

WEALTH AND HAPPINESS REVISITED

Growing wealth of nations *does* go with greater happiness¹

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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 rises in income will produce at best short-lived gains in happiness. If people’s happiness depends on income relative to others (social comparisons), or on income relative to their own past income (adaptive expectations) then raising the incomes of all may not increase average happiness. In contrast, the theory of absolute utility predicts that additional income allows each person to fill additional needs, thus increasing average happiness.

We test the absolute utility theory against both types of relative utility theories. Previous tests 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. We also apply a model by VanPraag and Kapteyn (1973), which can estimate separate effects for social comparisons, adaptive expectations, and absolute income 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 higher than the long-term effect for a given rise in income.

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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 (Duesenberry 1949) 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 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, more commonly used 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.

Easterlin (1974) made the first attempt to test these competing theories. He first suggested cross-sectional comparison across nations with differing levels of GDP/capita. Current data (Veenhoven 1989; 1991; Diener and Oishi 1999; Inglehart and Klingemann 2000) now show for over 40 nations that national happiness increases monotonically with higher GDP/capita, consistent with the absolute utility theory. Micro-level correlations between personal income and individual happiness appear to be greatest in poor nations and almost negligible in several rich nations (Veenhoven 1991), also consistent with absolute utility theory.

Cross-sectional data cannot control for cultural and institutional factors that covary with national income, such as increased freedom, improved public services, and possible cultural biases toward happiness. Therefore, Easterlin also compared over time within a nation (the US). He observed that income per capita had doubled between 1946-1970, while average happiness had remained at the same level. He saw that as another proof for relative utility theory.

This finding has been also been contested. Veenhoven (1989) cited examples of other nations where a rise in income was followed by an increase in happiness, post-war Western Europe and Brazil. Recently data became available about more nations and longer periods. The first analyses of these data have yielded mixed results. Oswald (1997) and Hagerty (2000) found small effects of national income on happiness. In contrast, Easterlin (1995) and Diener and Oishi (2000) could not detect any effect. Easterlin (1995) concluded again, “Raising the incomes of all will NOT increase the happiness of all”.

The present paper reports an analysis of the newest data, which tests Easterlin's claim and rejects it. We first review previous comparisons over time and show that all studies found positive effects of income on happiness, and that the longitudinal effects are in fact *greater* than the observed same-time differences between poor and rich nations and poor and rich individuals. Section 2 then introduces new data that update the time series of each nation, and broadens the sample to include 9 low-income countries. In section 3 we test both Easterlin's hypothesis that happiness depends only on relative income as well as the 'needs hypothesis' that happiness depends only on absolute income, by fitting VanPraag and Kapteyn's (1973) welfare function to the new data. This provides the most rigorous test on the largest database available for Easterlin's original question.

Previous Research

Previous research has been limited in three ways. First, all authors bemoan the short time-series and the absence of developing nations in their samples (Easterlin 1995; Diener and Oishi 1999). (Developing nations are expected to show the largest effect of income on happiness, if diminishing marginal utility holds for income. But developing nations have limited budgets for surveys of citizen happiness.) Both of these factors limit the power of the tests to detect longitudinal effects of income. For example, Easterlin's latest review (1995) includes data from 11 countries from 1972 to 1987, all from developed OECD nations. In contrast, the current study draws on the World Database of Happiness (Veenhoven 1999) and includes 21 countries, 9 of which are developing, with far lower per capita incomes than previous studies include.

The second limitation of previous studies is that though Easterlin recommends that utility models incorporate reference groups and adaptive expectations when applied to happiness data, no previous studies actually estimate such effects. The current paper estimates such models using VanPraag and Kapteyn's (1973) theory of relative utility.

The third limitation of previous studies is that most failed to compute the coefficient of central interest: the change in national happiness with a 1% change in national income. Easterlin (1974; 1995) computed only trend coefficients over time. Though over a long period of constant growth a significant trend effect would also imply a significant effect of income, no country shows exactly constant growth. Therefore the most informative statistic is the change in happiness with change in income per capita.

Two studies have reported this statistic, and are summarized in the first column of **Table 1**. Diener and Oishi (2000 Table 8.3) found the slope of national happiness in 14 nations to average .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 1 is $.007(10-1)/(4-1) = .021$ 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 study that estimates the effect of national income is Hagerty (2000 Table 4). He reported the change in happiness as .061 (on a 10-point scale) per \$1000 change in GDP/capita. Converting his coefficient to percentage of GDP/capita (at the mean) yields an estimate of $.061/\$1000 * \$15,326/100 = .0093$ change in happiness per 1% change in GDP/capita. This estimate is less than half that of Diener and Oishi, but was still significantly greater than zero.

Summarizing the first column of **Table 1**, the effect of national income growth on national happiness is clearly small when observing nations over time, though it seems to be positive. Is the effect small enough to ignore? In order to compare these effect sizes with other well-accepted effects, the second column of **Table 1** shows the effect sizes estimated from *cross-sectional analyses* of an increase of 1% GDP/capita. 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 .010 per 1% change in GDP/capita, while Easterlin's (1995) analysis of 24 nations calculates it as .009. Note that Diener and Oishi's cross-sectional estimate is *smaller* than their time-series estimate, and that Easterlin's estimate is *smaller* than Hagerty's time-series estimate, yet both Diener and Oishi and Easterlin dismiss the time-series estimate as "virtually flat". The reason, of course, is that the statistical power to detect the effect is limited by the variation in 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 \$8,000, whereas the standard deviation in the Hagerty time-series was only about 1/4 of that, or \$2,000 within a country over 25 years. In conclusion, the effect sizes in column 1 are roughly equal to or greater than generally

accepted effect sizes in column 2. *Only the statistical power to detect the effect is lower in studies from column 1.*

The last column of **Table 1** shows other effects of income that are well accepted, that are also smaller than those in column 1. The last column summarizes cross-sectional studies that estimate the effect of a 1% GDP/capita rise for an *individual*. Diener and Oishi estimated this as about one half the size of a 1% rise in national GDP/capita, or about .005. Hagerty (2000 Table 2) calculated this as .0049 – quite close to Diener and Oishi’s estimate. Blanchflower and Oswald (1999 Appendix 1) reported the linear coefficient of personal income as .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 .0021 per 1% rise in an individual’s income. *Note that all of the effect sizes in the last column are smaller than both of the effect sizes from the first column.* Contrary to previous characterization, the effect size of national GDP/capita is larger than effect sizes reported for individual GDP/capita.

In summary, previous research on the effect of national GDP/capita show significant and positive effects, contrary to Easterlin’s conclusion. Moreover, the results summarized in **Table 1** 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).

The current study tests these findings directly on a broader sample of countries by estimating VanPraag and Kapteyn’s model. Since it incorporates absolute utility, adaptive expectations, and reference group effects, the relative contribution of each can be estimated.

Table 1

Summary of effect sizes of income on happiness found in previous research

<i>Study</i>	<i>Effect of 1% rise in national income from time-series estimation</i>	<i>Effect of 1% rise in national income from cross-sectional estimation</i>	<i>Effect of 1% rise in individual’s income from cross-sectional estimation</i>
Diener and Oishi (2000)	.022 ^a	.010 ^a	.005 ^a
Hagerty (2000) ^c	.009 ^b	--	.005 ^c
Easterlin (1995)	-- ^d	.009 ^e	--
Blanchflower and Oswald (1999)	--	--	.002 ^f

Notes: ^a Computation of estimates shown in text.

^b Slope from Hagerty Table 4 is .061/\$1000. Converting to a 1% GDP base yields: .061/\$1000*\$15326 /100= .0093.

^c Slope from Hagerty Table 2 is .004/\$1000. Converting to a 1% GDP base and to a 10-point scale yields: .004/\$1000*\$26,793/100*(10-1)/(3-1) = .0048.

^d Denotes no estimates reported in paper.

^e Slope estimated from Easterlin (1995 Figure 4) is 1.8/\$14,000. Converting to a 1% GDP base yields: 1.8/\$14000*\$7000/100=.009.

^f Slope taken from Blanchflower and Oswald, Appendix 1 is .00000409/\$1. Converting to a 1% GDP base and to 10-point happiness yields: .00000409*(\$11,236)/100*(10-1)/(3-1)=.0021.

Relative utility model

Easterlin proposes that a person's happiness depends not on absolute current income, but on own income *relative* to other people (a reference group) in the same time period, and to the person's own income in past periods (adaptive expectations). The reference group hypothesis predicts that if we perceive ourselves to be doing better than average in the country, we judge ourselves to be happy. In sociology, this reasoning is known as 'social comparison theory'. A review of comparison theory variants can be found with Veenhoven (1991). In economics it is referred to as the theory of 'interdependent preferences'. An early account of this view was presented by Duesenberry (1949), who proposed the basic model of interdependent preferences to explain savings rates, in which an individual's utility is simply his or her income relative to the average person's income: $U_i = I_i / I_{av}$. This is an extreme form of social comparison because it predicts that raising the incomes of all will NOT increase the happiness of all, and predicts that happiness is a zero sum game.

The second type of relative utility variant involves a version of adaptive expectations, in which a person compares their current income with the income they expect based on past income streams. This creates a 'rising expectations' phenomenon where constantly growing income creates no new happiness because it is already expected and discounted.

VanPraag and Kapteyn (1973), Kapteyn and Wansbeek (1985) and VanderStadt, Kapteyn, and van de Geer (1985) have provided a flexible model that integrates both types of relative income while preserving some effect of absolute income. They model utility (or happiness) for an individual i at the current time ($t=0$) as,

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

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, μ_{i0} is the mean of their expected income distribution at time 0, and σ its standard deviation. 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 (VanderStadt et al., 1985, Eq. 9):

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

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 determining 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 assume that σ is constant over all times and persons (VanderStadt et al., 1985 p.182). 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 (VanderStadt et al., 1985 Eq. 11).

$$a_t = (1-a)/a^{-t} \quad (3)$$

$$w_{ij} = k \quad (\text{when } j \text{ is in } i\text{'s reference group, else } k=0)$$

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 contrast, 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. VanderStadt et al. (1985) estimated the model for just two periods, but found strong effects for adaptive expectations and no effects for reference groups. Their study focused on satisfaction with income, and not on satisfaction with life as a whole².

We will estimate their model, but because our data differ, our estimation method must differ in three ways³. First, the happiness data is aggregated to countries, whereas VanPraag 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 VanPraag 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 \$10,000 to many years of \$15,000. VanPraag 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 third problem in applying this model to the happiness surveys is that many countries conducted happiness surveys intermittently, so that missing data exist in the time series. This is a problem for the estimation method of VanderStadt et al. (1985) who apply the Koyck transformation (commonly used in adaptive expectations models) on (2). In our case the Koyck transformation would result in unacceptable amounts of missing data because it requires all lagged happiness data to exist. Therefore the model in (2) 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 sub problem 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 2** 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 2** 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 \$10,000 (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 2 Nations studied, with years spanned and average GDP/capita for each

<i>Country</i>	<i>Years</i>	<i>Number of happiness surveys</i>	<i>Average GDP/capita in 1995 \$U.S.</i>
<i>High GDP/capita</i>			
United States*	1972-94	26	\$17,584
Japan	1958-96	39	\$18,265
Norway	1972-96	6	\$19,874
Denmark	1973-96	41	\$18,474
Luxembourg	1973-96	22	\$17,797
<i>Medium GDP/capita</i>			
United Kingdom	1973-96	40	\$11,185
Ireland	1973-96	22	\$8,953
Netherlands	1973-96	38	\$14,972
Belgium	1973-96	22	\$13,796
France	1973-96	40	\$15,372
Germany	1973-96	40	\$14,140
Italy	1973-96	40	\$12,486
<i>Low GDP/capita</i>			
Spain	1984-96	22	\$8,144
Portugal	1985-96	13	\$4,228
Greece	1981-96	26	\$4,565
South Africa	1981-96	7	\$2,395
Brazil	1975-96	5	\$1,917
Korea (South)	1979-96	5	\$3,132
Mexico	1975-96	4	\$1,780
India	1975-96	4	\$321
Philippines	1979-96	3	\$622
Total		465	

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

3. 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 1**, 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 is missing (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 3 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 all consistent with absolute preferences and contradict Dusenburry’s extreme relative preference theory.

The next two columns of **Table 3** 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 correlations in column 3), then evidence for reverse causation is enhanced. These rows of **Table 3** show that average lagged correlations are positive but were lower than the average contemporaneous correlation in column 1 of +.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 3** 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 (calculated at the country’s mean income). The last row of **Table 1** shows that the average estimate over all countries is that happiness rises by +.008 (on a 10-point scale) with each 1% rise in national income. This is slightly smaller than the effect size found by Hagerty for 8 countries (see Table 1 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 .002 to .005 (Table 1 column 3).

Table 3. 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***	+.41**	+.54***	0.032	0.006
Japan	+0.04	-.03	-.28*	0.006	0.001
Norway	-.38	-.20	-.38	-0.026	-0.005
Denmark	+0.53***	+.52***	+.54***	0.060	0.011
Luxembourg	+0.71***	+.69***	+.73***	0.047	0.008
<i>High GDP/capita</i>				.024	.004
U.K.	+0.01	+.03	+.01	0.002	0.000
Ireland	-0.10	-.13	-.23	-0.015	-0.001
Netherlands	+0.38**	+.35**	+.44***	0.046	0.007
Belgium	-0.40*	-.41*	-.42*	-0.084	-0.012
France	+0.15	+.14	-.33**	0.177	0.027
Germany	+0.24	+.20	+.38**	0.018	0.003
Italy	+0.90***	+.89***	+.87***	0.169	0.021
<i>Medium GDP/capita</i>				.045	.006
Spain	-0.09	-.16	-.08	-0.031	-0.003
Portugal	+0.65**	+.24	+.74***	0.433	0.018
Greece	-0.20	-.19	-.37*	-0.305	-0.014
South Africa	-.40	-.37	-.43	-1.010	-0.024
Brazil	-.32	-.20	-.17	-0.140	-0.003
Korea (South)	+.92*	+.93*	+.92	0.380	0.012
Mexico	+.95	+.83	+.85	1.730	0.031
India	+.71	+.82	+.72	4.040	0.013
Philippines	+.86	-.45	+.80	9.948	0.062
<i>Low GDP/capita</i>				1.67	.010
Average	+0.27	+.19	+.23	.740	.008

** p<.05 *** p<.01

Table 3 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. One country (Belgium) display a visible U-shape, where happiness declines until 1987, then rises again. A significant quadratic trend was confirmed for Belgium ($t=3.79$, $p<.001$), though for none of the other countries. Inglehart

and Rabier (1986) first commented on the (then) decline in Belgian life satisfaction, but only our newer data show the recent increasing trend. The remaining 4 countries with significantly increasing happiness (U.S., Netherlands, Portugal, Germany) show trends in Figure 2 that are less clearly visible. This is also supported by their lower (though still significant) correlation coefficients. In one country (Germany), the positive trend appears due to the spike in happiness in 1990 (during reunification). This is the only nation of the 9 where the significant trend is due to a few positive outliers. For the remainder, the trends seem stable over at least 10 years, and sometimes over 25 years.

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 VanPraag and Kapteyn's model, modified for estimation of happiness data to (5). **Table 4** 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 increase confidence that global minima were attained.

Table 4 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). For example, 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. 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 .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 .26 and .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.

Table 4
R² 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 Lo GDP countries	Restricted Model, No reference groups
R ²	.9132	.9131	.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 (.00, .96) ^a	0.01 (.00, .12) ^a	-0-
a	0.31 (.01, .77) ^a	0.26 (.00, .75) ^a	0.26 (.01, .72) ^a
p	0.42 (.01, .92) ^a	0.43 (.00, .82) ^a	0.43 (.01, .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)
Philippines	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.

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. Prior to the increase at year 11, GDP/capita is a constant \$15,000. The adaptive expectations model with parameters estimated in Table 4, column 3 predicts that happiness stabilizes at 5.71. At 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 strict 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 4** 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 & 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 averages that included the effect of wealth, these dummies show differences net of wealth.

4. DISCUSSION

Previous studies tracking longitudinal 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 results show that increasing national income *does* go with increasing national happiness, consistent with a needs theory and contrary to strict 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. We introduced a method for estimating the relative utility model of VanPraag and Kapteyn on the happiness data, and showed not only a significant absolute effect of income, but also a relative effect due to adaptive expectations such that a nation adapts somewhat over a two-year period to increased income (Figure 3).

In contrast, no effect was found for social comparison of relative income across nations. VanderStadt, Kapteyn, and van de Geer (1985) used VanPraag 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 further reducing the effect size of income.

Limitations

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). However, both of these variables are themselves influenced by the increase in national income (e.g., Barro 1999), so that studies of the relative influence of each will be necessary. 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 3** 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 micro data 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 micro data 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.

Finally, we should note that the current theory still cannot explain Japan's happiness over time. Easterlin (1995) points out that national happiness there shows no upward trend since 1958, despite a stupendous increase in GDP/capita. The reasons for this are still unclear, but the current data show that Japan is an exception rather than the rule in the 21 nations studies here.

Implications

Happiness is apparently not a zero-sum game and can be raised by improving living conditions. This has been a central but until recently untested belief of economists and public policy analysts. Some may be disappointed at the small size of income's effect on happiness. Future research should investigate how to increase this effect size further, in the same way that suppliers improve the efficiency of production inputs. For example, it is likely that the specific expenditures to which the increased income is put will influence average 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. Further research and consumer education holds potential to increase long-term happiness.

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.

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

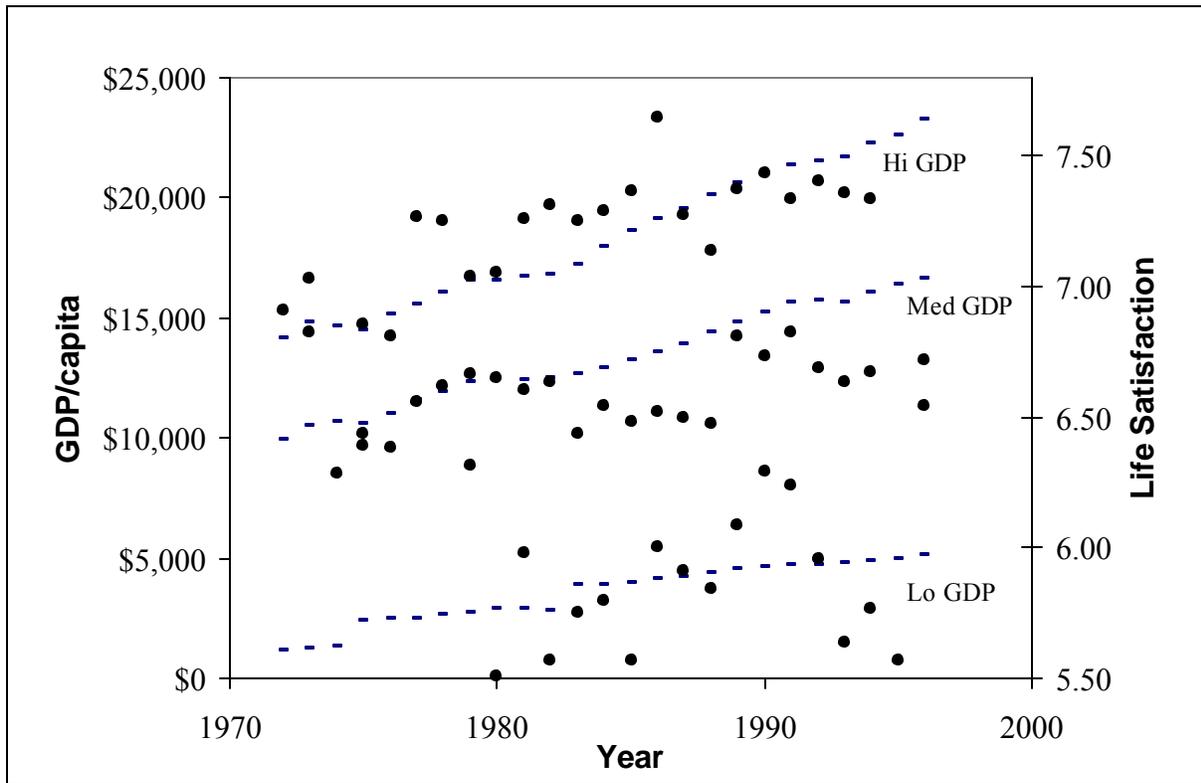
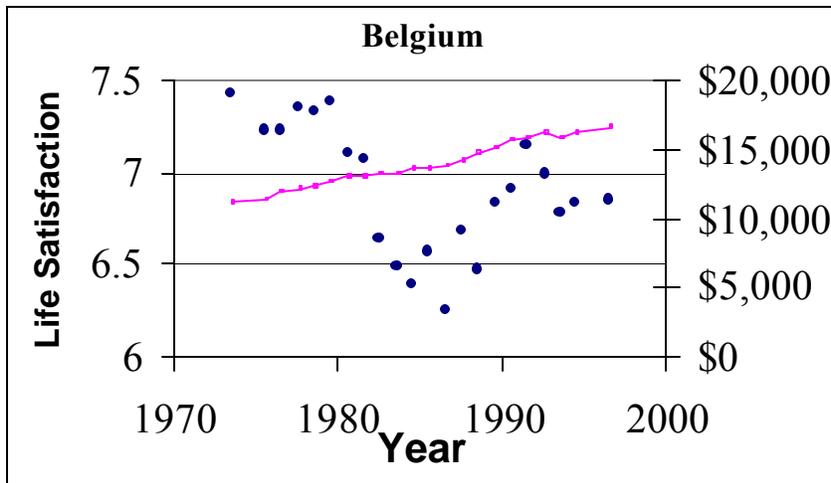
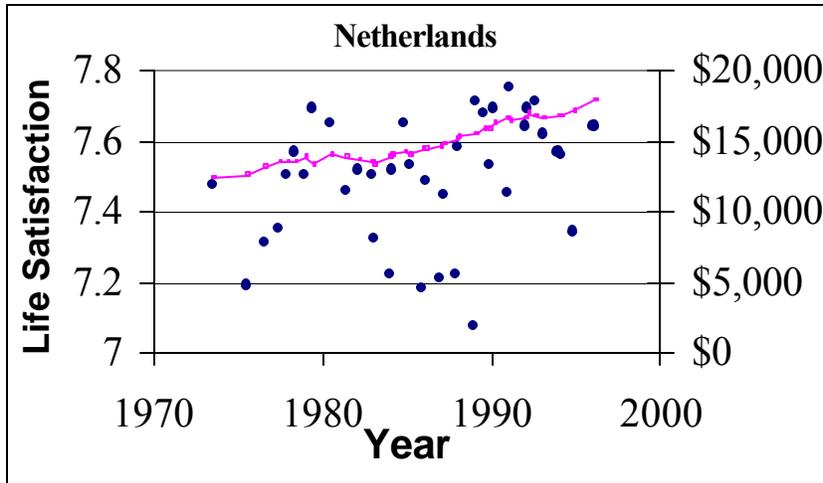
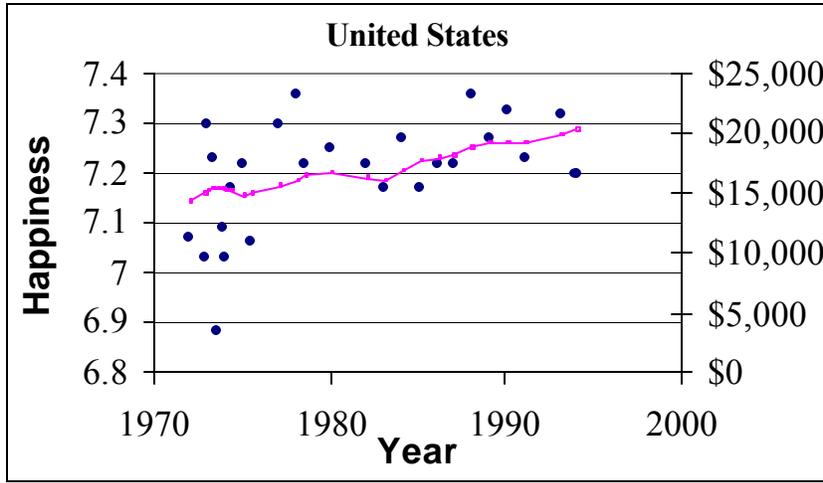
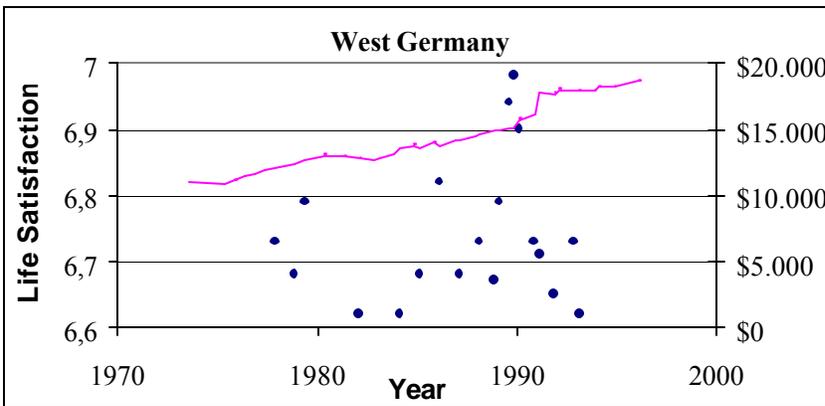
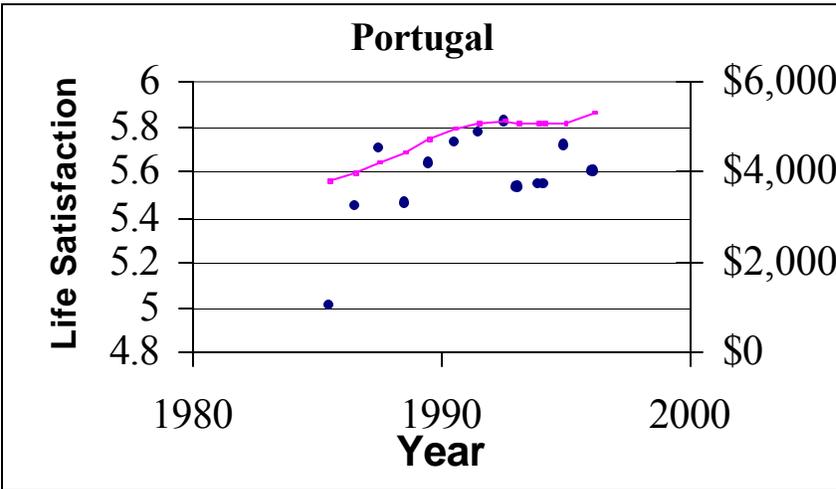
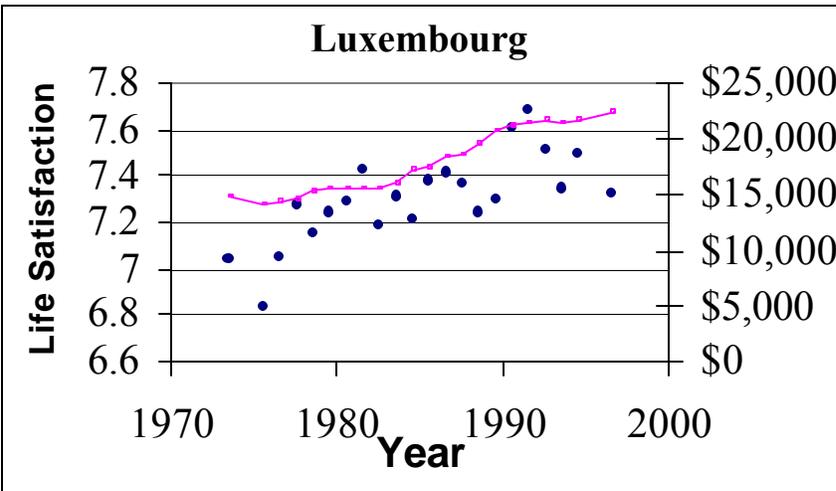


Figure 2: Happiness in 7 countries that showed significant correlations with GDP/capita. Happiness or life satisfaction is plotted with solid dots and is scaled on the left hand side. GDP/capita in \$US 1987 is plotted with the line and is scaled on the right hand side.





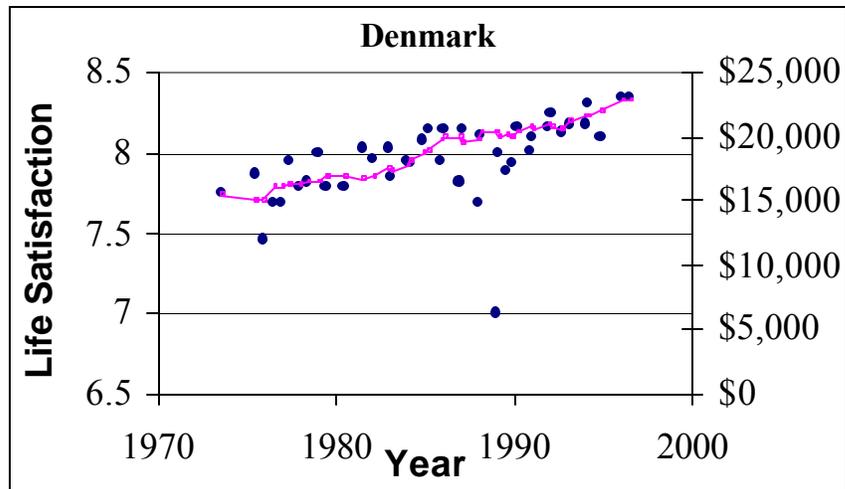
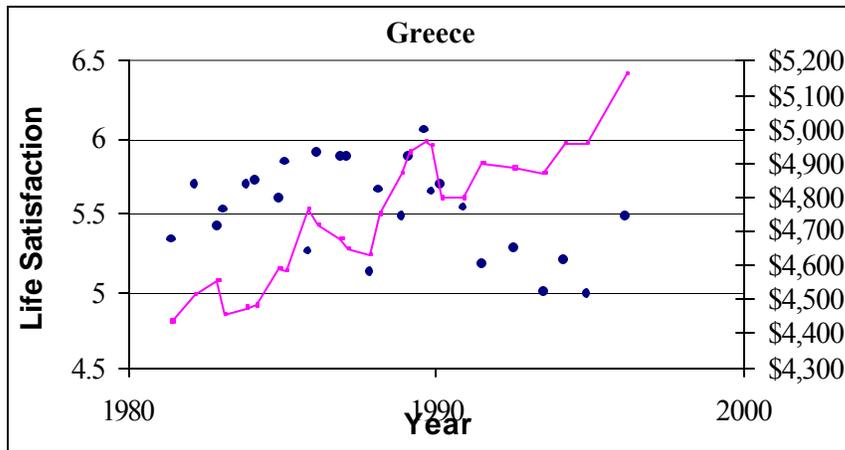
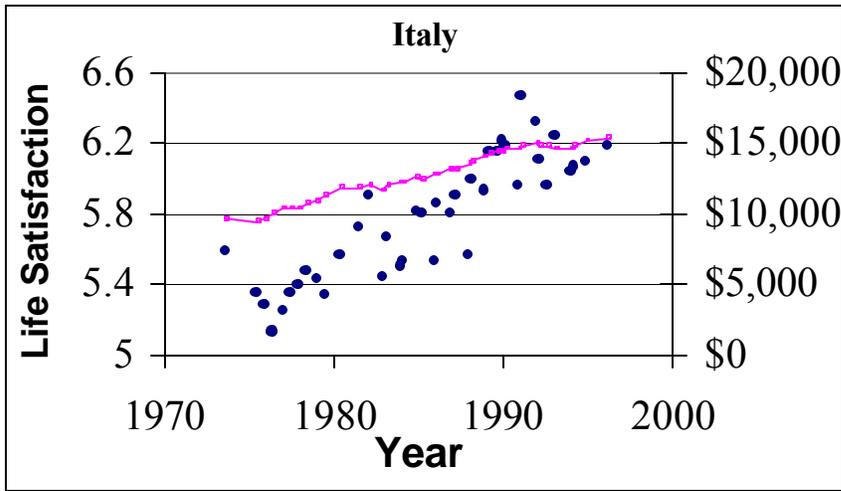
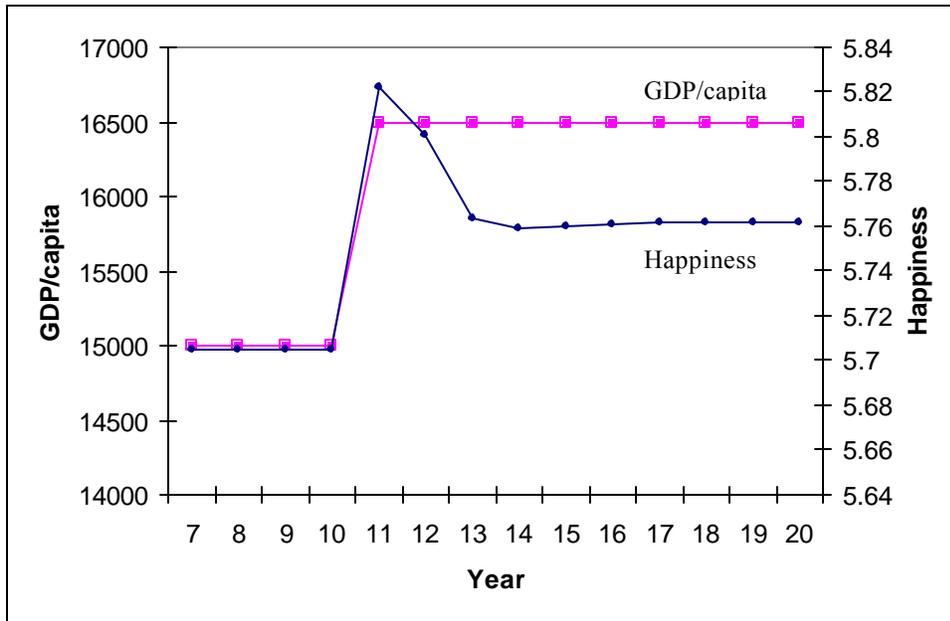


Figure 3: Effect on predicted happiness from a 10% rise in GDP/capita in year 11.



NOTES

¹ This paper has benefited greatly from 3 anonymous reviewers, and from comments by Prasad Naik and Ed Diener.

² 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 psycho-biologically 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.