{s=-\infty}^{0} p^s \ln(y_{is}) \quad (4)$$

where y_i^* is the permanent income perceived by citizens of country i, p is the memory weight to estimate "permanent income", and s is the index for time periods prior to the current period (s = 0).

Substituting these additions into (1) yields the estimation equation:

$$H_{i0} = c + \sum d_i + b_2(1-p)\sum_{s=-\infty}^{0} p^s \ln(y_{is}) - b_1(1-a)\sum_{t=-\infty}^{-1} a^t \sum_{k=1}^{N} k_j \ln(y_{jt}) + \varepsilon_{i0} \quad (5)$$

where c is the overall y-intercept, d_i is the dummy variable or intercept for country i, b_2 is the coefficient of the absolute (permanent) income, and other symbols are as defined in (2–4).

To demonstrate the difference that the permanent income assumption makes, take an example such that an individual's income rises at time t = 0 in a step function, from many years of $10000 to many years of $15000. Van Praag and Kapteyn's model assume that the full increase is perceived at once, causing happiness to peak at time 0, and to decline thereafter due to adaptation to the new income. In contrast, the permanent income hypothesis would predict that the individual would not be certain that the additional income is permanent in the first year, but would take several years to become certain that the new income is permanent. As a result, the permanent income assumption (4) predicts that happiness will peak at some time greater than t = 0.

The model in (5) is estimated directly using the constrained non-linear least-squares estimation program in SPSS. This program uses a sequential quadratic programming algorithm, with a quadratic programming subproblem to determine search direction (Gill et al., 1986). The resulting estimates are least-squares, given the restrictions that a, p, and k are between 0 and 1.

2. DATA

The data consisted of happiness ratings and GDP/person from 21 countries. The happiness ratings were collected from Veenhoven's (1999) World Database of Happiness. All countries were included that had fielded at least 3 surveys over time, using the same rating scale on a representative sample of citizens. The data span the

years 1958–1996. Table I lists the countries, the years surveyed, and the number of data points from each. Twelve of the countries in the list participated in the Eurobarometer survey program since 1973, which employs the same life-satisfaction scale over time and between countries. The question wording for the Eurobarometer was: "On the whole, how satisfied are you with the life you lead? Are you: very satisfied, fairly satisfied, not very satisfied, or not at all satisfied with the life you lead?" Coding was originally on a 4-point scale, and was transformed by Veenhoven to a 10-point scale to allow easy comparison with other scales. Veenhoven gives the month that each survey was fielded, which was transformed to the appropriate quarter and year. One country (U.S.) assesses "happiness" rather than life-satisfaction.

Material wealth is measured by GDP/person, expressed in 1987 US dollars, to give a consistent scale across countries. Data was collected from the World Bank (1997). For years prior to 1960, GDP/person was collected from the U.N. Statistical Yearbook (1961). For countries that reported quarterly, GDP/person was recorded to the nearest quarter of the year in which the survey was done. In all other cases, GDP/person was recorded to the nearest year. Since some countries fielded two surveys per year but reported only annual GDP measures, the scores from the two surveys were averaged for that year.

For purposes of this analysis, we divide the 21 countries in Table I into 3 groups: countries with high GDP/capita (Norway, Denmark, Luxembourg, U.S., Japan), countries with medium GDP/capita (England, Ireland, Netherlands, Belgium, France, Germany, Italy), and countries with real GDP/capita of less than $10000 (India, Philippines, South Korea, South Africa, Mexico, Brazil, Portugal, Spain, Greece). Note that this sample includes a great diversity in per capita GDP and in growth paths. In contrast, Easterlin's sample included only developed countries with medium to high GDP/capita. The more diverse sample will allow tests of decreasing returns to happiness of GDP/capita.

TABLE II

Nations Studied, with Years Spanned and Average GDP/capita for Each

Country	Years	Number of happiness surveys	Average GDP/capita in 1995 $U.S.
High GDP/capita			
United States*	1972–1994	26	17584
Japan	1958–1996	39	18265
Norway	1972–1996	6	19874
Denmark	1973–1996	41	18474
Luxembourg	1973–1996	22	17797
Medium GDP/capita			
United Kingdom	1973–1996	40	11185
Ireland	1973–1996	22	8953
Netherlands	1973–1996	38	14972
Belgium	1973–1996	22	13796
France	1973–1996	40	15372
Germany	1973–1996	40	14140
Italy	1973–1996	40	12486
Low GDP/capita			
Spain	1984–1996	22	8144
Portugal	1985–1996	13	4228
Greece	1981–1996	26	4565
South Africa	1981–1996	7	2395
Brazil	1975–1996	5	1917
Korea (South)	1979–1996	5	3132
Mexico	1975–1996	4	1780
India	1975–1996	4	321
Philippines	1979–1996	3	622
Total		465	

*Surveys in the US asked about ‘happiness’ instead of ‘life-satisfaction’.

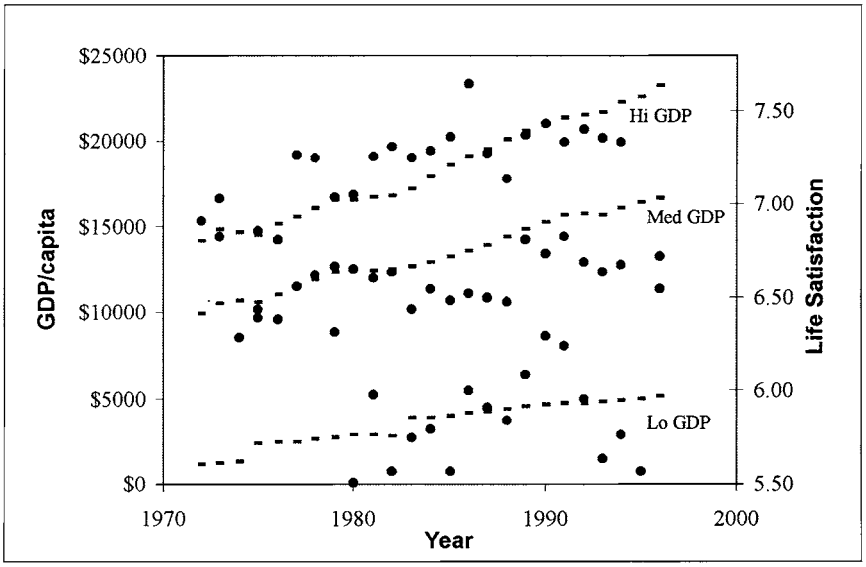

Figure 1. GDP/capita (dashes) and national life satisfaction (dots) by year for high, medium, and low GDP capita countries.

RESULTS

Descriptive Statistics on Happiness and Income

The dashes in Figure 1 display the growth of real income per capita (on the left-hand axis) by year for the three groups of countries. For example, the upper line shows that real income for the top group was about $14000 per capita in 1972, and grew to about $23000 in 1996. Note that the slope of the medium income group is lower, and the slope of the lowest income group is lowest. This diverging pattern is typical of current global growth patterns (Sachs and Warner, 1997), where incomes of less developed countries have diverged instead of converged to that of more developed countries. Hence the sample of countries for which we have happiness data appears typical of the income growth patterns observed in the world as a whole.

The dots in Figure 1 represent the average national happiness ratings (on the right-hand axis) of the nations in each group for that year. For example, the national happiness of the 4 nations in the top income group averaged 6.9 in 1972, and rose to 7.9 in 1996. Several points should be noted from Figure 1. First, any cross-section of happiness (holding time constant) is fairly consistent, in that nations

with lower incomes report lower average happiness scores. This effect is now generally acknowledged (Easterlin, 1995; Diener and Oishi, 1999) and is documented in Table I, column 2. Second, the top two time-series of happiness shows perceptible *growth* over time. This appears to support the needs-based theory. However, the graph should be viewed with caution because some data are missing (some nations do not survey happiness every year, especially not developing nations). Formal testing must await estimation of separate effects in the presence of missing data, but Figure 1 gives a helpful visualization of the data.

Table III displays some results for each country separately. Remember that the number of observations ranges from 41 to 3 so that some items with high correlation are not significant. The first column presents the contemporaneous correlation between national happiness and national wealth for each nation. It shows that wealth is positively correlated with happiness for 14 of the 21 countries, and that only 1 of the 21 countries had a significant negative correlation – Belgium. In contrast, 7 of the 21 countries show significant positive correlation with wealth. This column shows that most countries display a positive relation between national income and happiness. The positive effects are consistent with absolute preferences and contradict all strong relative preference theories.

The next two columns of Table III display lagged correlations, because these can bear hints about causality. If a change in wealth is followed next year by a change in happiness (high correlations in column 2), then evidence for causation is enhanced. Conversely, if a change in happiness is followed next year by a change in wealth (high correlation in column 3), then evidence for reverse causation is enhanced. These columns of Table III show that average lagged correlations are positive but were lower than the average contemporaneous correlation in column 1 of +0.27. Hence the causal mechanism appears to operate within a 1-year window, and we cannot distinguish the direction of causality with current data.

The last two columns of Table III present the magnitude of the effect of the regression of GDP/capita on happiness. Column 4 reports the raw beta coefficient from the regression as the effect of $1000 increase in GDP/capita on happiness, and column 5 converts this to the effect of a 1% increase in GDP/capita in the country

TABLE III

Correlation of Life-satisfaction and Income in 21 Nations 1973–1996

Country	Correlation same time	Correlation lagged: GDP/capita 1 year before	Correlation lagged: Life-satisfaction 1 year before	Slope per $1000	Slope per 1% GDP/ capita
U.S.	+0.51***	+0.41**	+0.54***	0.032	0.006
Japan	+0.04	–0.03	–0.28*	0.006	0.001
Norway	–0.38	–0.20	–0.38	–0.026	–0.005
Denmark	+0.53***	+0.52***	+0.54***	0.060	0.011
Luxembourg	+0.71***	+0.69***	+0.73***	0.047	0.008
High GDP/capita				0.024	0.004
U.K.	+0.01	+0.03	+0.01	0.002	0.000
Ireland	–0.10	–0.13	–0.23	–0.015	–0.001
Netherlands	+0.38**	+0.35**	+0.44***	0.046	0.007
Belgium	–0.40*	–0.41*	–0.42*	–0.084	–0.012
France	+0.15	+0.14	–0.33**	0.177	0.027
Germany	+0.24	+0.20	+0.38**	0.018	0.003
Italy	+0.90***	+0.89***	+0.87***	0.169	0.021
Medium GDP/capita				0.045	0.006
Spain	–0.09	–0.16	–0.08	–0.031	–0.003
Portugal	+0.65**	+0.24	+0.74***	0.433	0.018
Greece	–0.20	–0.19	–0.37*	–0.305	–0.014
South Africa	–0.40	–0.37	–0.43	–1.010	–0.024
Brazil	–0.32	–0.20	–0.17	–0.140	–0.003
Korea (South)	+0.92*	+0.93*	+0.92	0.380	0.012
Mexico	+0.95	+0.83	+0.85	1.730	0.031
India	+0.71	+0.82	+0.72	4.040	0.013
Philippines	+0.86	–0.45	+0.80	9.948	0.062
Low GDP/capita				1.67	0.010
Average	+0.27	+0.19	+0.23	0.740	0.008

***$p < 0.01$.
**$p < 0.05$.

(calculated at the country's mean income). The last row of Table III shows that the average estimate over all countries is that happiness rises by +0.008 (on a 10-point scale) with each 1% in national income. This is slightly smaller than the effect size found by Hagerty for 8 countries (see Table I, column 1) and less than half the effect size found by Diener and Oishi. Note that this effect size is still more than twice as large as the effect size found for *individuals* within countries, which range from 0.002 to 0.005 (Table I, column 3).

Table III also shows average effect sizes for high, medium, and low GDP/capita countries, shown in summary rows beneath each group of nations. They show that the average effect size for higher GDP countries is smaller than that for medium GDP countries, which in turn is smaller than that for lower GDP countries. This evidence is consistent with a national utility function that is logarithmic in income, showing that the increase in happiness with a given dollar increase in income is greatest for nations with lowest GDP/capita. This decreasing effect size has long been visible in cross-sectional analyses (Veenhoven, 1991; Easterlin, 1995), but this is the first analysis where effect sizes have been calculated within-country, controlling for culture and institutions.

Easterlin's earlier claim was based on reports from 11 nations up to 1987. Five of these 11 nations now show significant *increases* in life satisfaction (U.S., The Netherlands, Germany, Italy, and Denmark), while only one shows a significant decline (Belgium). Hence the new data require substantial revision of Easterlin's conclusion that no country showed significant trends in happiness.

Did the trends in these countries suddenly begin during the last 10 years, or were the trends developing over a longer period of time? Figure 2 plots happiness over time, for each of the 9 countries with significant trends. Three countries (Italy, Denmark, and Luxembourg) show clearly visible, linear increases in happiness since 1974. Three additional countries (Netherlands, Portugal, Germany) show increasing trends with higher error variance (contributing to their lower correlation coefficients), but are still significant.

One country (Belgium) displays a visible U-shape, where happiness declines until 1987, then rises again. A significant quadratic trend was confirmed for Belgium ($t = 3.79$, $p < 0.001$), though for none of the other countries. Inglehart and Rabier (1986)

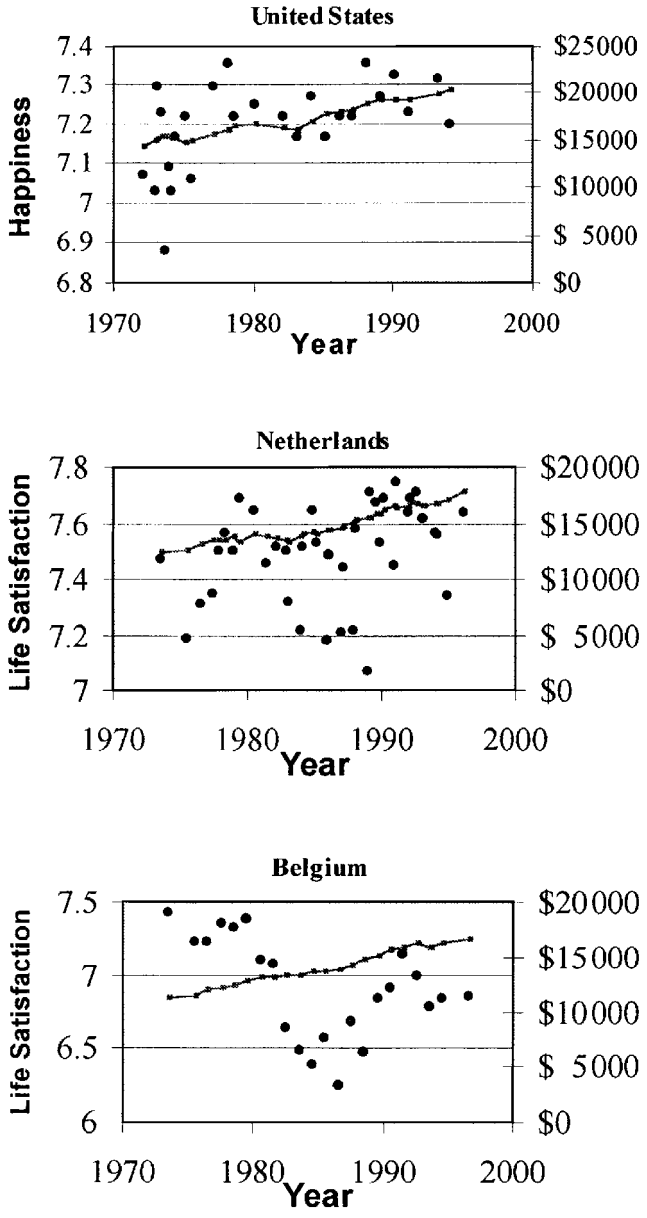

Figure 2. Happiness in 9 countries that showed significant correlations with GDP/capita. Happiness or life satisfaction is plotted with solid dots and is scaled on the left hand side. GDP/capita in $US 1987 is plotted with the line and is scaled on the right hand side.

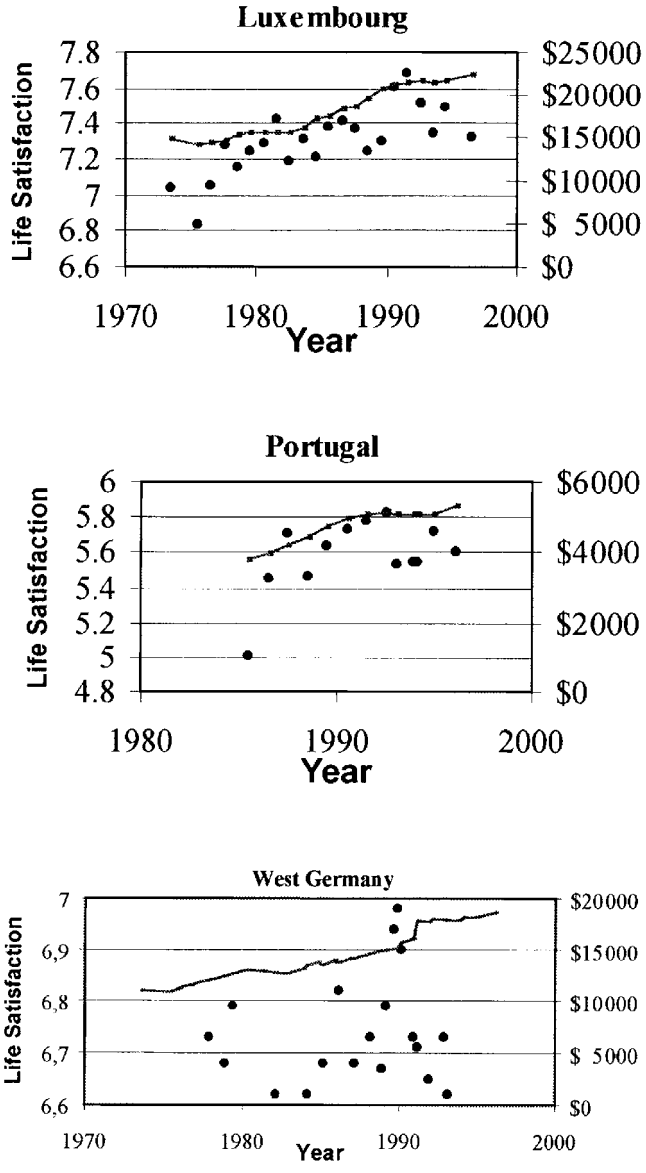

Figure 2. Continued.

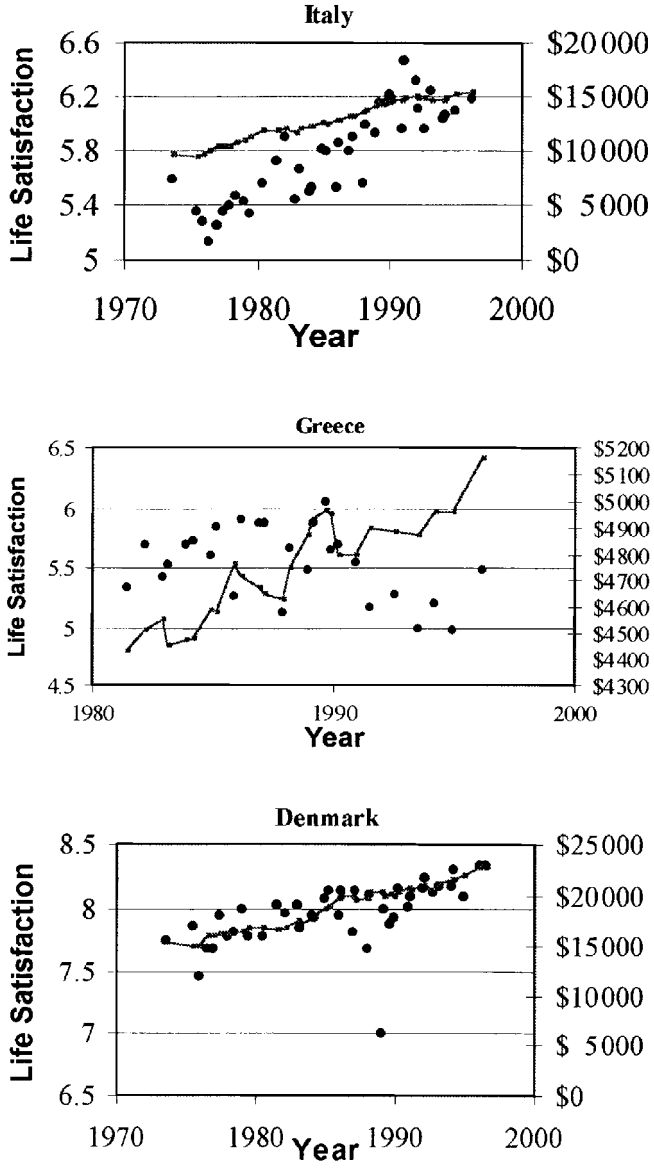

Figure 2. Continued.

first commented on the (then) decline in Belgian life satisfaction, but only our newer data show the recent increasing trend. Inquiry revealed that Belgian unemployment was rising in the early 1980s, but it was not reflected in GDP/capita because the government temporarily increased deficit-spending. In anther country (Germany), the positive trend appears due to the spike in happiness in 1990 (during reunification). Finally, the U.S. displays a significant trend because of the low happiness scores in 1972–1974. These may in part be due to the social unrest caused by the Vietnam War, but it may also be due to inclusion of surveys that are not comparable with the General Social Survey (GSS) time-series. These additional surveys in 1972–1974 contained identical wording of the happiness item, but sampling design and administration may have differed. When these non-GSS surveys were deleted, no significant trend was found for the U.S. In summary, of the nine countries with significant trends, 3 may be due to extrinsic factors or outliers, but 6 display smooth increases in happiness mirrored by increases in national income.

Joint Effects of Absolute Income, Adaptive Expectations and Reference Groups

The joint effects due to absolute income, adaptive expectations, and reference groups were simultaneously estimated using Von Praag and Kapteyn's model, modified for estimation of happiness data to (5). Table IV gives the estimates from the quadratic programming estimation program in SPSS, using constraints that k, a, and p are between zero and one. Different initial starting positions and extensive bootstrapping showed that all solutions were stable and increased confidence that global minima were attained.

Table IV shows the results of these estimations for two different definitions of reference groups and for a constrained version that does not include reference groups. The first column shows the results from the most general assumption that all other countries in the sample are included in a country's reference group (reference group = all). Under this model, increasing income in the U.S. would tend to decrease happiness in India, all else constant, because India is assumed to compare its income to all other countries. The percent of variance accounted for by each model is given in the top row.

TABLE IV

R^2 and Coefficients from Models Predicting Happiness in 21 Nations
Z-scores from asymptotic standard errors are in parentheses

	Full model, ref group = all countries		Full model, ref group = Hi, Med, or Low GDP countries		Restricted model, no reference groups	
R^2	0.9132		0.9131		0.9131	
b_2	1.26	(2.67)	1.21	(2.57)	1.23	(2.63)
b_1	–0.92	(–1.95)	–0.90	(–1.97)	–0.93	(–2.02)
k	0.07	(0.00, 0.96)[a]	0.01	(0.00, 0.12)[a]	–0–	
a	0.31	(0.01, 0.77)[a]	0.26	(0.00, 0.75)[a]	0.26	(0.1, 0.72)[a]
p	0.42	(0.01, 0.92)[a]	0.43	(0.00, 0.82)[a]	0.43	(0.01, 0.78)[a]
(constant)	0.56	(0.47)	0.15	(0.15)	0.12	(0.13)
U.S.	1.37	(16.86)	1.37	(16.78)	1.37	(16.87)
U.K.	1.30	(12.29)	1.26	(15.61)	1.25	(15.93)
Ireland	1.43	(9.98)	1.37	(12.18)	1.37	(13.78)
Netherlands	1.73	(21.54)	1.70	(23.03)	1.71	(23.96)
Belgium	1.09	(12.20)	1.06	(13.08)	1.06	(13.34)
Luxembourg	1.45	(19.02)	1.45	(18.93)	1.45	(19.03)
France	0.18	(2.42)	0.16	(2.09)	0.16	(2.34)
Spain	0.91	(5.28)	0.80	(4.03)	0.82	(7.71)
Portugal	0.67	(2.45)	0.53	(2.80)	0.54	(3.17)
Germany	0.85	(11.26)	0.82	(12.21)	0.82	(12.51)
Italy	0.20	(2.18)	0.16	(2.24)	0.16	(2.25)
Greece	0.56	(2.26)	0.43	(2.28)	0.44	(2.96)
Denmark	2.07	(30.85)	2.07	(30.82)	2.07	(30.89)
Mexico	2.92	(6.72)	2.72	(10.13)	2.71	(10.15)
Brazil	2.53	(6.11)	2.34	(9.29)	2.33	(9.30)
Norway	1.38	(11.60)	1.38	(11.60)	1.39	(11.68)
South Africa	1.78	(4.62)	1.58	(6.97)	1.59	(7.01)
Korea	1.09	(3.21)	0.93	(4.23)	0.93	(4.38)
India	3.11	(4.40)	2.79	(5.82)	2.76	(6.73)
Phillippines	3.36	(5.52)	3.08	(7.85)	3.06	(8.56)
Japan	–0–		–0–	–0–		

Notes: n = 336.
[a]z-statistics are not given for k, a or p because their distribution is non-normal due to constrained estimation. Instead, a 95% confidence interval is shown that was computed from 400 bootstrapping replicates.

Lower rows show the coefficient estimates and z-scores computed from asymptotic standard errors. For example, the first coefficient shown is the coefficient for absolute income, b_2. It is significant and positive, contradicting Easterlin's and Duesenbury's hypothesis that happiness is completely relative. The second row shows that the coefficient for relative utility b_1 is negative and approaches significance. The next three rows contain estimates that were non-normal because they were constrained to be between 0 and 1. Therefore the z-scores are not shown, but instead the 95% confidence intervals are reported from bootstrapping with 400 replicates of the sample. The third row shows that the best estimate of the social comparison term k is 0.07, and its confidence interval includes zero. Hence we find no evidence that countries compare themselves to all other countries around the globe.

The second column tests a more restricted hypothesis that a country's reference group is composed only of countries with similar GDP/capita. The coefficient for own absolute income b_2 is again significant, as is the coefficient for relative income. However, the coefficient for reference groups k does not differ from zero. Therefore the third column restricts the model to $k = 0$ – that is, each country considers only its own past in determining happiness. The R^2 drops very little, and most estimates are similar to previous columns. Again, the coefficient for own absolute income b_2 is significant, as is the coefficient for relative income. Examining lower rows, the memory coefficients a and p are estimated as 0.26 and 0.43, respectively. Note that the upper bound of both excludes one, which implies that at least some of the lagged incomes contribute significantly to national happiness. Note also that the lower bound approaches zero. Even if $a = 0$ then from (5) the first lagged term would still have a coefficient different from zero. Hence the model includes at least one relative income term that depends on a country's previous income.

To show the relative effects of these non-linear coefficients, Figure 3 plots predicted happiness of a hypothetical nation undergoing a 10% increase in GDP/capita, using the coefficients estimated in column 3. Prior to the increase at year 11, GDP/capita is a constant $15 000. The adaptive expectations model with parameters estimated in column 3 predicts that happiness stabilizes at 5.71. At

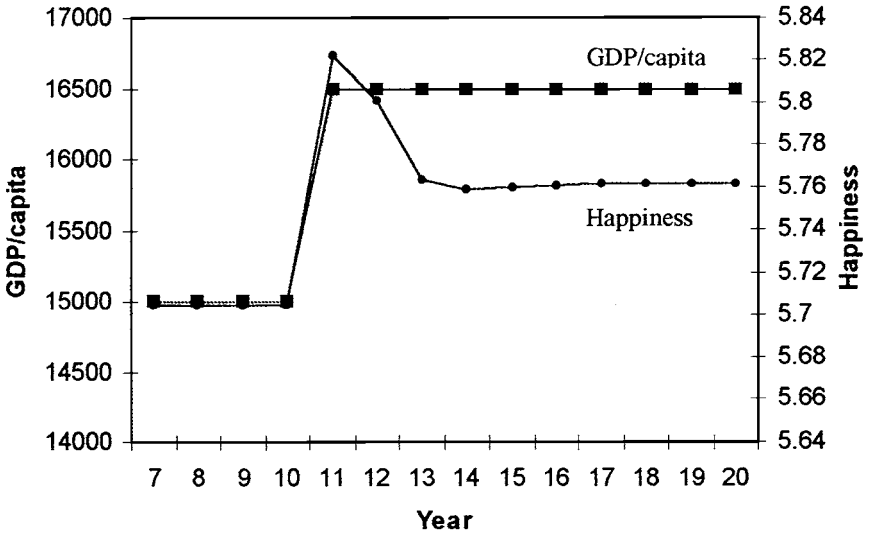

Figure 3. Effect on predicted happiness from a 10% rise in GDP/capita in year 11.

year 11, the 10% rise in national income appears, and happiness is predicted to spike to 5.83. Later years show the decay in happiness due to adaptive expectations. The graph shows that about 90% of adaptation occurs in the first two years following an increase in income, but that happiness does *not* decay to its original value. Instead, the adaptation effect reduces happiness to about one half of its peak increase. In summary *both* absolute and relative utility effects are active as national happiness varies with national income. Contrary to strong models of relative utility, happiness is not a zero-sum game. Instead, increasing the income of all *does* increase the happiness of all, but adaptation reduces the rate of increase to about half of its peak.

The bottom rows of Table IV show the estimates for the intercepts for each nation. For example, the U.S. has an average level of happiness that is 1.37 points higher than that of Japan. (Japan was used as the reference case, defining its dummy variable as zero.) The differences are in line with the results of earlier cross-national comparisons of happiness, using different samples and measures (e.g., Veenhoven and Ehrhardt, 1995). In these studies, the Mediterranean countries score relatively low as well, even when happiness is measured by mood-level rather than by life-satisfaction.

Whereas the former studies compared simple averages over nations, these dummies show differences among nations after income is controlled.

3. DISCUSSION

Previous time-series studies tracking effects of income on happiness have been plagued by low statistical power, which has been incorrectly interpreted as evidence against absolute utility models. The current study improves statistical power by including longer time series, by adding 9 nations with low GDP/capita and (in some analyses) by pooling countries into income tiers. The study is also the first to estimate dynamic effects of happiness, to capture both long-term and short-term effects of income on happiness.

The results show that increasing national income *does* go with increasing national happiness, consistent with a needs theory and contrary to strong relative utility models. Of the 21 countries, 7 now show a significant positive coefficient of income growth, and only one shows a negative coefficient. Higher income countries show smaller effects of absolute income than lower income countries, consistent with diminishing marginal utility of money. In addition to the long-term effect of income predicted by the needs theory, we also find a short-term effect due to partial adaptation. Both dynamic effects are demonstrated in Figure 3.

In contrast, no effect was found for social comparison of relative income across nations. Van de Stadt et al. (1985) used Van Praag and Kapteyn's model to estimate social comparison effects for socio-demographic reference groups, but detected no effects. Studies by Diener et al. (1993) found no evidence for the influence of relative standards. For example, differences in happiness across income brackets appeared the same in poorer and richer areas of the U.S., even though people in a poorer area with a given income should be more likely to compare themselves relative to others in the poorer area, thus predicting higher happiness for the same level of income. Similarly, African-Americans and the poorly educated did not derive greater happiness from specific levels of income. Likewise, Veenhoven and Ehrhardt (1995) found that the comparison theory of happiness fails several empirical tests. However, some studies have

found strong social comparison effects. Hagerty (2000) found that, controlling for income, citizens of higher-income Standard Metropolitan Statistical areas in the U.S. had lower happiness. Similarly, Clark and Oswald (1996) found that worker satisfaction was inversely related to their comparison wage rates. It appears that the choice of reference groups and statistical method is crucial, and requires further research.

The outcomes are compatible with needs theory modified to include some adaptation effects. The needs theory implies that citizens had unmet needs that could be gratified by goods and services, though with diminishing marginal utility of income. Incomplete adaptation to changes in income also occurs, thus reducing the long-term effect size of income.

Limitations and Future Research

It is important to recall that the correlations observed here do not prove causation. Omitted variables that are correlated with GDP may also influence happiness. For example, the observed rise of happiness may be due in some part to growing democracy in western society (Barro, 1999) or to women's emancipation (Schyns, 1998). Also, simultaneous causation may exist, where not only does income improve happiness, but also happiness may increase GDP in later periods, perhaps by creating more productive workers. Table III investigated the timing of changes in wealth relative to happiness, and compared concurrent correlations with lagged correlations for 1-year time period. This analysis did not reveal much difference, yet effects may appear at other intervals. More detailed time series will be necessary to further test causation.

Future studies would also benefit from microdata analysis of individual respondents over time. However, such panels of individuals are very rare, and would not contain the breadth of countries in the current study. For example, Blanchflower and Oswald (1999) have analyzed microdata from the U.S. and Britain, but have not been able to estimate longitudinal effects at the individual level because those countries interview different individuals in each year.

We should caution that any theory explaining happiness as depending *only* on average income (even a dynamic theory) is clearly insufficient for public policy purposes. The *distribution*

of income over citizens (inequality), and their *freedom* to use the income in any way they wish have been shown in cross-sectional studies to impact happiness as well. As better time-series on inequality and freedom evolve, these variables should also be addressed. In addition, the specific *expenditures* that citizens make with their income are also likely to affect happiness. Diener and Oishi (2000) and Galbraith (1984) propose that increased public expenditures (parks, roads, hospitals) will most efficiently increase average happiness. Investment in some social security has also be suggested to raise happiness, though Veenhoven (2000) observed no effects. Alternatively, Scitovsky (1992) and Lane (2000) propose that education and leisure time with friends and family will most efficiently increase individual happiness. In contrast, expenditures on "consumer items" may result in fast adaptation and little lasting happiness (e.g., trading up to a sport utility vehicle but rarely using its expensive off-road features). It may be that consumers are myopic in purchasing some items, anticipating the spike in happiness but not the longer-term decay. These theories may help explain the failure of the current model to explain Japan's happiness profile. Easterlin (1995) points out that national happiness in Japan shows no upward trend since 1958, despite a stupendous increase in GDP/capita. (Our current paper shows that this is an exception rather than the rule among the 21 nations in our sample.)

In summary, happiness is apparently not a zero-sum game and can be raised by growth in national income. This has been a central but until recently untested belief of economists and public policy analysts. Not too long ago unhappiness was deemed the normal human condition. Since expulsion from Paradise, humans could only hope for happiness in the after-life. Promises of greater happiness in earthly existence were dismissed as overly simplified utopism. The current research on happiness allows empirical tests of this, and has shown that entire nations can become happier with economic growth and its covariates. Future studies may show how to further increase the growth of national happiness.

NOTES

[1] This paper has benefited greatly from comments by Ed Diener, Prasad Naik, and Christopher Jencks.

[2] Van de Stadt et al. (1985) estimated the model for just two periods, but found strong effects for adaptive expectations and no effects for reference groups. We caution that their study focused on satisfaction with income, and not on satisfaction with life as a whole. The findings about satisfaction with income do not necessarily apply to satisfaction with life-as-a-whole. Satisfaction with income is largely derived from comparison with external standards, because we lack an inner sense-organ for appraising income adequacy. Satisfaction with life-as-a-whole is rather derived from inner affective experience, which is psychobiologically linked to need gratification.

[3] In addition to the changes in estimation method, some may object that happiness ratings are strictly an ordinal scale and cannot be aggregated by averaging scores, but instead should be analyzed by ordered logit. However, previous studies using ordered logit (Hagerty, 2000; Blanchflower and Oswald, 1999) have found essentially the same results as regression analysis that treats the scale as equal-interval. Similarly, Veenhoven's (1993) rescaling supports the theory that respondents are able to use the happiness scale as equal-interval.

REFERENCES

Barro, R.J.: 1999, 'Determinants of democracy', Journal of Political Economy 107(6), pp. S158–S183.

Blanchflower, D.G. and A.J. Oswald: 1999, 'Well-being over time in Britian and the USA', National Bureau of Economic Research working paper, on the web at http://www.nber.org/papers/w7487.

Clark, A.A. and A.J. Oswald: 1996, 'Satisfaction and comparison income', Journal of Public Economics 61, pp. 359–381.

Cobb, C., T. Halstead and J. Rowe: 1995, The Genuine Progress Indicator: Summary of Data and Methodology (Redefining Progress, San Francisco, CA).

Diener, Ed: 1984, 'Subjective well-being', Psychological Bulletin 95, pp. 542–575.

Diener, E. and S. Oishi: 2000, 'Money and happiness: Income and subjective well-being across nations', in E. Diener and E.M. Suh (eds.), Subjective Well-being Across Cultures (MIT Press, Cambridge MA, pp. 185–218).

Duesenberry, J.S.: 1949, Income, Savings, and the Theory of Consumer Behavior (Harvard University Press, Cambridge, MA).

Easterlin, R.A.: 1974, 'Does economic growth improve the human lot? Some empirical evidence', in P.A. David and M. Reder (eds.), Nations and Households in Economic Growth (Academic Press, New York).

Easterlin, R.A.: 1995, 'Will raising the incomes of all increase the happiness of all?', Journal of Economic Behavior and Organization 27, pp. 35–47.

Frank, R.H.: 1999, Luxury Fever: Why Money Fails to Satisfy in an Era of Excess (Free Press, New York).

Friendman, M.: 1957, A Theory of the Consumption Function (Princeton University Press, Princeton, NJ).

Galbraith, J.K: 1984, The Affluent Society, 4th ed. (Houghton Mifflin, Boston).

Gill, P.E., W.M. Murray, M.A. Saunders and M.H. Wright: 1984, 'Procedures for optimization problems with a mixture of bounds and linear constraints', ACM Transactions on Mathematical Software 103(3), pp. 282–296.

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), pp. 746–771.

Inglehart, R. and H-D. Klingemann: 2000, 'Genes, culture, democracy, and happiness', in E. Diener and E. Suh (eds.), Culture and Subjective Well-Being (MIT Press, Cambridge, MA, pp. 165–184).

Ingelhart, R. and J-R. Rabier: 1986 'Aspirations adapt to situations – But why are the Belgians so much happier than the French?', in F.M. Andrews (ed.), Research on the Quality of Life (Survey Research Center, University of Michigan, Ann Arbor, MI, pp. 1–56).

Inkeles, A.: 1993, 'Industralization, modernization, and the quality of life', International Journal of Comparative Sociology 31(1), pp. 1–23.

Kapteyn, A. and T. Wansbeek: 1985, 'The individual welfare function: A review', Journal of Economic Psychology 6, pp. 333–363.

Lane, R.E.: 1993, 'Does money buy happiness?', The Public Interest 113 (Fall), pp. 56–65.

Lane, R: 2000, The Decline of Happiness in Market Democracies (Harvard University Press).

Marshall, T.: 1997, 'Does income make us happy?' *San Francisco Chronicle*.

Michalos, A.C.: 1985, 'Multiple Discrepancies Theory (MDT)', Social Indicators Research 6(1), pp. 347–413.

Oswald, A.J.: 1997, 'Happiness and economic performance', The Economic Journal (Nov.), pp. 1815–1831.

Sachs, J.D. and A. Warner: 1997, 'Fundamental sources of long-run growth', American Economic Review (May) 87(2), pp. 184–188.

Schyns, P.: 1998, 'Crossnational differences in happiness: Economic and cultural factors explored', Social Indicators Research 43, pp. 3–26.

Scitovsky, T.: 1992, The Joyless Economy: The Psychology of Human Satisfaction (New York: Oxford University Press).

United Nations: 1961, United Nations Statistical Yearbook (New York).

Van de Stadt, H., A. Kapteyn and S. van de Geer: 1985, 'The relativity of utility: evidence from panel data', The Review of Economics and Statistics 67 (May), pp. 179–187.

Van Praag, B.M.S. and A. Kapteyn: 1973, 'Further evidence on the individual welfare function of income: An empirical investigation in the Netherlands', European Economic Review 4, pp. 33–62.

Veenhoven, R.: 1989, 'National Wealth and individual happiness', in K.G. Grumert and F. Olander (eds.), Understanding Economic Behavior (Kluwer Academic, Dordrecht, Netherlands, pp. 9–32).
Veenhoven, R.: 1991, 'Is happiness relative?', Social Indicators Research 24, pp. 1–34.
Veenhoven, R.: 1997, 'Developments in satisfaction research', Social Indicators Research 37, pp. 1–46.
Veenhoven, R.: 1999, 'World Database of Happiness, Catalog of Happiness in Nations', http://www.eur.nl/fsw/research/happiness.
Veenhoven, R.: 2000, 'Wellbeing in the welfare state, level not higher, distribution not more equitable', Journal of Camparive Policy Analysis 2, pp. 91–125.
Veenhoven, R. & J. Ehrhardt: 1995, 'The cross-national pattern of happiness. Tests of predictions implied in three theories of happiness', Social Indicators research 34, pp. 33–68.

Michael R. Hagerty
Graduate School of Management
University of California, Davis
Davis, CA 95616
USA
E-mail: marhagerty@ucdavis.edu

Ruut Veenhoven
Erasmus University Rotterdam and University of Utrecht