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Relative Income, Happiness and Utility: An Explanation for the Easterlin Paradox and Other Puzzles

Andrew E. Clark
Paul Frijters
Michael Shields

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Forschungsinstitut
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of Labor

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Andrew E. Clark
Paris School of Economics and IZA

Paul Frijters
Queensland University of Technology

Michael Shields
University of Melbourne and IZA

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

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ABSTRACT

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The well-known Easterlin paradox points out that average happiness has remained constant over time despite sharp rises in GNP per head. At the same time, a micro literature has typically found positive correlations between individual income and individual measures of subjective well-being. This paper suggests that these two findings are consistent with the presence of relative income terms in the utility function. Income may be evaluated relative to others (social comparison) or to oneself in the past (habituation). We review the evidence on relative income from the subjective well-being literature. We also discuss the relation (or not) between happiness and utility and discuss some non-happiness research (behavioural, experimental, neurological) dealing with income comparisons. We last consider how relative income in the utility function affects economic models of behaviour in a number of different domains.

JEL Classification: D01, D31, H00, I31, J28

Keywords: income, happiness, utility, comparison, habituation

Corresponding author:

Andrew E. Clark
PSE
48 Boulevard Jourdan
75014 Paris
France
E-mail: andrew.clark@ens.fr

Relative Income, Happiness and Utility: An Explanation for the Easterlin Paradox and Other Puzzles

ANDREW E. CLARK, PAUL FRIJTERS *and* MICHAEL A. SHIELDS[1]

June 2007

"*Every pitifulest whipster that walks within a skin has had his head filled with the notion that he is, shall be, or by all human and divine laws ought to be, 'happy'*" (Thomas Carlyle).

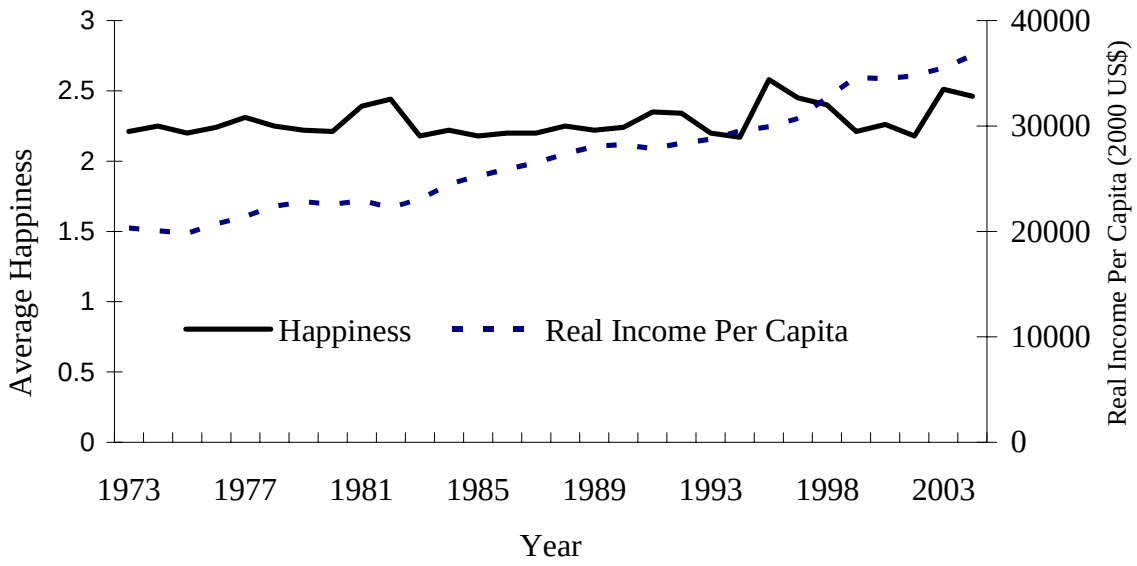
1. Income, Happiness and the Easterlin Paradox

Studying the causes and correlates of human happiness has become one of the hot topics in economics over the last decade, with both the size and depth of the literature increasing at an exponential rate (Kahneman and Krueger, 2006). One of the main catalysts in the literature on income and happiness has been Easterlin's seminal article (1974; updated in 1995), setting out the 'paradox' of substantial real income growth in Western countries over the last fifty years, but without any corresponding rise in reported happiness levels. Similar studies have also since been conducted by psychologists (Diener et al., 1995) and political scientists (Inglehart, 1990). Figure 1 shows an Easterlin graph for the US over the period 1973-2004. While real income per capita almost doubles, happiness (from the General Social Survey) shows essentially no trend. From this figure, to borrow a term from health economics, it looks as if individuals in the US are 'flat of the curve', with additional income buying little if any extra happiness. It has been argued that once an individual rises above a poverty line or 'subsistence level', the main source of increased well-being is not income but rather friends and a good family life (see, for example, Lane, 2001). This 'subsistence level' could be as low as US$10,000 per annum (as reported in Frey and Stutzer, 2002a; and McMahon, 2006). Following on with this argument, the radical implication for developed countries at least is that economic growth *per se* is of little

[1] Clark: Paris School of Economics, France, and IZA, Germany; Frijters: School of Economics and Finance, Queensland University of Technology, Australia; Shields: Department of Economics, University of Melbourne, Australia. We are grateful to the editor and two anonymous referees for very constructive comments. We also thank Colin Camerer, Richie Davidson, Ed Diener, Dick Easterlin, Ada Ferrer-i-Carbonell, Carol Graham, John Helliwell, Felicia Huppert, Danny Kahneman, Brian Knutson, George Loewenstein, Sonja Lyubomirsky, Dan Mroczek, Yew-Kwang Ng, Matthew Rablen, Larry Samuelson, David Schkade, Wolfram Schultz, Dylan Smith, Oded Stark, Arthur Stone, Stephen Wheatley Price, Peter Ubel and Dan Wilson for invaluable advice. Andrew Oswald and Bernard van Praag provided especially detailed suggestions. Frijters and Shields would thank to thank the Australian Research Council (ARC) for funding.

importance, and should therefore not be the primary goal of economic policy (Oswald, 1997). Layard (2005) goes as far as arguing that we need a 'revolution' in academia, where every social scientist should be attempting to understand the determinants of happiness, and it should be happiness which is the explicit aim of government intervention.[2]

FIGURE 1: Happiness and Real Income Per Capita in the US, 1973-2004[3]



This 'paradox' is not specifically a US phenomenon. The same picture can be drawn for Japan (Easterlin, 1995), which has seen one of the largest increases in real per capita income of any country since World War II, and also for Europe. Figure 2 shows trends in average life satisfaction for five European countries since 1973. As in the US, there has been no obvious increase in life satisfaction over a thirty-year period, even though real incomes per capita have increased sharply in all five countries. The only trend found is in Italy, the poorest country of the five, where average life satisfaction increased from 2.67 in 1973 to 2.88 in 2004, a rise of 9.3%. Easterlin (2005a) provides a useful summary of this macro empirical literature.

The same time-series data in transitional countries, however, suggest a larger role for income. Consider Figure 3, which shows average life satisfaction and real income in East

[2] It is interesting to note that this 'modern' viewpoint of the role of government in promoting happiness contrasts sharply with that of the ancient Greeks and much of the world of antiquity (see McMahon, 2006, for a history of the philosophy of happiness). Angner (2005) provides a fascinating account of the modern history of subjective well-being.

[3] *Source*: World Database of Happiness and Penn World Tables. Happiness is the average reply to the following question: '*Taken all together, how would you say things are these days? Would you say that you are…?*' The responses are coded as (3) Very Happy, (2) Pretty Happy, and (1) Not too Happy. Happiness data are drawn from the General Social Survey.

Germany during the decade following reunification. East Germans experienced a substantial increase in real income between 1991 and 2002, and reported a considerable rise in their life satisfaction over the same period.

FIGURE 2: Life Satisfaction in Five European Countries, 1973-2004[4]

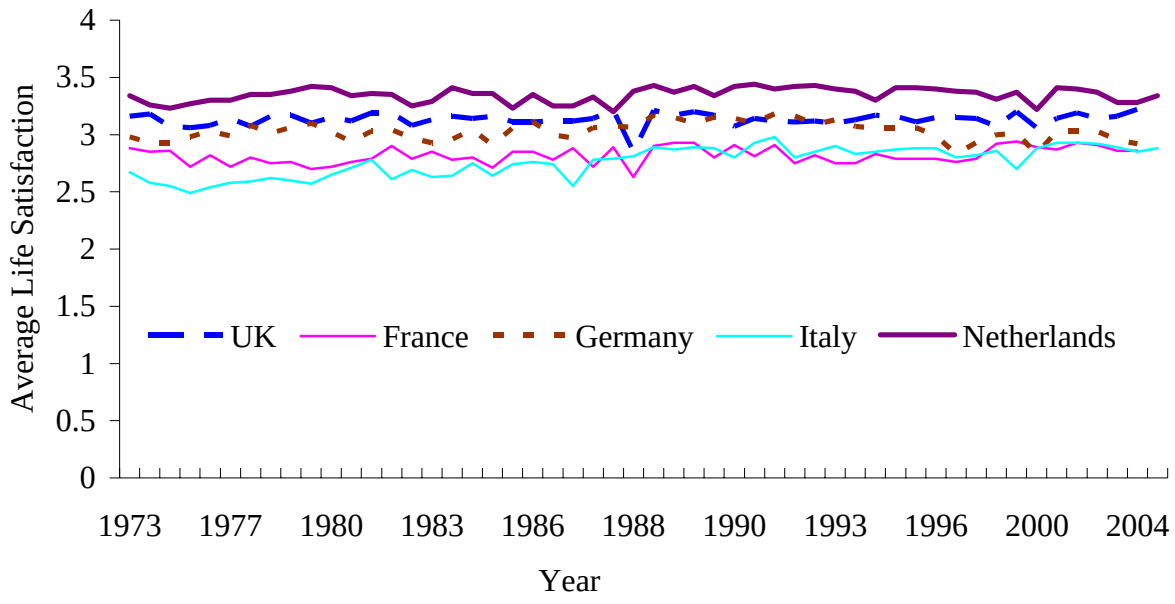
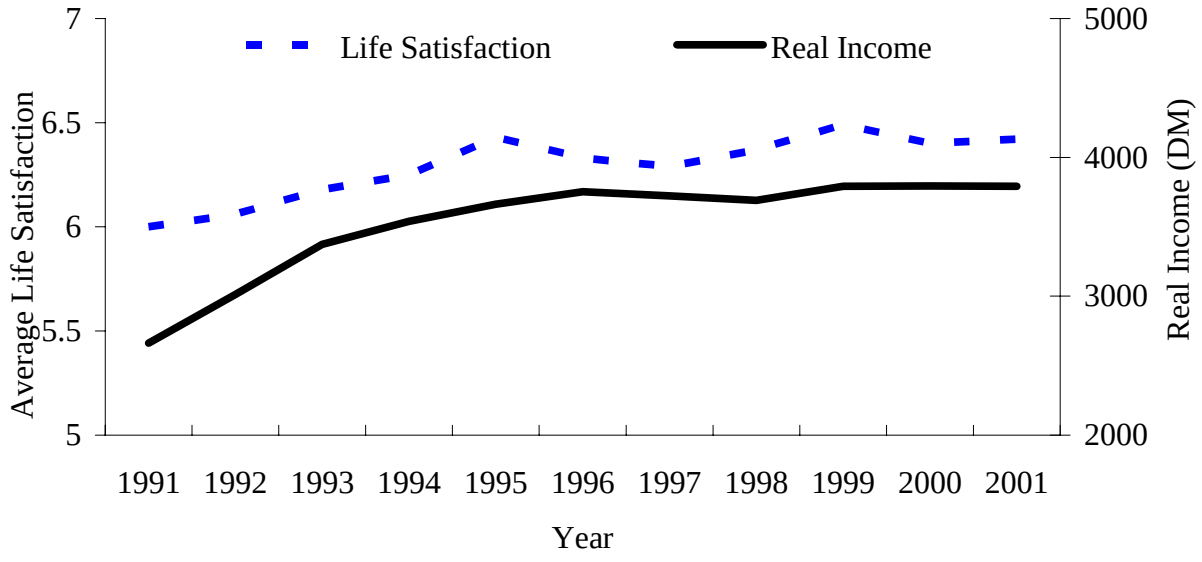


FIGURE 3: Life Satisfaction and Income in East Germany, 1991-2002[5]



[4] *Source*: World Database of Happiness. Happiness is the average reply to the following question: '*On the whole how satisfied are you with the life you lead*'. The responses are coded as (4) Very Satisfied, (3) Fairly Satisfied, (2) Not Very Satisfied, and (1) Not at all Satisfied. Life satisfaction data are drawn from the Eurobarometer Survey.

[5] *Source*: Frijters et al. (2004a). Data are drawn from the German Socio-Economic Panel Study (GSOEP). Respondents are asked: '*How satisfied are you at present with your life, all things considered?*' The responses run from 0 (completely dissatisfied) to 10 (completely satisfied).

However, we should be cautious in concluding from these graphs, which illustrate bivariate correlations, that income does not buy happiness in the developed world. A parallel body of work has produced what is now a large amount of evidence suggesting that money does matter. There are three stylised facts in this second literature.

1) A regression of happiness on income using cross-section survey data from one country (with or without standard demographic controls) generally produces a significant positive estimated coefficient on income. This holds for both developed (see, for example, Blanchflower and Oswald, 2004; Shields and Wheatley Price, 2005) and developing (Graham and Pettinato, 2002; Lelkes, 2006) countries. However, the income-happiness slope is larger in developing or transition than in developed economies.

2) Recent work has used panel data to control for unobserved individual fixed effects, such as personality traits, and concludes that changes in real incomes are correlated with changes in happiness (see, for example, Winkelmann and Winkelmann, 1998; Ravallion and Lokshin, 2002; Ferrer-i-Carbonell and Frijters, 2004; Senik, 2004; Ferrer-i-Carbonell, 2005; Clark et al., 2005). Further, a number of these studies have been able to utilise exogenous variations in income to establish more firmly the *causal* effect of income on happiness (e.g. Gardner and Oswald, 2007; Frijters et al., 2004a, 2004b, 2006). It is again the case that income has a larger effect in transition than in developed countries. In addition, the slope of the income-happiness relationship is not necessarily the same between groups (Clark et al., 2005; Frijters et al., 2004a; Lelkes, 2006).

3) Recent detailed studies of the 'macroeconomics of happiness' using very large samples and cross-time cross-country models that control for country fixed-effects, have shown that happiness co-moves with macroeconomic variables including GDP, GDP growth and inflation (see, for example, Di Tella et al., 2003; Helliwell, 2003; Alesina et al., 2004). A useful set of recent figures is to be found in Leigh and Wolfers (2006).

The bulk of the evidence in **1) – 3)** thus suggests that income does raise happiness. One of the key challenges for the nascent economics of happiness literature is therefore to render the significant income coefficient found in much of empirical literature consistent with the time profiles shown in Figures 1, 2 and 3, and to identify the ensuing implications of the fundamental income-happiness relationship for both economic theory and policy design.

This paper attempts to respond to that challenge. Our answer is based on the concept of income comparisons – both to others in the relevant reference group (social comparisons) and to oneself in the past (adaptation or habituation). In Section 2, we provide a unified account of the observed income-happiness gradients in both the micro and macro literature by presenting them as straightforward extensions of the textbook utility function.

We then turn to the question of micro-economic evidence that is consistent with the presence of income comparisons in the utility function. The recent growth of the empirical literature on income and happiness has produced much information in this respect. We summarise these new findings in Section 3, especially focusing on studies that have used panel data from surveys such as the British Household Panel Survey (BHPS), the German Socio-Economic Panel Study (GSOEP) and the Russian Longitudinal Monitoring Survey (RLMS). These panel studies allow researchers to track individuals' income and happiness over long periods (now over 20 years in the case of the GSOEP) and to control for individual fixed traits, the latter having been shown to be crucial for the empirical modelling of subjective well-being (Ferrer-i-Carbonell and Frijters, 2004).

In Section 4 we directly address the question, 'Is happiness related to utility'? In particular, we consider a number of findings from the analysis of objective data, experimental economics, and neuroscience which are consistent with relative income playing a role in the individual utility function. However, we also underline a number of possible objections to the use of happiness data to reveal such income comparisons. Section 5 then highlights some of the main implications of income comparisons for a range of issues relating to economic theory and policy design. The economic issues we focus on include many of the central concerns of economics: consumption, investment, economic growth, savings, taxation, labour supply, wages and migration. Finally, section 6 concludes.

2. Explaining the Easterlin Paradox by Relative Income

The explanation of the Easterlin paradox detailed in this paper rests on the ways in which income translates into utility. It is important to be clear about the logical step that we are taking here. While the paradox is couched in terms of income and happiness, we are going to appeal to a specific type of utility function to account for it. In other words, we imagine that happiness scores provide information about utility. We will maintain this hypothesis over both this section and the micro-level income and happiness results described in Section 3. Section 4 will then explicitly set out the evidence linking happiness and utility.

In this section we consider the implications of relative or comparison income terms in the individual utility function. These comparisons may concern others, or oneself in the past, evoking the possibility that individuals adapt or 'get used to' their changing income (Easterlin, 2001). Both of these types of comparison can be presented as simple extensions to the standard economics textbook utility function. Consider a utility function of the form:

$$U_t = U(u_1(Y_t),\ u_2(Y_t \mid Y_t^*),\ \mathrm{u}_3(T - l_t, Z_{1t})) \tag{1}$$

where $U(.)$ is a common function over all individuals indicating how the sub-utilities u_1, u_2, and u_3 are combined into final utility *U*; the subscript *t* refers to time.

In this specification, Y_t is the vector of incomes y_t from *t*=0 to *t* and $u_1(.)$ can be thought of as the classic function showing utility from consumption, which is increasing at a decreasing rate in its argument. As we are thinking of a vector of incomes in general, past incomes may affect current consumption, for example via wealth. In a one-period model, or in a model without savings, income will equal consumption c_t, so that $u_1(Y_t) = u_1(y_t) = u_1(c_t)$. The sub-utility function $u_3(T - l_t, Z_{1t})$ picks up the influence of leisure, $(T - l_t)$, with l_t denoting hours at work, and a vector of other socio-economic and demographic variables, Z_{1t}.

The empirical application of (1) typically appeals only to current values of Y_t and a partial log-linear specification:

$$U_t = \beta_1 \ln(y_t) + \beta_2 \ln(y_t / y_t^*) + Z_t'\gamma \tag{2}$$

where y_t is usually a measure of real individual or household income, y_t^* is some specific reference income, and *Z* includes both demographics and hours of work.

While the first and third parts of the utility function in (1) are standard, the second is less so, and shows the influence of status or habituation. The economic analysis of such relative income effects (or more generally, interdependent preferences) can be dated back to at least Veblen (1899), and then Duesenberry (1949). More recent contributions include Pollak (1976), Frank (1985) and Elster and Roemer (1991)

The variable Y_t^* is often called 'reference group' or 'comparison' income, and the ratio Y_t/Y^*_t is called 'relative' income. Any empirical test of such a utility function will require us to specify individual reference groups. In this respect, we can distinguish between internal

reference points, such as own past income or expected future income, and external reference points, where comparisons refer to distinct demographic groups such as own family, other workers at the individual's place of employment, people in the same neighbourhood, region, country, or even people across a whole set of countries. With external reference points, $u_2(Y_t \mid Y_t^*)$ can be interpreted as the 'status return' from income, or the positional or conspicuous consumption aspect of income.[6] This status function is assumed to increase at a decreasing rate in Y_t, but decrease at an increasing rate in Y_t^*. The status function is homogeneous of degree zero, so that $u_2(aY_t \mid aY_t^*) = u_2(Y_t \mid Y_t^*)$: status is unaffected by proportional increases in income and reference income. In many cases, $u_2(Y_t \mid Y_t^*) = c_t / \overline{c}_t$, where $\overline{c}_t$ is average reference group consumption, but the formulation is sufficiently general to encompass the bulk of the specifications used in the literature.

In the following sub-sections, we show how this basic model can easily explain the Easterlin paradox, first considering comparisons to others, and then comparisons to one's past.

2.1 Social comparisons

To illustrate the main forces at work when individuals compare to others, consider the following stylised implication of the relationship between income and happiness across countries when: i) income is the only systematic difference between countries (so that we can relegate u_3 in equation (1) to a constant and ignore it); and ii) reference income is average income within the country. This case is depicted in Figure 4, for the function: $U_i = \beta_1 \frac{y_i}{y_i + A} + \beta_2 \ln(y_i / \overline{y}_i)$, with $\overline{y}_i$ being average income in the country where individual *i* lives, and *A* being a positive constant. The functional form here is deliberately chosen to ensure that the benefit of an across-the-board proportional rise in income tends to zero as income goes to infinity: a general rise in income leaves the second term unchanged, and has an effect on the first term which tends to zero as income increases. Note that this is not true of the formulation in (2) where a growth in log-income by *x* will increase utility by $x\beta_1$ for any level of income.

The main prediction of this model is that the gradient between income and happiness will be steeper within a country at a point in time than over time by country. This is due to the status benefit of high income within a country. Crucially, however, this status benefit has no aggregate impact on country-level happiness (in this model, the more status one person has, the less others

[6] Others' income might also matter for non-comparison reasons: for example if a general rise in income leads to higher prices. We only consider social comparisons here.

have: status is a zero-sum game). Over time in a given country, the only effect of income on aggregate happiness will be via the consumption component of the utility function (u_1).

FIGURE 4: The Relationship between Income and Happiness at the Individual and the Aggregate Level

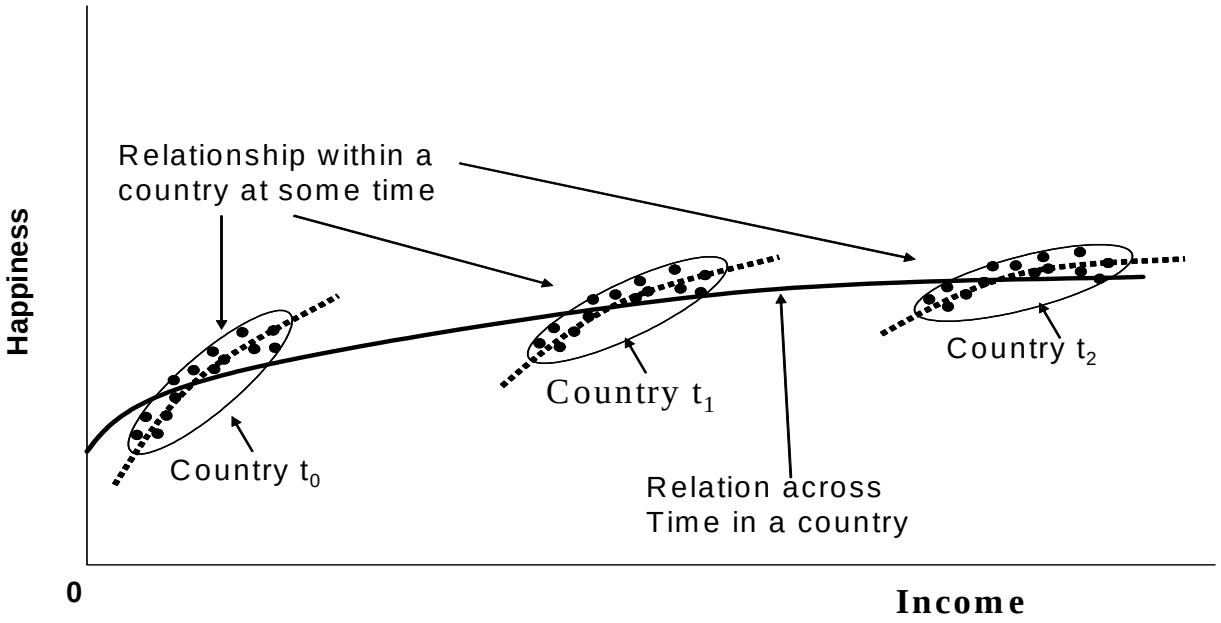


Figure 4 is easiest to interpret if we imagine that, over time, individuals in a particular country move from the left ellipses to the right ellipses. At t_0 the population in this country is poor and the slope between individual income and individual happiness (which is shown by the dotted line) is relatively steep. At t_1 the population has become somewhat richer, and the relationship between individual income and individual happiness is less steep than at t_0. In the third period, t_2, average income is high and the slope between individual income and individual happiness is fairly flat. It is clear that in all three periods the status return from income yields a relationship between individual income and individual happiness (the dotted line) which is steeper than the relationship between aggregate income and aggregate happiness (as shown by the thick line). In the last period, where individuals are relatively rich, there is almost no aggregate benefit at the country level from higher income, but there is still a substantial individual status return to earning more.

This stylised illustration sums up a pervasive opinion over the last few decades about the relationship between income and happiness at the individual country level. The marginal utility from extra consumption approaches zero as countries become richer (in equation (2), this

marginal utility equals β_1/y; in the specification we use for Figure 4, it is $\beta_1 A/(y_i+A)^2$). On the contrary, the marginal utility of extra status never approaches zero, because in general y^* (reference group income) rises in line with own income, y. This model thus explains the Easterlin (1974) paradox and concurs with much of the psychological and some of the economic literature. At a point in time, those with higher incomes enjoy higher consumption and higher status (and are thus happier); over time, as everyone becomes richer, as the amount of status is fixed, the only benefit to the country is from higher consumption, the value of which drops towards zero.

This simple model can be embellished by considering the relationship between income and happiness across several countries simultaneously, as in Di Tella et al. (2003). Here the authors estimate individual happiness equations over 12 countries and 18 years, controlling for not only individual demographic variables, but also country fixed effects, time dummies, and macroeconomic variables such as lagged GDP. They find, as Kapteyn et al. (1976) had previously argued, that 'social reference spaces' (reference groups) can include whole countries, and that happiness within a country is strongly positively correlated with GDP growth over the last year. This can be squared with the general observation that, over long periods of time, GDP and happiness are uncorrelated in richer countries by an expanded happiness function with two different kinds of comparison:

$$U_{ijt} = \beta_1 \ln(y_{ijt}) + \beta_2 \ln(y_{ijt} / y^*_{jt}) + \beta_3 \ln(y^*_{jt} / y^*_t) + Z'_{ijt}\gamma \qquad (3)$$

Here U_{ijt} is the happiness of an individual i in country j at time t, y^*_{jt} is average income in country j at time t; and y^*_t is average income over the whole set of countries (say Europe) at time t. This happiness function is of the same nature as that appealed to in (2) to describe happiness within a country, but with an added component $(\beta_3 \ln(y^*_{jt} / y^*_t))$ reflecting the income of one country relative to that in another set of countries. This added component shows individuals' utility gain from living in a relatively successful country.

If income in all countries grows at the same pace, then y^*_{jt} / y^*_t will remain unchanged. In this case, the discussion applied to Figure 4 is valid for each country, although individual countries at a point in time may be on different portions of the unbroken line, depending on their income level. However, if one country's GDP grows relative to that of its neighbours, then y^*_{jt} / y^*_t will change, and the high-growth country will enjoy greater happiness. The best outcome for each

country is to have high income while its neighbours have low incomes. However, unless one country can increasingly outstrip its neighbours, the additional benefit of more income is subject to decreasing returns.[7] This type of happiness function can help explain why countries are locked in an arms race over growth, even though, on aggregate, that growth will only bring utility via the consumption function. In each country the component $\beta_3 \ln(y^*_{jt} / y^*_t)$ produces a strong relationship between GDP and happiness. However, analogously to the individual argument within a country, the happiness return from being richer than other countries is, from the world perspective, a zero-sum game.

At the individual level, these kinds of status-races can lead to sub-optimal outcomes if they crowd out non-status activities. This can be illustrated using the general (one-country) utility function (1), where a higher income for individual *i* reduces the utility of everyone whose reference group includes *i*. In the specification proposed, higher income comes about at the expense of leisure time. Consider the parameterisation:

$$U_{it} = \beta_1 \ln(y_{it}) + \beta_2 \ln(y_{it} / y_t) + \gamma \ln(T - y_{it} / w_t) \qquad (4)$$

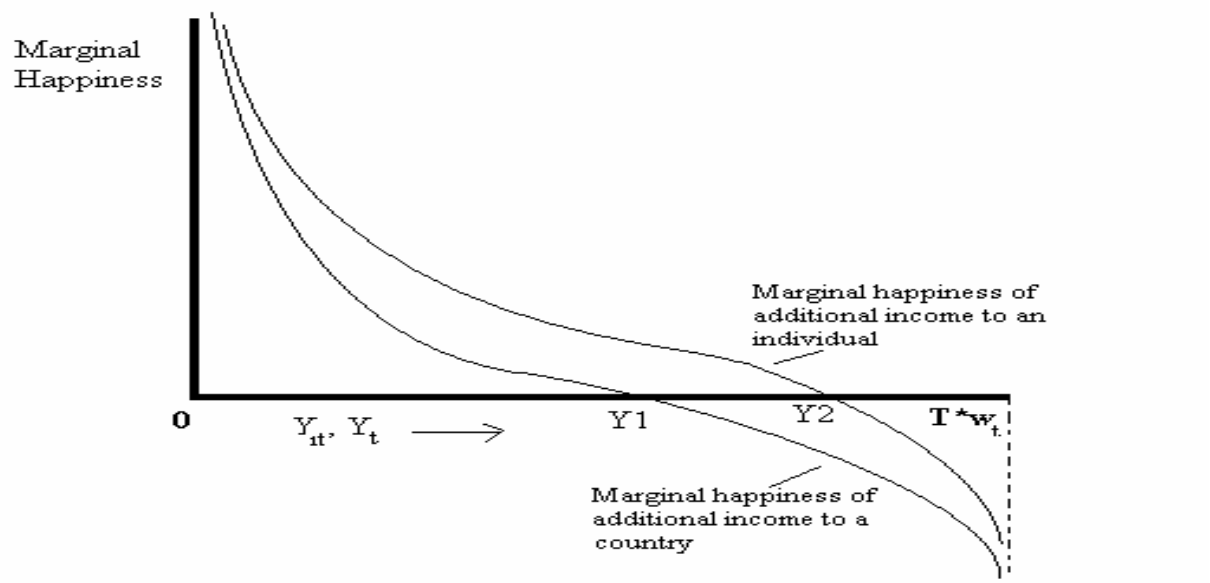
where the expression $\gamma \ln(T - y_{it} / w_t)$ reflects the utility from leisure (which is written as T minus the number of hours spent earning income y_{it} at wage w_t). Figure 5 illustrates the individual's utility-maximising choice of income relative to that pertaining in the social optimum (where status externalities are internalised).

In this figure, the top curve shows $\frac{dU_{it}}{dy_{it}}$, the marginal utility to the individual of additional labour income. This marginal utility is positive up to income *Y2*, at which point the detrimental effect to the individual of less leisure is exactly balanced by the increased consumption and higher status that come with more income. The lower curve in this figure represents $\frac{\partial U_{it}}{\partial y_{it}}\Big|^{y_t = y_{it}} + \frac{\partial U_{it}}{\partial y_t}\Big|^{y_t = y_{it}}$, which is the effect of additional income in the country when everyone's income increases at the same time (i.e. when all individuals make the same choice). This effectively removes the status benefit of higher income. The second curve lies below the first due to the negative externality of y_t in the term $\beta_2 \ln(y_{it} / y_t)$. Individuals choose income of *Y2*, where their marginal utility of income is zero, whereas the societal optimum, taking externalities

[7] Note that if the 'true' happiness function does indeed depend (negatively) on some measure of reference group income, but we instead estimate a happiness equation that does not include *y**, then the negative effect of higher levels of y* over time will show up as a negative time-trend (as in Di Tella et al., 2003).

into account, is at the lower income of *Y1*. It is tempting to relate Figure 5 to the literature on excessive work hours (see Schor, 1992).

Figure 5: The Marginal Happiness of Additional Income for an Individual versus a Country



The above illustrations considered, for simplicity, reference groups defined at the country or supra-country level, but the same generic argument holds when reference groups are defined at a finer level. The empirical literature on relative utility has typically appealed to more disaggregated reference groups. This is partly for intuitive reasons of social distance (people living in London are more likely to compare themselves to other Londoners than to people living in Glasgow or Cardiff; people compare more within their age cohort than outside of it), and partly to obtain sufficient variation in comparison income, y_t^*, to allow for a tight estimate of its coefficient.

The reference groups appealed to in the discussion above can be thought of as external. The next sub-section discusses a utility function with internal reference points, specifically the individual's own past income or income aspirations for the future.

2.2 Adaptation

The second main explanation of the Easterlin paradox relies on adaptation to the arguments of the utility function. Here we are principally concerned with adaptation to income, although recent work by economists and psychologists has covered other life domains, such as unemployment, marriage, divorce and health. With income adaptation, individuals get used to their circumstances, so that changes in income have only transient effects. Frederick and Loewenstein (1999) define adaptation as 'a reduction in the affective intensity of favourable and

unfavourable circumstances', and the concept of reversion back to some baseline hedonic level following temporary highs and lows in happiness has been termed the 'hedonic treadmill' (Brickman and Campbell, 1971). Kimball and Willis (2006) provide a fuller review of work on the psychology of adaptation and reference points.

From an economist's point of view, a simple way of thinking of adaptation to income is in terms of an internal backward-looking reference point. We thus remain in the general framework of equation (2), but now consider that y^*_t is formed from own past incomes. If the individual compares her own income at time *t* to (a geometric average of) that earned over the past three years, we would have:

$$
\begin{aligned}
U_{it} &= \beta_1 \ln(y_{it}) + \beta_2 \ln(y_{it} / y^*_t) + Z_{it}'\gamma \\
y^*_t &= (y_{it-1})^{\alpha} (y_{it-2})^{\gamma} (y_{it-3})^{1-\alpha-\gamma} \\
U_{it} &= \beta_1 \ln(y_{it}) + \beta_2 [\ln(y_{it}) - \alpha \ln(y_{it-1}) - \gamma \ln(y_{it-2}) - (1-\alpha-\gamma)\ln(y_{it-3})] + Z_{it}'\gamma
\end{aligned}
\qquad (5)
$$

In the final utility function we have the logs of current income and income over the last three periods.[8] This equation can in principle be extended to include further lags of current income; if aspirations are important (another internal reference point, but this time forward-looking) it may also include expected future incomes. One of the main implications of this specification is that the short-run effect of an increase in log income equals $\beta_1 + \beta_2$ whilst the long-run effect is only β_1. This is obviously analogous to the social comparison case, where the marginal utility of higher income was greater when others' income remained constant than when others' income rose in line. In terms of Figure 4, the short-run benefit of higher income is illustrated by the dotted lines, whereas the (flatter) thick line shows the long-run benefit.

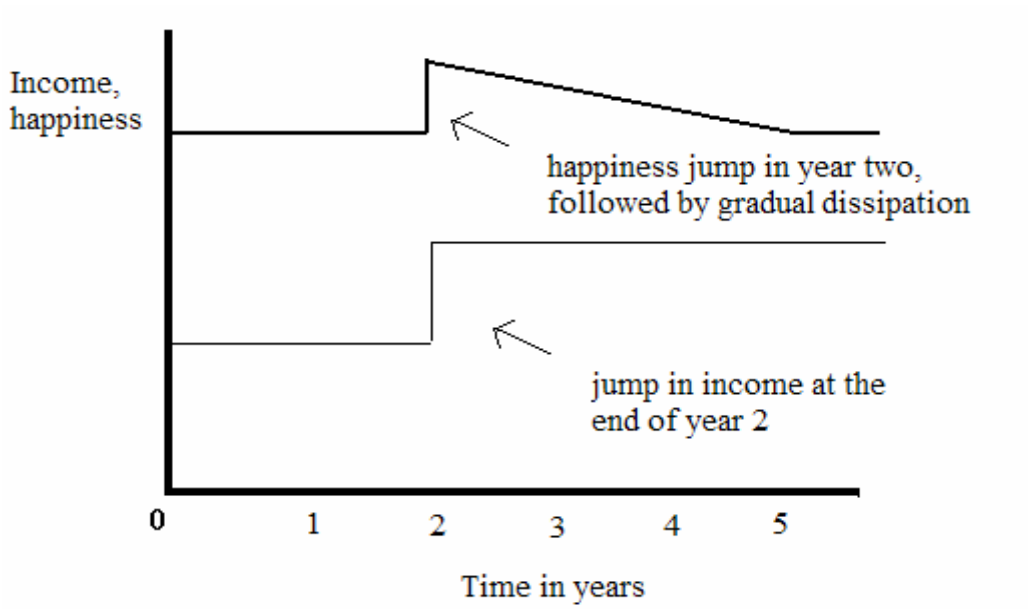
Figure 6 illustrates a simple case where β_1=0 (so that there is no consumption benefit from income), and $\alpha = \gamma$=1/3, which corresponds to the situation where the short-run benefit of higher income dissipates linearly over the following three years. For illustrative purposes we have smoothed this dissipation.

The top line denotes happiness and the lower line income. The latter is constant for the first two years, jumps at the beginning of year two, and remains constant thereafter. At the time of

[8] We do not specify here whether incomes are nominal or real. Practically, models using lagged income terms express them in real terms or include time dummies. However, in the case of money illusion individuals may compare nominal rather than real amounts. A recent article (Boes et al., 2007) uses long-run panel data to test for the presence of money illusion in subjective well-being judgements, concluding that it is largely absent.

the income shock, happiness also jumps, but due to the gradual adaptation of reference income, happiness returns to its initial level by the beginning of period five. In this set-up, the only way to achieve permanently greater happiness is to have continually rising income.[9] Adaptation therefore potentially explains the Easterlin paradox of a flattish long-run relationship between income and happiness, but a steeper short-run slope.

Figure 6: Change in Happiness following an Income Shock



This section has proposed two flavours of a model of income comparisons in order to explain the Easterlin paradox. This paradox is expressed in terms of income and happiness; in this section we have worked under the assumption that happiness and utility are synonyms, and have proposed explanations based on modifications of the utility function. The following section summarises developments and issues in the recent literature that has used individual-level happiness information to try to find evidence that relative income really does matter; Section 4 then lists a number of ways of testing for the presence of relative income terms in the utility function that do not rely on subjective well-being data.

3. Evidence of Comparisons using Happiness Data

The growing economics of happiness literature is testament to the fact that an increasing number of economists believe that self-reported well-being data contain valuable information that can

[9] Not only do rising wage profiles discourage turnover for incentive reasons, in this model they also provide utility to the worker.

complement our understanding of individual behaviour.[10] In terms of the specific subject of this review, happiness data are the cornerstone of the Easterlin paradox; this section asks whether the same data can be used to resolve this paradox, by empirically demonstrating the importance of social comparisons and adaptation. A rapidly-growing number of econometric studies have used survey data on happiness or life satisfaction to evaluate the importance of 'absolute' versus 'relative' income. Under the maintained hypothesis that happiness is a good proxy measure of utility, this corresponds to estimating the relative size of the coefficients β_1 and β_2 in equation (2).

3.1 Happiness and social comparisons

All empirical tests of social comparisons over income, whether using happiness data or any other approach, require candidate measures of y_t^*. One such candidate is the income of 'people like me' (e.g. those with the same age, education etc., who are doing the same kind of job). This reference group income can be calculated in two different ways. We can first estimate wage equations and then compute the predicted income of 'someone like me', where the regression controls for individual characteristics such as age, sex, education and region, as in Clark and Oswald (1996). Second, perhaps more simply, we can compute cell averages (for example, average wage by region, sex and education). This latter calculation can either be carried out within the dataset, or matched in from an external source.

A crucial issue in the econometric literature is that of identification: y_t^* is typically estimated as a linear function of some explanatory variables X_1 in the wage equation approach. To then identify the effect of y_t^* on happiness, we need either exclusion restrictions (some variables which appear in X_1 but which do not enter the happiness equation), or identification directly from the functional form (such as when the prediction of y_t^* enters in a different functional form in the happiness regression to the variables in X_1). The cell average approach relies on a more subtle exclusion restriction that individuals compare themselves only to the average income within each cell.

The empirical literature mostly started by considering job satisfaction, reflecting economists' interest in wages and the labour market, and perhaps also the original research carried out in

[10] A search of ECONLIT for journal articles with either 'Happiness', 'Life Satisfaction' or 'Well-being' in the title, identifies 465 published articles between 1960 and 2006. Of these 363 (78%) have been published since 1995, 285 (61%) have been published since 2000, and one-third of the literature (37%, or 173 articles) has appeared in print in just the last three years.

industrial psychology, before moving on to global measures of well-being such as happiness and life satisfaction.

Probably the first economist to estimate subjective well-being equations using both y and y_t^* was Dan Hamermesh (1977). Although Hamermesh's focus is upon occupational choice and the effects of training in American data, and he does not discuss relative income in detail, his job satisfaction regressions include the residual from a wage equation as an explanatory variable. This residual, y- y_t^* in our terminology, has a positive and significant effect on job satisfaction.

The regression approach of calculating the income of 'people like me' was also used by Clark and Oswald (1996) on the first wave of British Household Panel Study (BHPS) data. The estimated coefficients on income and comparison income in a job satisfaction equation are statistically equal and opposite, which is consistent with a fully relative utility function: to paraphrase Easterlin (1995), in these results increasing the income of all increases the happiness of no-one. Lévy-Garboua and Montmarquette (2004), and Sloane and Williams (2000), using Canadian and British data respectively, have also found evidence that econometrically-predicted comparison income is negatively correlated with job satisfaction.

Articles which calculate comparison income as a cell average, rather than an econometric prediction from individual data include Cappelli and Sherer (1988), who find that pay satisfaction is negatively correlated with an outside 'market wage', calculated by averaging pay for specific occupations in other firms (airlines, in this case). Clark and Oswald (1996) find a negative relationship between job satisfaction in BHPS data and average earnings by hours of work matched in from the UK Labour Force Survey.

Stepping outside of the realm of work, a number of recent papers have found comparison income effects using cell means. Ferrer-i-Carbonell (2005) calculates comparison income as an average within fifty cells defined by sex, age and education in six years of German GSOEP data; McBride (2001) uses 1994 data from the General Social Survey, and defines comparison income as average earnings of the individual's cohort, defined as those who are between 5 years younger and 5 years older than her. Blanchflower and Oswald (2004) use GSS data over the period 1972-1998, with y_t^* defined as average income by State. Luttmer (2005) also takes a geographic approach to reference groups, and calculates average income by local area identified in a number of waves of the US National Survey of Families and Households; this is shown to be negatively correlated with respondents' life satisfaction, conditional on their own income. Graham and Felton (2006) replicate this finding across 18 Latin American countries. Helliwell and Huang (2005) is in the same vein, calculating average household income by census tract in Canadian GSS data. The estimated coefficient on this variable in life satisfaction equations is

negative, and equal in size to the positive coefficient on household income, suggesting that life satisfaction is totally relative in income. As the estimated coefficient on income refers to $\beta_1+\beta_2$ in equation (2), and that on relative income to $-\beta_2$, the finding that the coefficients are equal and opposite is tantamount to saying that the consumption benefit of higher income (β_1) is essentially zero, which is consistent with Figures 1 to 3.

A novel paper dealing with social comparisons is Knight and Song (2006). This paper appeals to cross-sectional information on 9,200 households in China, and thus refers to an economy which is very different from the Europe-North America nexus which has so far dominated the literature. The authors are not only able to identify which villages their respondents came from, but also confirm that 70% of individuals indeed see their village as their reference group (by simply asking them to whom they compare themselves), making their rural sample well-suited to the question of how important reference groups really are. Controlling for own income, and for village income, those respondents who say that their income was much above the village average report far higher happiness than those who say that their income was much below the village average. The difference between the two estimated coefficients implies a happiness boost of one point, on a zero to four scale, making relative income the most important right-hand side variable.

The above work considers y_t^* as the income of 'people like me' or those living in the same neighbourhood. Another potential peer group is those with whom the individual comes into close daily contact: her family, friends and work colleagues. With respect to the latter, and despite the current abundance of microeconomic data, very few papers have related individual well-being to co-workers' wages. One direct test is Brown et al. (2006), who use matched employer-employee data from the British Workplace Employee Relations Survey (WERS). Individuals were asked to report their satisfaction with the amount of influence they have, their pay, their achievement, and the respect they receive. Controlling for own wage, the (normalised) rank of the individual in the firm wage distribution is correlated positively and significantly with all four measures of satisfaction (see their Table 6b).

The situation is equally sparse with respect to family and friends. Clark (1996a) uses BHPS data to relate individual job satisfaction, conditional on own wage, to the wages of their partners and the average wage of other household members. The results show that individuals do indeed report lower job satisfaction scores the higher are the wages of other workers in the household. McBride (2001) also introduces a family benchmark, appealing to the question in the GSS: "*compared to your parents when they were the age you are now, do you think your own standard of living now is: much better, somewhat better, about the same, somewhat worse, or*

much worse?". While this is a valid approach, it is worth noting that it is perhaps a poor candidate to explain the flat income-happiness relationship, as it remains fixed over time. In other words, for the same individual, y_t^* does not change with *y*, although new cohorts will presumably have higher values of y_t^* than will older cohorts.

Modelling the utility function via proxy variables, such as life or job satisfaction, is not the only way to demonstrate social comparisons. One method that essentially inverts the question is that of the Welfare Function of Income, associated with the Leyden school in the Netherlands, and, particularly, with Bernard van Praag. This predates the work on satisfaction by some years, with the first published article being Van Praag (1971). This project involved asking individuals to assign income levels (per period) to six different verbal labels (such as "excellent", "good", "sufficient" and "bad") and then, based on the values given, estimating for each individual a lognormal "Welfare Function of Income". The resulting individual estimated means (μ) and variances (σ) were then used as dependent variables in regressions which sought to explain which types of individuals require a higher level of income to be satisfied, and which individuals have valuations that are more sensitive to changes in income.

The results using cross-country data produced a number of important findings. In terms of this paper's subject, we would like to know who has a higher value of μ (i.e. who needs more money to be satisfied?). Comparisons to others were analysed via the inclusion in the regressions of reference group income (usually cell average income over age, education and certain other individual or job characteristics) as a right-hand side variable. The empirical results (for example, Hagenaars, 1986; and Van de Stadt et al., 1985) show that, *ceteris paribus*, the higher is the reference group's income, the higher are the levels of income assigned by individuals to the six verbal labels, as social comparisons over income would imply.

One of the very few papers ever to appeal to respondent-defined (rather than researcher-defined) reference groups is Melenberg (1992). He uses 1985 and 1986 Dutch Socio-Economic Panel data in which individuals are asked about their social environment – the "*people whom you meet frequently, like friends, neighbours, acquaintances or possibly people you meet at work*". Respondents are asked to indicate the average age, household size, income, education and labour force status in this group. Melenberg shows that the average income of this (respondent-defined) reference group is positively and significantly correlated with the estimate of μ from the WFI: those who associate with higher-earners need more money in order to describe their income as good or adequate.

3.2 Happiness and adaptation

There is a large literature in psychology that deals with the general issue of adaptation in many life domains (see Frederick and Loewenstein, 1999), but only a very few studies have focused on income adaptation (see the work reviewed on their page 313). Perhaps the most famous example is that of Brickman et al. (1978), who show using a very small sample of lottery winners (n=22) that this group with their positive income shock do not have significantly higher life satisfaction than a control group.[11] They propose an explanation based on the twin concepts of contrast (i.e. winning money opens up new pleasures but also makes existing pleasures less enjoyable) and habituation (winners get used to a new standard of living). More recent examples of adaptation in non-monetary spheres are Lucas et al. (2003) and Lucas (2005) with respect to marriage and divorce, Wu (2001) and Oswald and Powdthavee (2005) for adaptation to illness or disability, and Lucas et al. (2004) regarding unemployment.

Here we are especially interested in adaptation to income changes. One early article is Inglehart and Rabier (1986), who use pooled Eurobarometer data from ten Western European countries between 1973 and 1983 to show that life satisfaction and happiness scores are essentially unrelated to the level of current income, but are positively correlated with a measure of change in financial position over the past twelve months. Their conclusion is that aspirations adapt to circumstances, such that, in the long run, stable characteristics do not affect well-being.

In the same tradition, Clark (1999) uses two waves of BHPS data to look at the relationship between workers' job satisfaction and their current and past labour income. The panel nature of the BHPS makes it possible to concentrate on individuals who stay in the same firm, and in the same position (i.e. have not been promoted or moved job in any other way). Both current and past labour income and hours are used as explanatory variables. Past income attracts a negative coefficient in the job satisfaction equation, and past hours a positive coefficient, consistent with a utility function that depends on changes in these variables. The data suggest a completely relative function, with job satisfaction depending only on the annual change in the hourly wage. Grund and Sliwka (2003) find similar results in German GSOEP panel data. Weinzierl (2005) introduces both past income and reference group income (calculated as a cell mean by gender, age and education) in life satisfaction equations using the GSOEP data, and finds negative and significant coefficients for both. Last, Burchardt (2005) finds evidence of adaptation in income satisfaction in ten years of BHPS data, with a suggestion of greater adaptation to rises in income than to falls in income.

[11] Important though this paper is, it is worth noting that the paper is cross-section ex post: no shock is observed. Further, winners were actually more satisfied than non-winners, but given the small sample size the difference was not significant.

A recent detailed study of life satisfaction and income adaptation was carried out by Di Tella et al. (2005), who analyse longitudinal data for around 8,000 individuals drawn from the West German sample of the GSOEP over the period 1984 to 2000. They find that the effect of an income increase after four years is only about 42% of the effect after one year: the majority of the short-term effect of income vanishes over time.

An alternative to using individual income, and its lags, is to concentrate on aggregate income. Di Tella et al. (2003) examine individual happiness in data covering 18 years across 12 European countries, and argue that some of their results on current and lagged GDP per capita show that 'bursts of GDP produce temporarily higher happiness' (p.817).

The Leyden Group (e.g. Hagenaars, 1986; Van de Stadt et al., 1985; Plug, 1997; and Van Praag, 1971; for a review see Van Praag and Frijters, 1999) explicitly attempted to measure the degree of adaptation to income. The cornerstone of this empirical work is the Welfare Function of Income, as described in Section 3.1 above. Questions permitting a direct estimate of the income needed to achieve a fixed level of welfare were posed in the GSOEP, in the EUROSTAT surveys of the 1980s, in Russian panels, in the Dutch Socio-Economic Panel, and in various other surveys. The relationship between this required income level and the individual's past income can then be seen as a direct measure of adaptation, or as Van Praag (1971) calls it, 'preference drift'. The stylised finding for about 20 European countries is that a $1 increase in the income of a household leads to a 60 cents increase (within about 2 years[12]) in what people consider to be a 'excellent', 'good', 'sufficient' and 'bad' income. Income adaptation is therefore high, but not complete in this methodology.

The individual-level reports match up with what is found at the aggregate level concerning subjective poverty (having an income lower than that was deemed minimal). European countries which are on average poorer (such as Greece and Portugal) are found to have many more respondents whose own income was below an insufficient level than richer European countries such as Germany or Switzerland. For instance, subjective poverty was about 3% in West Germany in the 1990s, but up to 90% in Russia in 1993 (Van Praag and Frijters, 1999).

A second individual-level reference point is aspirations. The concept is the same as that of adaptation: if aspirations rise with own actual income, then the effect of income on happiness will be muted.

As might be imagined, there is only relatively little work here, as it is difficult to know how

[12] The 60% finding was initially based on cross-sectional within-country data, but has since also been found to hold over time. See Van Praag and Frijters, 1999, for specific longitudinal results.

to accurately measure income aspirations.[13] Easterlin (2005b) uses direct measures to show that material aspirations (the big-ticket consumer items that make up the good life) seem to increase in line with ownership of such consumer items. However, this is not true with respect to marriage, where over forty percent of those who have been single their entire lives, and are aged 45 and over, cite a happy marriage as part of the good life. Two recent papers have taken different approaches to measuring income aspirations, and relating them to subjective well-being. Stutzer (2004) combines the analysis of subjective data with the income evaluation approach of the Leyden school, by using the answer to the Minimum Income Question[14] as a measure of individual income aspirations (and thus one measure of y^*) in a life satisfaction equation.

McBride (2006) introduces a novel way of calculating aspirations directly in a matching pennies game, where individuals play against computers. The computer chooses heads or tails according to (known) probability distributions (for example 80% heads, 20% tails). After each round of playing, individuals report their satisfaction with the outcome. McBride's first contribution is to introduce social comparisons in some of the treatments (by telling the individual the outcomes of the other players). Second, he is able to identify an aspiration effect by varying the heads and tails probabilities played by the computer. Each subject has five pennies to play. When paired with a 80% heads, 20% tails computer, the best strategy is to always play heads, which gives an expected payoff of four pennies. When paired with a 65% heads, 35% tails computer, the best strategy is still to always play heads, but now the expected payoff is only 3.25 pennies. By manipulating the probabilities, McBride creates variations in aspirations. The empirical analysis shows that satisfaction is *a)* higher the more one wins, *b)* lower the more others win, and *c)* lower the higher was the aspiration level.

3.3 Do social comparisons and adaptation explain the Easterlin 'Paradox'?

Some of the research that we have cited above allows us to undertake tentative back-of-the-envelope calculations of the relationship between income and happiness. For example, we can take the key finding in the Leyden literature that adaptation over time accounts for around 60% of the effect of income (i.e. income's long-run effect is only 40% of its short-run effect), which corresponds closely to the results in Di Tella et al. (2005). We can further appeal to one of the best sources of information on the extent of social comparisons, Knight and Song's (2006)

[13] Suggestive indirect evidence is easier to find. Clark (1997), for example, suggests that the stubbornly higher job satisfaction reported by British women in BHPS data might partly reflect their lower expectations.

[14] Where individuals are asked to indicate the sum per period they think is the absolute minimum net family income their family requires to make ends meet. This was introduced in Goedhart et al. (1977).

finding that relative income is at least twice as important for individual happiness as actual income, even in poor regions (in their case rural China). Together, this suggests a utility function in which 2/3 of aggregate income has no effect because it is status-related, and thus disappears in a zero-sum game, and where 60% of the effect at the individual level evaporates within two years due to adaptation. Hence only around 13% of the initial individual effect will survive in the long run at the aggregate level.[15] Precisely such a happiness function is shown in Figure 4, which represents the basic aspects of the Easterlin 'Paradox' shown in Figures 1 and 2. It is possible that even this small positive long-run effect may be an overestimate, as new generations or cohorts may start with higher aspiration levels than older generations. Any such intergenerational adaptation of aspirations would further diminish the long-run aggregate effect of higher income, but is at present still ill-accounted for in the literature.

3.4 Key challenges for empirical work

Akin to many areas of applied economics, establishing the nature of the empirical relationship between income and happiness faces a number of challenges, even if we presume that happiness is perfectly measured and conforms to experienced utility. Here we highlight a number of the main difficulties.

Firstly, economic theory often dictates that the relevant measure of welfare is consumption, not income, and that income in happiness regressions is only a noisy proxy for consumption (Weinzierl, 2005). As such researchers will tend to underestimate the importance of material circumstances on happiness. Headey and Wooden (2004) go some way toward to addressing this issue. They use Australian panel data (HILDA) and find that 'net worth', which is arguably a better proxy for current consumption than a transitory measure of income, matters broadly at least as much as does income in determining happiness. As they conclude, 'the unimportance of material circumstances has been exaggerated'. The main reasons why consumption and income may differ are the consumption that individuals obtain directly from others, and deferred consumption via savings. Regarding the first of these, individuals in developed economies are provided with a great deal of consumption goods via the State, such as education, health care, and transfers-in-kind, which are only rarely taken into account in empirical estimations. If public-goods consumption is not directly measured, then proxy variables, such as local area or country income, which are related to public goods via taxation, will attract positive coefficients.

[15] These percentage figures are remarkably close to the estimates of interdependent preferences and habit-formation in Ravina (2005), using panel data on US credit-card holders' consumption expenditure. Weinzierl (2005) includes both cell-average reference group income (by age, sex and education) and lagged income in a life satisfaction equation. The estimated coefficients imply that satisfaction is completely relative with respect to income. We do not know, however, whether this definition of the reference group is apt.

This will pollute the status effect of aggregate incomes on happiness, so that the coefficient on aggregate income in happiness regressions will suffer from upward bias if public good consumption is not taken into account.

Even measuring personal consumption is difficult. Not only do individuals likely have trouble remembering how much of their income they have saved in financial assets, but more fundamentally it is difficult to establish empirically a clean borderline between purchases that have only current consumption benefits and purchases with some future consumption benefit. How much of a car or a house purchased today should be counted as current consumption and how much as future consumption? How much of education is current status consumption, and how much investment? Issues such as these, which relate to the majority of major purchase decisions, are very tricky and create a significant rift between theoretical models and empirical estimates of consumption. If we do use individual income instead of consumption in happiness regressions, we should remember that income is an overestimate of what is consumed when young (when we save) and an underestimate when old (when we dis-save). Forcing income to have a single coefficient over all ages then implies an upward bias in the effect of age on happiness.

The second major empirical difficulty, as already briefly mentioned above, is to correctly identify reference groups, especially when individuals move a great deal in their lifetimes and reside in high population-density areas. Only very few studies ask individuals about their reference groups, rather than simply imposing one. As noted in Section 3.1, Melenberg (1992) asks respondents directly about the income of the people with whom they interact often. We are only aware of one study where respondents were given a list of options and asked to explicitly state to whom they compare themselves. As mentioned above, in Knight and Song (2006) 68% of survey respondents in China reported that their main comparison group consisted of individuals in their own village, whereas only 11% stated that their main comparison group consisted of individuals from outside of the village.[16]

Almost all of the rest of the literature has resorted to assuming a particular reference income, and therefore inserts variables into the empirical model such as the individual's predicted income according to her characteristics or the income in some geographical area, which is less convincing. The generic problem with using constructed reference groups is that they might pick up effects other than social comparison: average income by geographical area will likely also

[16] Wave 3 (2006) of the European Social Survey will go some way to filling this lacuna. Individuals are first asked "*How important is it to you to compare your income with other people's incomes?*" They are then asked "*Whose income would you be most likely to compare your own with?"*, with responses on a showcard of Work colleagues, Family members, Friends, and Others.

measure local public good consumption; co-workers' income may pick up measurement error in own reported income; and income predicted from a regression may reflect own expected future income. Therefore, in the absence of accurate information about reference groups, we should be cautious in claiming to have evaluated the importance of social comparisons over income from happiness data.

A third point is that the group of individuals (or countries), to whom individuals compare is assumed to be exogenous, and not a matter of choice. Falk and Knell (2004) ask what happens if individuals can partly choose their reference groups.[17] To obtain interior solutions for this choice, the psychological literature has distinguished between 'self-enhancement' and 'self improvement' motives. A concern for status implies that individuals prefer low-income reference groups: this is 'self-enhancement'. In the extreme, everyone would compare themselves to the poorest individual(s), which clearly does not fit reality. The 'self improvement' motive then posits some indirect benefit to having a higher-income reference group. One such benefit works through the cost of effort: "*people perform better and are more successful if they set themselves high goals or compare with high reference standards*" (p. 421). The main result of Falk and Knell's model is that the endogenously-chosen reference level increases with individual ability (as measured by the rate of transformation of effort into output), so that higher-ability individuals will choose higher-income reference groups. The choice of reference group will then be based on the trade-off between status and the higher output that comes from lower effort cost. Rablen (2006) considers an explicit dynamic model where agents face self-control problems (there are future benefits from current effort). He shows that the 'planner', who maximises the individual's intertemporal utility, may find it optimal to introduce a reference level into the utility function. The optimum reference level comes from the trade-off between the direct utility cost of evaluating outcomes relatively and the future benefits from higher current effort levels. Stark (2005, 2006a) has written a number of papers which appeal to reference-group choice to better explain the migration decisions of heterogenous individuals. It is important to note, however, that the empirical happiness literature is still in its infancy on this issue.

A fourth challenge concerns the timing of income changes: the empirical prediction from the loss-aversion hypothesis of Tversky and Kahneman (1991) is that the absolute effect of a loss of one dollar, from an initial reference position, on individual happiness is greater than the effect of a gain of one dollar. Any test of this prediction, which is highly relevant for many economic

[17] A related question is treated in Oxoby (2004): what if individuals can choose the domains over which status comparisons take place?

phenomena (see Section 5), will require precise observation of the timing of both income movements and reference income movements. Panel data, in which individuals are typically interviewed only once per year, is consequently severely limited in its ability to distinguish asymmetric happiness responses to incomes that are above and below the reference position. At present, only experiments can address this asymmetry, but even these face well-known limitations: experimental subjects are very often non-representative; the laboratory situation itself may lack realism; and laboratory experiments on social phenomena are inherently unsuitable for the measure of meaningful adaptation (such as the adaptation of reference groups) as subjects cannot be kept in the laboratory for sufficiently long periods of time. Until we can better track movements in both income and reference income, the loss-aversion hypothesis will remain difficult to verify in this literature.

A fifth challenge is to deal with the issue of missing variables. No data set has all the variables one might wish and their absence often leads to problems. Missing variables lead on to the issues of the endogeneity of key variables and spurious relations between income and happiness, and the problem of slope heterogeneity.

The first effect of missing variables is to render income potentially endogenous. It seems plausible that happy people, or, equivalently, individuals with 'happy' personality traits, are more likely to obtain better jobs (see Graham et al., 2004, and Lyubomirsky et al., 2005). Barker (2005) similarly concludes that many later life outcomes depend on adverse influences during early development, and specifically links both income and depression to birth size. The lack of personality traits and early life influence variables in the data then implies that income is endogenous. Drawing on these arguments, Ferrer-i-Carbonell and Frijters (2004) find in GSOEP data that the partial correlation coefficient between changes in income and changes in happiness is smaller than that between levels of income and levels of happiness. They advocate panel data techniques to account for unobserved fixed individual traits that produce endogeneity problems. However, even fixed-effect estimation will not identify time-varying factors that lead to both greater happiness and higher income, producing spurious correlation. Good health, which allows individuals to obtain better jobs and increases well-being, is a good candidate for a missing factor that may lead to such a spurious correlation; marital stability and good relations with co-workers are other possibilities. While the omission of these types of variable in happiness regressions leads to an upward bias on the income coefficient, the reverse holds with respect to variables that are themselves influenced by income and which are included as separate regressors in a happiness regression. Health again fits the bill, as does housing and even marital status: these outcomes are improved by higher incomes but are included in the regression as

exogenous factors, producing a smaller estimate on the income coefficient. The balance of such conflicting effects is hard to predict.

Recent years have seen a number of papers appealing to natural experiments to skirt the issue of endogeneity by providing some exogenous variation in income.[18] Frijters et al. (2004a, 2004b, 2006) consider the large changes in real incomes observed in East Germany (following reunification) and Russia (following transition) as exogenous, and find a greater effect of income on happiness than in much of the existing literature. Gardner and Oswald (2007) use information on lottery winnings in the BHPS as reflecting exogenous income movements. In both level and panel equations, lottery winnings are found to significantly reduce mental stress scores. It is worth underlining that natural data will only very rarely produce truly exogenous income movements, although this is an issue for all work in applied microeconomics for which income is important.

Missing variables at the aggregate level are important since any variable that correlates positively with income and negatively with happiness may, if excluded from the data, give the false impression that income does not lead to greater happiness and would thus be able to explain the Easterlin Paradox. Some candidates which might spring to mind in this context are pollution, (lower) social capital, and hours of work. Can any of these indeed explain why growth is not making us happier? Probably the most detailed attempt at tackling this research question is Di Tella and MacCulloch (2005a) using 23 years of Eurobarometer data and 28 years of American GSS data. They examine a series of potential omitted variables which could explain why increasing income has not led to more happiness. These are life expectancy, pollution (measured as kilograms of Sulphur Oxide emissions per capita), unemployment and inflation, hours worked, the divorce rate, crime and income inequality. Their empirical results show that most of these are indeed correlated with life satisfaction in the expected manner. However, their inclusion as right-hand side variables does not explain why rising income has not produced rising well-being because, like income, these additional variables have mostly *also* improved over time without increasing happiness: in their own words 'introducing omitted variables worsens the income-without-happiness paradox'.

Missing variables may also lead to different individuals having a different marginal benefit from income i.e. 'slope heterogeneity'. Presuming the same coefficient on income over the whole sample may not be appropriate if there are important interacting variables omitted from

[18] An alternative is to instrument income, although the task of finding instruments which affect income but not subjective well-being is a hard one. Lydon and Chevalier (2001) instrument income via spousal characteristics in a sample of UK University graduates, which leads to a doubling of the size of the income coefficient in a job satisfaction equation.

the data. Has the literature found any such interacting variables? The answer appears to be yes: a recent example is Lelkes (2006), who shows that the religious were less affected, in life satisfaction terms, by income movements during economic transition in Hungary. If religiosity were a missing variable in this example, there would have been slope heterogeneity on unobservables in Hungary. Smith et al. (2005) propose the same type of mediating relationship for health. Clark et al. (2005) argue that such slope heterogeneity is likely to be present in many more settings and propose to identify it on functional form assumptions on the error term and the allowed types of slope heterogeneity. They use latent class techniques applied to three waves of European Community Household Panel data to identify four different classes, in terms of both intercept and the estimated coefficient on income in financial satisfaction equations.

A sixth and final challenge is the issue of the estimation method. Frey and Stutzer's (2002a) plea for greater use of panel techniques to overcome some of the missing variables problems signalled above has largely been heeded. However, little attention has been paid to the exact specification of the independent variables and one can think of many non-linearities that may be important in actual work but that are usually ignored. In particular, the consensus use of log income in well-being equations may hide important departures from log-linearity. In particular, it may miss the presence of kinks, not only over time (as in loss-aversion), but also regarding comparisons to others: is the return to having one dollar more than the neighbour the exact opposite of having one dollar less? Better data and more flexible estimation techniques are needed to address this challenge.

4. Is Happiness Related to Utility?

In this section we ask what basis there is for believing that happiness is a reasonable measure of the economic notion of (decision) utility, i.e. the thing whose maximisation leads to choice behaviour. It is, of course, surprisingly difficult to say whether any given series of numbers conforms to utility or not. The full scale of the identification problem can be gauged by reflecting on the two requirements that (decision) utility must fulfil in textbook treatments:

1. Utility guides individual choice in the sense that choices serve to maximise the *expected* stream of utility.
2. Utility itself is the outcome of both choices and chance factors that were outside the control of the individual but whose possibility was taken into account when decisions were made.

The first identification problem is that in practice we are not able to say with any precision what choices individuals really have available to them at a moment in time. Having children, getting a job, getting married, health, etc., are only partially outcomes of our own choices as they also depend on choices made by others and other factors outside of our control. This is not only the case for events in the past but also (and even more so) for possible events in the future, of which there are many more than actually eventuate. Which jobs, marriage partners, and schools could an individual choose from and at which prices one may ask? We usually do not know. This makes it in practice extremely difficult to check that an observed outcome indicator of utility (say, happiness) does indeed represent the best outcome attainable by that individual. A second and related problem is that observed happiness may not be the same construct as expected happiness: behaviour is driven by expectations and not necessarily by realisations. In order to prove that a series S_{it} is the same as utility we would therefore need to observe what the individual *expected* S_{it} to be in all future periods under *all* possible future states, together with all the probabilities of all future states of the world. This information is necessary to show that the choices undertaken do lead to the highest expected future stream of S_{it}. We would also need to be able to check that the realised S_{it} corresponds to the *ex ante* expected S_{it} for the state of the world that came about *ex post*. We would then be able to see whether the realised S_{it} does relate to the same concept as the expected S_{it}.

This type of information does not to our knowledge exist and seems likely to remain elusive for the foreseeable future regarding happiness or any other candidate empirical measure of utility. What circumstantial evidence can we then turn to support the hypothesis that happiness is a good measure of utility?

There have been four main approaches:

1. Presuming that choice behaviour is somehow evolutionarily hard-wired, we can look for evidence that happiness or any other measure of utility relates to observable hard-wired reward-response mechanisms in the brain. If individuals are also presumed to interact strategically, it further needs to be shown that we are evolutionarily geared to be able to predict other people's happiness.
2. To compare the trade-offs implicit in the best-guess estimates of the causal determinants of happiness and to see whether these match up reasonably well to observed choice behaviour in those spheres.

3. To formulate a theory for how the brain comes up with a happiness number and then see whether choice behaviour is consistent with the happiness predictions of that theory.
4. To verify in laboratory and natural experiments that the found best-guess causal determinants of happiness, such as relative concerns, are also a determinant of choice behaviour in settings where all other factors are kept constant.

We next proceed to discuss what each of these four approaches has yielded so far, followed by a number of reasons why happiness might *not* correspond to utility.

4.1 Is happiness related to hard-wired reward-response stimuli and is it predictable?

Well-being scores can be examined in relation to various physiological and neurological phenomena. It is known (see Shizgal, 1999; Fernández-Dols and Ruiz-Belda, 1995; Sandvik et al., 1993) that there is a strong positive correlation between emotional expressions like smiling, and frowning, and answers to well-being questions. Ito and Cacioppo (1999) showed that positive and negative emotions are associated with the extent of the startle response, and various measures of facial expressions (facial electromyography).

A recent literature has looked at the relationships between positive and negative states, on the one hand, and neurological measures, on the other. Obtaining physical measures of brain activity is an important step in showing that individuals' self-reports reflect real phenomena.[19] Particular interest has been shown in prefrontal brain asymmetry.[20] In right-handed people, positive feelings are generally associated with more alpha power in the left prefrontal cortex (the dominant brain wave activity of awake adults are called alpha waves), and negative feelings with more alpha power in the right prefrontal cortex.[21] This relationship was initially suggested by the observations of patients with unilateral cortical damage (see Davidson, 2004), but more recently has been explored using techniques to measure localised brain activity, such as electrodes on the scalp in Electro-encephalography (EEG) or scanners in Magnetic Resonance Imaging (MRI).

A recent example is Urry et al. (2004). In this study 84 right-handed individuals (drawn from the Wisconsin Longitudinal Study) provide answers to questions on positive and negative

[19] Davidson (2004) notes that 'The identification of the brain circuitry responsible for different aspects of affective processing has helped to parse the domain of emotion into more elementary constituents in a manner similar to that found in cognitive neuroscience, where an appeal to the brain has facilitated the rapid development of theory and data on the subcomponents of various cognitive processes' (p.1395).

[20] Other approaches have also been explored. Knutson et al. (2001) explore the relationship between positive emotions and activity in subcortical circuits including the nucleus accumbens.

[21] This is an oversimplification, and recent work has cast the left-right opposition in terms of approach versus withdrawal (anger, a negative approach-related emotion, is associated with more alpha power in the left prefrontal cortex): see Urry et al. (2004).

affect, measures of hedonic well-being using global life satisfaction scores, and measures of eudaimonic well-being, which are designed to capture elements such as mastery, relations with others, self-acceptance and purpose. Brain activity is measured via EEG. Left-right brain asymmetry is shown to be associated with higher levels of positive affect, and with both hedonic and eudaimonic well-being. Interestingly, the correlation between brain asymmetry and positive affect explains all of the correlation with hedonic well-being, but only some of the correlation with eudaimonic well-being; in other words, left-right asymmetry is not just about pleasurable feelings. Davidson (2004) describes further work in which left-right asymmetry is associated with quicker recovery from negative affect challenge (i.e. "shocks" to happiness), over and above its effect on baseline well-being.

Brain asymmetry is also associated with physiological measures, such as cortisol and corticotropin releasing hormone (CRH), which are involved in response to stress, and with antibody production in response to influenza vaccine (Davidson, 2004). In general, it seems that brain asymmetry is not only associated with measures of subjective well-being, but general measures of wellness of the organism's functioning.[22]

Since there is a distinct advantage in strategic games in knowing what the other person's utility function looks like, it would seem reasonable to ask whether a proposed measure of utility is predictable by others. Many studies have shown that individuals are able to a large extent to recognise and predict the satisfaction level of others. In interviews in which respondents are shown pictures or videos of others, they accurately identify whether the individual shown to them was happy, sad, jealous, and so on (see Sandvik et al., 1993; and Diener and Lucas, 1999). This is also the case when respondents were shown individuals from other cultures.[23] It might then be argued that there is a common human language of satisfaction or happiness, so that subjective well-being is at least to an extent observable and comparable between individuals. It has also been found that individuals in the same language community have a common understanding of how to translate internal feelings into a number scale, simply in order to be able to communicate with each other. Respondents translate verbal labels, such as 'very good'

[22] A recent review article by Pressman and Cohen (2005) describes the relationships between affective "style" and physical health; see also Steptoe et al. (2005). The medical literature has also found high correlations in the expected sense between low well-being scores and coronary heart disease (Sales and House, 1971), strokes (Huppert, 2006), suicide (Koivumaa-Honkanen et al., 2001) and length of life (Palmore, 1969; and Mroczek and Spiro, 2006). Individuals with higher life satisfaction scores were less likely to catch a cold when exposed to a cold virus, and recovered faster if they did (Cohen et al., 2003). Blanchflower and Oswald (2007) show that happiness and high blood pressure are negatively correlated, both at the individual and at the country level.

[23] This is reminiscent of work in the area of 'emotion' undertaken in the 1960s (see the description in Chapter 1 of Nettle, 2005). American respondents were very good at identifying the emotions depicted by American actors in a series of photographs; but importantly so were the Dani tribespeople of Papua New Guinea.

and 'very bad', into roughly the same numerical values (see Van Praag 1991).[24] A tempting conclusion is that an evolutionary advantage accrues to the accurate evaluation of how well others are doing.[25,26]

The general idea of having a third party evaluate respondents' happiness has been used to validate the replies that individuals themselves provide (see Sandvik et al., 1993; Diener and Lucas, 1999). When friends and family are asked about how happy they believe the respondent is, the scores they provide tend to correlate with the respondent's own report.[27] Another obvious choice is the interviewer: again, the answer the interviewer gives tallies with that of the respondent. Lastly, respondents are sometimes given open-ended interviews in conjunction with standard questions about their well-being. When third parties, who do not know the respondent, are played tape recordings of these open-ended interviews, their evaluation of the respondent's well-being matches well with the respondent's own reply.

4.2 Do the implicit trade-offs look like they correspond to choice behaviour?

There are by now many hundreds of identified 'correlates' of happiness and for each one of them there are difficulties in identifying the correct coefficients due to the usual problems of causality and measurement. If we just focus on the variables that show up in most regressions, however, what can we say about how reasonable the signs of the coefficients look, and the plausibility of the implicit trade-offs?

Studies looking at happiness or life satisfaction have identified clear positive relations with income, marriage, job status, health, and religion (see Kahneman et al., 1999, or more recent surveys, such as Layard, 2005). Improved health, income, and job status can be seen as extensions of the budget constraint. Marriage can be viewed as an opportunity for taking advantage of specialisation and access to home production. Being religious similarly can be seen as having access to spiritual goods and to psychological coping mechanisms. Hence these

[24] More precisely, it looks as if individuals convert the verbal labels into cardinal numbers that equally divide up the response space. Practically, this is one reason why ordinal and cardinal estimation techniques applied to subjective measures of well-being or health most often produce similar results (Ferrer-i-Carbonell and Frijters, 2004).

[25] Seabright (2004, Chapter 3) invokes the possibility that smiling and laughter may have evolved as (accurate) signals of trustworthiness. It is not easy to fake smiles, and extremely difficult to fake laughter.

[26] A point worth making is that when asked to report their level of happiness, life satisfaction or well-being in surveys, only a small minority of respondents do not provide an answer (less than 1% of respondents in the BHPS or GSOEP). The concept of happiness is intuitively understood by almost everyone.

[27] This test is not as clean as it might appear at first sight, for the reasons underlined in Manski (1993). Third parties and respondents may share unobserved characteristics which lead them to supply similar answers, even though the correlation between the two underlying constructs (how happy the individual thinks she is, and how happy her friend thinks she is) may be only small. This applies particularly to third-party reports from both friends and family who likely share with the respondent idiosyncratic uses of language. This is less of a problem with third-party raters who are unknown to the respondent. The correlation is not affected if both *A* and *B* use the same linear transformation of their real evaluation into a report, but it will be exaggerated if part of both *A*'s and *B*'s answer reflects a norm belief that people "should" score 8 out of 10 on subjective well-being scales.

findings concur with what we would expect from a mainstream view of utility. It is, however, worth mentioning that having children and additional education only slightly affect utility. Since these have a strong choice element to them, so that at the margin we would expect the utility effect of an additional child or year of education to be zero, this general finding can be rationalised.

When we look at trade-offs in terms of which variable explains most of the variation (and is therefore worth the most happiness), health usually yields the highest number. Even to the mean income earner, the difference between the best possible health and the worst possible health is worth millions per year (i.e. more income than is available). What is also striking is how much a job and marriage are worth. A recent estimate of the implicit value of marriage and a job in Australia is that both are worth about twice mean yearly income (Carroll et al., 2007). While these figures are high, they are not that strange if we reflect on the time and trouble that people are prepared to go through to find partners and jobs. Such trade-offs can also be used to calculate the shadow wage, as in Clark (1996b), where the negative effect of one more hour of work per week on job satisfaction is cancelled out by a pay rise of £8.60 per week (in 1991 prices). Similarly, Van Praag and Baarsma (2005) calculate that the negative externalities from noise at Schiphol airport in Amsterdam (in 1998) could be compensated by a tax of around three dollars per passenger per flight.

4.3 Does it correspond to theory?

One way to check whether happiness corresponds to utility is to use outside information about the function $u(X_{it})$ and to see whether the theory resulting from that outside information correctly predicts the series S_{it} and the associated revealed preference behaviour.

One implicit theory that has been followed here is that low satisfaction in a domain of life is often (though not always) avoidable. Rational maximising individuals are then predicted to be more likely to walk away from jobs or marriages with low job or marital satisfaction. If people do indeed display this behaviour, then this may be taken as evidence that individuals maximise satisfaction. This theory sounds intuitively plausible but is only valid under the restrictive assumption that low satisfaction in a job or a marriage is, on average, *predictive* of the *expectation* that individuals have about the alternative i.e. their satisfaction is lower when they expect to be able to do better. This theory is usually only implicit (though not always: see Frijters 2000).

Many panel data studies have found that subjective well-being at time *t* predicts future behaviour, in that individuals clearly choose to discontinue activities associated with low levels

of well-being (see Kahneman et al., 1993; Frijters, 2000; and Shiv and Huber, 2000). Measures of life satisfaction have been shown to predict future marital break-up (Gardner and Oswald, 2006). A number of labour market studies have shown that job satisfaction is a strong predictor of job quits, even when controlling for wages, hours of work and other standard individual and job variables (see, for example, Freeman, 1978; Clark et al., 1998; Clark, 2001; Kristensen and Westergaard-Nielsen, 2006). A recent example using data on the self-employed is found in Georgellis et al. (2005). Clark (2003) shows that mental stress scores on entering unemployment predict unemployment duration: those who suffered the sharpest drop in well-being upon entering unemployment were the quickest to leave it.

4.4 Do the empirical correlates of happiness also show up in experiments?

In controlled experiments, researchers are able to change the variable of interest while holding the rest constant. This makes an indirect test possible of the validity of happiness as utility: if some factor is important for happiness, then it should also be important for choice behaviour when all other factors are held constant. In the context of this paper, the key question is whether relative concerns show up in experiments.

One source of evidence on the importance of comparisons to others in actual choice behaviour comes from the burgeoning experimental economics literature on fairness. Survey evidence such as Kahneman et al. (1986) finds that people have strong views about fairness in economic exchange. Laboratory evidence on ultimatum games (Guth and Schwarz, 1982; and Smith, 1994) suggests that individuals will throw away real income to obtain a fairer division of a smaller pie. Perhaps even more explicitly, Zizzo and Oswald (2001) report the results of an experiment whereby subjects can pay to burn each other's money. A majority of subjects chose to do so, even though it costs them real earnings. The average subject had half of her earnings burnt, and richer subjects were burnt more often. Chen et al. (2006) describe a fascinating set of experiments involving Capuchin monkeys, and find evidence that their preferences are reference-dependent (see also Brosnan and de Waal, 2003). It is tempting to view these experimental outcomes in the light of some sort of comparative process.[28]

Social comparisons can also be demonstrated by asking individuals to express preferences over hypothetical outcomes. Alpizar et al. (2005), Johannsson-Stenman et al. (2002) and Solnick and Hemenway (1998) present respondents with states of the world which differ in both the

[28] Comparisons and fairness are not synonyms however: while the former implies that an individual is happy to receive more than others, fairness considerations suggest that they would prefer not to.

absolute and relative domains. For example, in Solnick and Hemenway (1998), individuals are asked to choose between states *A* and *B*, as follows:

A: Your current yearly income is $50,000; others earn $25,000.

B: Your current yearly income is $100,000; others earn $200,000.

It is specified that "others" refers to the average of other people in the society, and emphasised that "*prices are what they are currently and prices (the purchasing power of money) are the same in States A and B*".

All three papers find evidence of strong positional concerns over income, in that individuals say they are willing to give up absolute income in order to gain status (choosing *A* over *B* above). Further, two of the papers ask analogous questions with respect to other life domains, and compare the resulting taste for status. Concerns about relative standing in Solnick and Hemenway (1998) are found to be strongest for attractiveness and supervisor's praise, and weakest for vacation time; in Alpizar et al. (2005) they are stronger for cars and housing, and weaker for vacations and insurance.

A natural experiment on how reference positions affects behaviour was recently described by Mas (2006). In New Jersey, police unions bargain over wages with their municipal employer and in cases of dispute, an outside arbitrator has the final say. Mas (2006) found a 12% increase in the per capita number of crimes solved (cleared) when unions win their case compared to when they lose, which he interprets as evidence that workers care about whether their pay conforms to a reference position.

Finally, we can appeal to physiological and neurological evidence regarding status and relative income. A series of well-known studies[29] relates the level of serotonin in monkeys to status within the primate group, and show experimentally that it is status that produces serotonin, rather than the inverse. We are not aware of experiments that have shown that relative income is associated with physiological outcomes in human subjects. Animal studies have examined neuronal activity when faced with pairs of rewards (here different flavours or quantities of fruit juice). Previous tests establish the preference ranking over fruit juices for each monkey. The experimental results show that "striatal neurons do not process reward information in a fixed manner but relative to other available rewards" (Cromwell et al, 2005, p.522; see also

[29] Nicely summarised in Frank (1999), pp.140-142. There is an entire separate literature on health outcomes and status: see Marmot (2004) and Cherkas et al. (2006) for example. Research has also shown that suicide is a function of relative income (Daly and Wilson, 2005), and that suicide and para-suicide by the unemployed is actually higher in low unemployment regions (Platt et al., 1992).

Tremblay and Schultz, 1999). Equally, there is some evidence that neuron firing is determined by the amount of relative reward within a gamble (i.e. relative to the amount that could have been won). A recent paper (Fließbach et al., 2007) uses MRI techniques to measure the brain activity of pairs of individuals engaged in identical tasks. Each individual's ensuing monetary reward is announced to both subjects, and both absolute and relative payments were varied. The results with respect to the ventral striatum show that relative income is significantly correlated with blood oxygenation in the brain. In fact, brain activity is completely relative in this respect, as there is no significant role for absolute income levels once relative income is introduced.

4.5 Why might happiness not be utility?

Despite the work described above, it is wise to remain cautious about the link between happiness and utility. One reason why we might think that happiness is not the same as utility is that happiness is an evaluation of what has occurred, and such an evaluation may not be the same as what people expected to happen. In other words, individuals may make systematic mistakes in predicting their happiness. This would drive a wedge between choice behaviour and happiness maximisation and thus between happiness and decision utility (though happiness could then still be experienced utility, i.e. the thing that people *would want* to maximise). This issue is discussed in Kahneman et al. (1997). Loewenstein et al. (2003) specifically provide a model of misprediction of future preferences (and therefore misprediction of future experienced utility), and apply their model to lifetime consumption and saving, and the purchase of durable goods.

Rabin (1998, pp. 33-34) summarises the experimental findings in this active area of psychology:

> How do people misperceive their utilities? One pattern is that we tend to underestimate how quickly and how fully we will adjust to changes, not foreseeing that our reference points will change. … People do not anticipate the degree of such adaptation, and hence exaggerate expected changes in utility caused by changes in their lives.

If it is indeed the case that people do not fully anticipate changes in reference points, then a wedge will be driven between happiness and utility.[30] The ramifications of systematic errors in

[30] It is perhaps worth pointing out here that the gap between utility and happiness relies on exactly the kind of comparison mechanism that we have appealed to as an explanation for the Easterlin paradox. Choice behaviour (base on predicted utility) does not take into account changes in y^* – but these latter are indeed subsequently revealed in happiness data.

anticipating reference group changes are substantial: in economic models with relative utility functions, it is typically assumed that people perfectly anticipate changes in their reference groups (this point reappears in the next section). Systematic forecast errors of the type Rabin claims directly and predictably violate the rational expectations hypothesis. Frijters et al. (2002), for example, found that East German respondents failed to anticipate in 1991 that their initial euphoria after German reunification would wear off and therefore structurally overestimated their future life satisfaction, which is consistent with the idea that they failed to realise that their reference position would adapt to the new situation.

Another reason to be cautious about using happiness data as a measurement of utility is the argument that there is more to life than happiness. The psychology literature has, for example, specifically argued that eudaimonia, which captures functional aspects of well-being, plays a separate role to the hedonic part of well-being (happiness or life satisfaction). These functionings include autonomy, competence, personal growth, positive relationships, self-acceptance, engagement and meaning (see Deci and Ryan, 2000; Ryff, 1989; Ryff and Singer, 1998; and Seligman, 2002). In this case, we may well trade off happiness against other constituent parts of utility, as argued by Kimball and Willis (2006).

A last reason to mistrust happiness as a measure of utility is the known malleability of happiness answers (see for instance Bertrand and Mullainathan, 2001). Happiness can easily be manipulated in surveys by reminding respondents about something positive or negative before the question. It is clearly not a number that people have on the tip of their tongue, just waiting to be reported.

5. Some Implications for Economic Theory and Policy Design

The previous sections have discussed evidence that people value relative outcomes, using happiness data (Section 3) and non-happiness approaches (Section 4). We now turn to the implications for economic theory and policy design of social comparisons and adaptation. Some of these have previously been presented in general terms (e.g. Frey and Stutzer, 2002a; Layard, 2005; Di Tella and MacCulloch, 2006), but we here provide a more formal and wide-ranging discussion of these economic issues. In particular we focus on the core issues of economic growth, labour supply, wage profiles, optimal taxation and consumption, savings and investment, and migration.

We will point out in several instances that the implications of social comparisons and adaptation may also result from utility functions without comparisons and adaptation but where there are constraints that are functions of past and aggregate circumstances. This occurs when

the effects from reference groups run via an aggregate group outcome (comparisons) or via a function of the past (adaptation), where these reference groups are not explicitly identified but rather assumed to underlie the observed correlations. In such cases it is hard to dismiss alternative readings that link constraints (prices and quantities) to the past or to aggregate outcomes. Since many prices and quantities in economics are unobserved (such as the price of home production or individual ability or the 'fundamentals' of economies), many models can be proposed with an unobserved price or quantity generating a relationship between individual behaviour and past actions or group aggregates. Only in some cases can we reasonably argue that reference groups are 'needed' to explain unambiguously an empirical regularity; we will point out in the applications below when this is the case.

5.1 Economic growth

We start with the ongoing debate about whether economic growth leads to greater happiness. Easterlin (1974, 1995) and others since (e.g. Lane, 2001) have argued that economic growth in Western countries does not lead to greater happiness, backed up by the fact that happiness levels are essentially flat in Western countries over time (Figures 1 and 2). Yet, in countries that started out from much lower levels, income growth has been associated with modest increases in happiness (Frijters et al., 2004a, 2004b, 2006). In terms of the models described in Section 3, it can be argued that most developed countries appear to be at a point of personal consumption c_t where the marginal utility from $U_1(c_t)$ is minimal, while for poorer countries there are still gains to be had in $U_1(c_t)$ from higher personal consumption. Further economic growth in developed countries then has little aggregate effect because reference incomes increase in line with income, producing no change in $U_2(y_t \mid y_t^*)$ with higher income. This explanation for the Easterlin Paradox has been widely adopted (see, for example, Easterlin, 1995, 2001; Veenhoven, 1997; McBride, 2001; and Layard, 2005). Equivalent formulations are the assertion that at certain levels of development only conspicuous consumption is important, or that 'keeping up with the Joneses' is the main economic motive in rich countries.

However, one possible weak point in this explanation is that it presumes that economic growth only affects consumption levels and has no effect on the distribution of income. If we relax this assumption, the effect of inequality on aggregate happiness also becomes relevant. For example, if we think of the second sub-utility function $U_2(y_t \mid y_t^*)$ as concave, with everyone in the country sharing the same reference income (some national 'norm'), then it is immediate that at a given level of aggregate income, personal consumption and work choices, a country with a

more unequal income distribution will be less happy on average: the additional status benefit of the individual with one dollar more than the norm does not compensate the additional status loss of the person with one dollar less than the norm. This is an additional rationale for pursuing income equality as a policy goal over and above the usual argument that consumption equality has welfare benefits due to concavity in the sub-utility $U_1(c_t)$. The effect of economic growth on happiness then hinges on the relationship between growth and inequality.

There is also a flip side to the argument that greater economic prosperity at some point ceases to buy more happiness. It can be argued that it is actually the concern for relative income embodied in the second sub-utility function $U_2(y_t \mid y_t^*)$ that keeps economic growth going beyond some wealth level. The argument here is that relative concerns are more important in rich countries, as personal consumption plays an increasingly marginal role: status is a luxury good. The driving force behind hard work in rich countries, despite high aggregate consumption levels, is the concern for status. This is indeed one possible evolutionary reason for having a term $U_2(y_t \mid y_t^*)$ in the utility function in the first place (Rayo and Becker, 2007). This argument has a long ancestry in economic debates. Bernard Mandeville's 1705 'Fable of the Bees' puts the argument allegorically. Mandeville juxtaposes two hypothetical beehives: one in which the bees only care about sustaining themselves and have no interest in status (i.e. there is only $U_1(c_t)$ and $U_3(T - l_t, Z_{1t})$) and another where status is what mainly matters (i.e. there is mainly $U_2(y_t \mid y_t^*)$). Mandeville postulates that the first beehive would be happy but not very rich, and is ultimately doomed to be taken over by the second beehive where the bees are mainly motivated by status (by $U_2(y_t \mid y_t^*)$). In that second beehive, the bees would keep working and looking for opportunities both within and outside their beehive to further their relative standing, leading to continual expansion and growth of the second beehive.

Mandeville's observations have since been echoed by many others. Adam Smith, for example, in his Theory of Moral Sentiments, noted, 'To what purpose is all the toil and bustle of this world?... It is our vanity which urges us on.' The modern-day equivalent of the argument by Mandeville and Smith and many other early economists is made in theoretical models by Glomm and Ravikumar (1994), Corneo and Jeanne (2001), and Pham (2005).[31] The key aspect of these models is that they specify $U_1(c_t)$ as $\ln(c_t)$, and $U_2(y_t \mid y_t^*)$ as $\ln(k_t) - \theta \ln(k_t^*)$, where k_t denotes wealth instead of income. These models abstract from the possibility of leisure, but it

[31] Stark (2006b) presents a model in which greater inequality decreases average social status in a population but increases the marginal personal status benefit of additional income, thereby leading to higher aggregate incentives to earn more, so that inequality is positively correlated with growth.

is the $U_2(y_t \mid y_t^*)$ part of the utility function in these models that drives continued economic growth. A related argument in Fershtman et al. (1996) is that social status is determined in part by relative education, therefore linking economic growth via education to status considerations.

Normatively speaking, the dominance of the status motive in the income-happiness relationship means that the benefits of economic growth are not to be found in greater happiness. There are other reasons indirectly related to utility that would still provide a rationale for economic growth, much in the vein of Mandeville's arguments: the link between the length of life and (aggregate) income; the link between the ability to withstand foreign aggression and economic activity; the ability to attract migrants when income levels are relatively high; and some status utility benefit to a country as a whole from having high income compared to other countries. Each of these elements relates to other literatures which we will only touch upon in the remainder of the paper.

5.2 Labour supply

Mandeville and his successors predicted that labour supply would remain high during economic expansions, as a result of status motives. Along the same lines, Neumark and Postlewaite (1998) note that in models where only personal consumption matters, with decreasing marginal utility of consumption, we should see falling aggregate labour supply as aggregate consumption rises, just as the bees in Mandeville's first beehive cease to work hard. In the utility function (1) above, however, there is a limit to the long-run reduction in labour supply with increasing consumption, because the relative term $U_2(y_t \mid y_t^*)$ is independent of consumption. Neumark and Postlewaite argue that status concerns in the income-happiness relation are the main reason why labour supply has not declined dramatically in the 20th century, despite the very significant rise in consumption levels. The same conclusions arise if we consider the job, rather than the income associated with it, as the carrier of status: here too, labour supply will be relatively unresponsive to overall consumption levels.

There are of course utility functions without relative considerations that are also consistent with labour supply not responding to the long-run growth in wages. Examples are utility functions that are log-linear in leisure and consumption (i.e. Cobb-Douglas utility functions in leisure and consumption). We can object to this alternative by pointing out that these do not exhibit any responsiveness to wage changes, i.e. labour supply is fixed. This is only true for one-period models though: we can build in a short-term response to wage changes in such standard models by allowing for borrowing such that individuals would shift labour supply from low-wage to high-wage periods. Hence it is not necessary to resort to relative motives to explain why

labour supply has not declined much over the past 100 years, even though relative motives do naturally lead to that observation.

Woittiez and Kapteyn (1998) and Vendrik (1998) point out that there may be intermediate factors between relative income concerns and labour supply decisions, such as social norms with respect to appropriate labour supply decisions that themselves in the long-run are determined by the payoffs to a more basic utility function. They also argue that female labour supply has increased in many countries as a result of changing wages, but more slowly than expected because the associated social norms took time to adjust. Both Neumark and Postlewaite (1998) and Park (2006) provide empirical tests of female labour supply as a function of relative income.[32]

Layard (2005) explicitly argues that the labour supply implications of income comparisons provide a rationale for growth-reducing taxation designed to bring about greater leisure. In this context, note that the model in (1) can be extended by supposing that status games may involve not only income, but also time investments. Veblen (1899) recognised this by talking about conspicuous consumption *and* 'conspicuous leisure'. This latter consists of all time investments whose main payoff is demonstrating to other people that one can afford to spend time on leisure: examples might be showing off (productively) useless skills (such as speaking Latin, or playing a musical instrument), which signal an abundance of time not used to increase $U_1(c_t)$. The tax implication is now far less clear, as we would ideally want to tax all investments into status races equally, so as to promote non-conspicuous consumption and leisure. Layard (1980) even went so far as to recognise that one may want to sustain several status races rather than fewer, because more races have more winners. The question then arises how multiple status races can be sustained, all the while countering crowding-out effects on non-conspicuous consumption and leisure. Frijters and Leigh (2005) hypothesise that conspicuous leisure is lower in mobile environments because mobility reduces the visibility of leisure more than that of consumption. Empirically, they find that US states with higher mobility rates also have higher aggregate levels of investment in conspicuous consumption (i.e. higher labour supply), both at any moment in time and through time. The average number of hours worked per week per working age person over 1981-2003 in US states with the highest level of internal mobility is about 28, as compared to 26 hours per week for states with the lowest level of internal mobility. The authors advocate

[32] A related issue is how hard individuals work once employed: their effective labour supply. A recent paper (Clark et al., 2006) appeals to both survey and experimental data to show that effort at work is a function of income relative to that of one's reference group. Stark and Tanajewski (2006) appeal to the notion of relative deprivation in the context of overtime work.

mobility taxes to help restore the balance between conspicuous consumption and conspicuous leisure.

5.3 Wage profiles

Kahneman et al. (1991) conclude from choice experiments that individuals are, at the margin, about twice as sensitive to losses as they are to gains; this is labelled loss-aversion or status quo bias. To reflect loss-aversion, we can appeal to a specification of the status component of utility, $U_2(y_t \mid y_t^*)$, as follows:

$$U_2(y_t \mid y_t^*) = 2f(y_t - y_t^*) - f(y_t - y_t^*) * I_{[y_t > y_t^*]}$$
$$y_t^* = \sum_{s=0}^{t} w_s y_{t-s} \qquad (6)$$

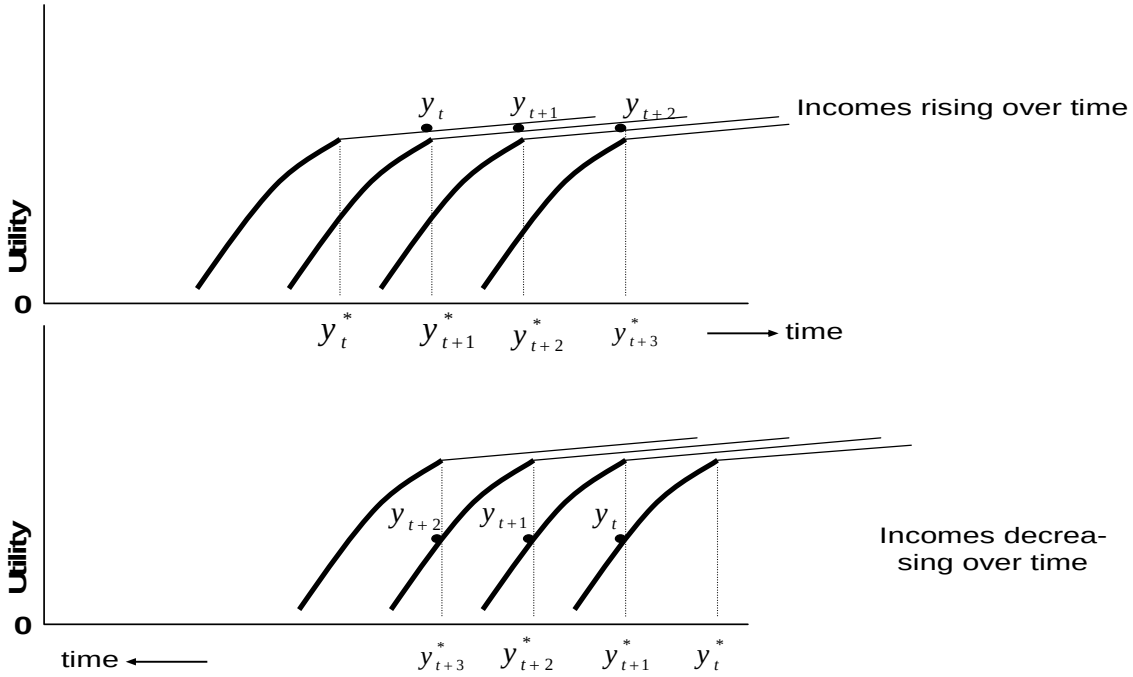
where the second term reflects the lower marginal utility of income higher than y_t^* relative to income lower than y_t^*, so that there is a kink at y_t^*. This reference income itself can be considered as some weighted average of previous incomes. Figure 7 illustrates this kind of utility function in the context of increasing or decreasing income profiles. For ease of illustration, reference income is set to equal income in the previous period.

This figure is read as follows. In the top panel, where income rises over time, income at *t* exceeds reference income, y_t^*, so that the individual is on the relatively flat part of the utility function. At time *t+1*, the reference income is now equal to y_t, so that the whole utility function shifts to the right. As income at *t+1* is higher than income at *t*, the individual is again on the flat part of the curve. As time goes on, the utility function shifts further and further to the right.

The opposite occurs in the lower panel, where the income profile is decreasing. To make the point that the same number of dollars are being disbursed in the two profiles, the income figures exactly match vertically. With the decreasing profile, the individual always receives less than her reference income, which is heavily penalised by this utility function. Consequently, utility is far lower under the decreasing income profile than under the increasing income profile, despite the actuarial value of the decreasing income profile being higher: any positive discount rate will produce higher present-discounted value from the profile with the higher income first. Note that we do not actually require loss-aversion for this conclusion, which is driven by the evolution of reference income over time, but that the kinked utility function reinforces the preference for growth. In fact, individuals will show similar preferences over two positively-sloped income

profiles, where loss-aversion plays no role. The steeper profile will be preferred, *ceteris paribus*, as income at each period will be evaluated relative to a lower reference point (a lower past income), producing higher utility.

Figure 7: Importance of Kinks in the Utility Function



Given this preference for income growth, independent of the income level, employers can save money by offering an increasing profile with lower actuarial value rather than a decreasing profile with higher actuarial value; individuals prefer the former even if they are perfectly rational. Frank and Hutchens (1993) and Loewenstein and Sicherman (1991) use evidence from small-sample surveys to show that individuals do indeed express a preference for wage profiles which rise over time, even though these have lower present discounted values than alternative profiles with constant or decreasing wages. Such an observation is very hard, if not impossible, to square with a fixed utility function that does not depend on past incomes.

Kinks in the utility function around moving reference points, also termed loss-aversion, have more implications than simply helping to explain upward-sloping wage profiles within firms. We would also expect employers to be likely to offer contracts guaranteeing no income reductions over the working life i.e. an endogenous absence of demotion in job titles and institutionalised downward wage rigidity. McDonald (2002) motivates an asymmetric utility function including loss-aversion, and then argues in a simple micro-macro model that it creates downward wage rigidity at the level of firms which in turn generates Keynesian business cycles. This also fits well with the empirical observation of Teulings and Hartog (1997) that wage

decreases are virtually never observed within organisations in Europe because individuals are sacked rather than demoted. Patacconi and Ederer (2005) also invoke sensitivity to relative decreases in job status to rationalise the lack of observed empirical reductions in rank and nominal pay within organisations.

A potentially fruitful avenue for future research along these lines is to test the hypothesis that retirement partly results from individuals being unwilling to take a step back within their organisation, and thus choosing retirement over wage cuts or demotion. Retirement would then generically follow the moment at which individual productivity peaks, even though workers may still have many highly productive years left. This comes about simply because individuals are loath to accept jobs and wages that are below their current reference position. In this situation, there is a case for deferring rewards for production until later in life i.e. to smooth wages such that they will increase up to some fixed age, which in turn raises the issue of credible long-term contracts and mandatory retirement.

5.4 Poverty

The relative importance of the three components of the utility function in (1) is crucial for the measurement of poverty. One common representation is that individuals are in poverty if their material consumption levels falls below some subsistence level; this appeals to a critical level of $U_1(c_t)$ rather than to overall happiness. This approach is behind concepts like the absolute poverty line, the cost of minimum calorie intake line, and minimum living standards, such as the minimum consumption basket defining the poverty line in the US, or the 1$ a day poverty line used by the World Bank. However, Sen (1983) and many others in the poverty literature have explicitly argued that relative concerns also matter for individuals, and that we should base the poverty line on relative rather than absolute consumption.[33] In this vein, the OECD publishes statistics on the number of individuals whose income is below half of median income in member countries, and the European Union currently employs a poverty line set at 60% of median income. In terms of equation (1), these relative representations of poverty assume that the $U_2(y_t \mid y_t^*)$ component of utility is the most important for individuals. The measurement of poverty via U_2 does however pose problems once we realise that the norm level of income, y_t*, is liable to evolve over time. For instance, if y_t^* depends on own past income, then, at a given level of own current income y_t, an individual whose income has just increased has higher utility

[33] One can argue that the concern for relative poverty results from self-interested insurance against negative shocks, and that the lower tail of the income distribution is informative about the size of the negative shocks currently prevalent in the economy.

than someone whose income has just decreased, so that poverty depends on both income levels and income profiles. In practise, taking income adaptation into account for relative poverty measures would seem to be very difficult.

Neither absolute nor relative poverty lines introduce any explicit role for the non-material aspects of utility, and are therefore not yet based on happiness. To make the distinction clear between happiness and whatever we currently mean by poverty, think of a factor like sunshine. No known definition of poverty considers it to be relevant whether a materially poor person enjoys more hours of sunshine than a rich person who suffers in a cold climate, even if the materially poorer person is happier. Implicitly, sunshine and all of the other non-income factors influencing happiness are considered as orthogonal to poverty, even though they are highly relevant for both happiness and individual decision-making. Poverty as currently operationalised concerns the sub-utilities $U_1(c_t)$ and $U_2(y_t \mid y_t^*)$, instead of happiness proper (U). A more happiness-based poverty measure would take into account non-material elements to provide a broader picture of well-being (the lives that individuals live), and would also jar less with the commonplace observation that individuals freely make a number of choices that leave them materially worse off (such as having children).

5.5 Optimal taxation and consumption

A burgeoning literature in recent years has addressed the optimal tax implications of utility functions which depend on relative income; this literature both relies on and produces predictions about the precise empirical properties of the income-happiness relationship. To our knowledge, this theoretical literature has not in the past been explicitly connected to the empirical happiness literature, despite there being clear potential gains from such integration (Weinzierl, 2005).

One of the most influential papers on optimal taxation is Frank (1985), who adopts the following utility function:

$$U = U(c_0, R(c_0), c_1) \tag{7}$$

where c_0 is the consumption of some positional good, potentially including both positional material goods (conspicuous consumption) and positional immaterial goods (conspicuous leisure). This first term of (7) corresponds to $U_1(c_t)$ in equation (1). The second term in the utility function, $R(c_0)$, denotes the individual's consumption rank with respect to the positional

good: this term corresponds broadly to $U_2(y_t \mid y_t^*)$. The third term c_1 denotes a non-positional good and corresponds loosely to $U_3(T - l_t, Z_{1t})$. The basic point made by Frank (1985) is that utility maximisation means that individuals consume c_0 up to the point where total marginal utility is zero:

$$\frac{dU}{dc_0}\Big|^{R(c_0)} + \frac{dR(c_0)}{dc_0}\frac{dU}{dR(c_0)}\Big|^{c_0} = -\frac{dU}{dc_1}\frac{dc_1}{dc_0} \tag{8}$$

where $\frac{dU}{dc_0}\Big|^{R(c_0)}$ is the marginal utility of the consumption of the positional good keeping rank constant, $\frac{dR(c_0)}{dc_0}\frac{dU}{dR(c_0)}\Big|^{c_0}$ is the marginal utility of the consumption of the positional good via its effect on rank, and $\frac{dU}{dc_1}\frac{dc_1}{dc_0}$ is the indirect effect of the increased consumption of the positional good via the (reduced) consumption of the non-positional good. The precise form of $\frac{dc_1}{dc_0}$ is given by the budget constraint that fixes total income, allowing non-positional goods c_1 to include both leisure and consumption activities. Frank emphasises that $\frac{dR(c_0)}{dc_0}\frac{dU}{dR(c_0)}\Big|^{c_0}$ is a pure externality: changes in rank have no social benefit even though they yield private benefits. This additional benefit of positional goods to an individual leads to societal over-consumption of positional goods, to the detriment of non-positional goods. Frank then points out that this externality produces a rationale for the taxation of the positional good, in order to promote the non-positional good. If we equate the positional good to relative income and the non-positional good to leisure, we obtain a rationale for income taxation in order to promote leisure. Layard (2005) adopts this argument.[34]

A number of other authors have adopted different specifications of the utility function, and of the reference position in particular, which affect the tax implications. For example, if we take the utility function in Ireland (1994):

$$U = U(f(c_0, c_1), s(c_0)) \tag{9}$$

[34] An older literature argues that 'social preferences' (also including altruism) can only be identified from observed transfers under restrictive assumptions (direct utility measures do not suffer from this drawback): see Oswald (1983) with respect to taxation and Ng (1987) for the related problem of public good provision.

where c_1 is a good whose consumption is unobservable, and $s(c_0)$ is status, specified as the belief spectators have about $f(c_0, c_1)$ based on observing c_0. Exactly as in Frank (1985), Ireland derives a general tendency to over-consumption of the observable good c_0 for a wide class of possible information regimes. He also illustrates the Pareto improvements that can be attained via income taxation coupled with direct transfers of c_1 to the poor.

Ljungqvist and Uhlig (2000) use a similar utility function, but concentrate on changes in optimal tax policy over the business cycle. Their main utility function is:

$$U = \frac{(c_t - \alpha \bar{c}_t)^{1-\gamma} - 1}{1-\gamma} - \beta l \qquad (10)$$

with $\bar{c}_t$ being the population average of individual consumption c_t, and l denoting labour supply. This utility function is analogous to that in equation (1), albeit with c_t and $\bar{c}_t$ entered as separable functions. The externality embedded in the presence of $\bar{c}_t$ leads to labour supply that is too high, very much in the same mould as Boskin and Sheshinski (1978) and Frank (1985). Ljungqvist and Uhlig show that this externality can be perfectly countered by a constant marginal tax on c_t, independent of the business cycle. The analysis is then extended by considering the reference position not as $\bar{c}_t$, but as $\bar{c}_{t-1}$ i.e. average consumption last period. In the presence of aggregate productivity shocks, they find that optimal tax rates co-move with current productivity shocks, creating counter-cyclical effects of taxation on the economy. This is exactly in line with the usual Keynesian optimal tax policy which is also counter-cyclical.

5.6 Savings and investment

A related recent theoretical literature has emerged on the dynamic effects of relative consumption (or status concerns). The papers we mention here abstract from the possibility of a term like $U_3(T - l_t, Z_{1t})$ and focus in the main on the timing of consumption. The key question addressed is the optimality of savings.

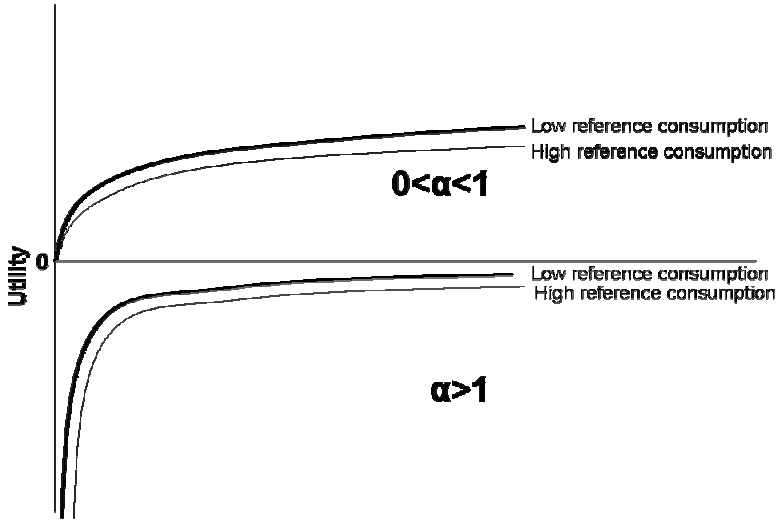
We might naïvely think that status does not affect savings, because the trade-off between current and future status would seem to be identical to the trade-off between current and future consumption. However, this line of thinking breaks down when we consider that individuals accumulate wealth over their lifetime, and that productivity generally increases, implying that in

a stylised sense reference income when 'old' is always higher than that when 'young'. In this case, relative concerns come into play through the marginal utility of consumption over the lifecycle, and therefore affect saving and investment decisions. Most of the generic arguments that arise here can be illustrated via the utility function introduced by Abel (1990), and subsequently adopted by a number of other authors:

$$U_t = \frac{(c_t)^{(1-\eta)(1-\alpha)}}{1-\alpha} * (\frac{c_t}{\tilde{c}_t})^{\eta(1-\alpha)} \qquad (11)$$

Here c_t is own consumption and $\tilde{c}_t$ is the geometric mean of the consumption of a reference group, which can be construed as the rest of the population or some slowly-adjusting social norm containing past generations' or the individual's own previous consumption. The parameter η, $0<\eta<1$, denotes a kind of 'weight' for relative concerns in individual utility and $\alpha>0$ reflects risk-aversion ($\alpha=0$ implies risk-neutrality). The key characteristics of this utility function are revealed when we consider that the relationship between the individual's marginal utility from own consumption and reference income $\tilde{c}_t$ depends crucially on α. The main possibilities are depicted in Figure 8, where the x-axis shows personal consumption and the y-axis utility.

Figure 8: Utility of Consumption with High/Low Reference Consumption, and $\alpha<1$ and $\alpha>1$



The two lines in the top panel of Figure 8, where $0<\alpha<1$ (so that U is positive), show how that a higher value of reference consumption (the thin line) reduces not only utility, but also the

marginal utility from own consumption, i.e. at every consumption level the curve is flatter with higher reference consumption. As such, when $0<\alpha<1$, individuals will want to consume more when reference consumption is lower: individuals will plan consumption in the periods when other individuals are not consuming, as their marginal utility of another dollar of consumption will be greater. This creates a coordination problem, as reference consumption results from simultaneous choices by everyone in the economy (for example if the reference point refers to average consumption by others). The difficulty in solving such coordination problems in endogenous growth models has to date appeared unsurpassable (Ljungqvist and Uhlig, 2000, and Abel, 2005, simply assume that $\alpha>1$). Even so, it seems intuitively plausible to imagine that the marginal (status) utility of consumption is higher when the consumption of others is lower. Intuitively also, we might think that when $0<\alpha<1$, savings will be too low: individuals will not postpone consumption to the future as future general consumption levels then will likely be higher due to productivity growth.

We obtain exactly the opposite results when $\alpha>1$, corresponding to the lower panel of Figure 8, which is the dominant assumption made in the literature. Here again, individual utility falls as reference consumption rises, but now the marginal utility of consumption increases. Individuals will want to consume more when others consume more, producing a kind of herding phenomenon: status is then a bandwagon good in the terminology of Duesenberry (1949). There is no difficult coordination issue to solve as all consumers will want to consume at the same time. The corollary is that individuals all save too much at the same time, because they all want to consume more towards the end of their lives, when the consumption of others will also be higher due to productivity increases.

In the terminology of Dupor and Liu (2003), the case with $\alpha>1$ can be called 'Keeping up with the Joneses' and that with $\alpha<1$ 'Running away from the Joneses'.[35] Crucially, the issue of whether the parameter α is in fact greater than one or not can in principle be empirically evaluated using happiness data, although this test has not to our knowledge been carried out to date. A simple method of obtaining the sign of $(\alpha-1)$ results from the cross-derivative of equation (11):

[35] There is an interesting analogy here with models of habit formation explaining unemployment persistence in macro and labour economics (for a review, see Darity and Goldsmith, 1996). The generic argument in this literature is that the unemployed get used to being unemployed, either via becoming discouraged (which is a form of adaptation to own circumstances) or via social norms (such as when they conform to the neighbourhood; see Clark, 2003, for an empirical test). In these models individuals become less keen on formal work when they or their reference group have been out of work for a long time and therefore become 'locked' into unemployment. This corresponds closely to the notion that people 'Keep up with the Joneses' rather than 'Run away from the Joneses', for in the latter case they would be more keen to have a job when they have been unemployed for a long time or when their reference group is unemployed.

$$\frac{d^2U_t}{dc_t d\tilde{c}_t} = \eta(\alpha - 1)(c_t)^{-\alpha}\tilde{c}_t^{-\eta(1-\alpha)-1} \tag{12}$$

It follows from (12) that the sign of the interaction between own consumption and reference group consumption in a reduced-form regression reveals the sign of (α -1).

Abel (2005) focuses on this issue in an overlapping two-generation model with a utility function for the new-born of the form:

$$U_t = \frac{(c_t)^{(1-\eta)(1-\alpha)} * (c_t / \tilde{c}_t)^{\eta(1-\alpha)}}{1-\alpha} + \beta \frac{(c_{t+1})^{(1-\eta)(1-\alpha)} * (c_{t+1} / \tilde{c}_{t+1})^{\eta(1-\alpha)}}{1-\alpha} \tag{13}$$

where c_t is own current consumption and $\tilde{c}_t$ is the geometric mean of the current consumption of everyone else alive. The term $(c_t)^{(1-\eta)(1-\alpha)}$ refers to the part of own consumption that is independent of others' consumption, and the term following β refers to future consumption. The main result emerges when we consider the marginal utility of future consumption:

$$\frac{dU_t}{dc_{t+1}} = \beta(c_{t+1})^{-\alpha}\tilde{c}_{t+1}^{-\eta(1-\alpha)} \tag{14}$$

When α <1 we obtain the intuitive result discussed above: the marginal utility from future consumption is lower when $\tilde{c}_{t+1}$ is higher, and therefore when there are general productivity increases. The externality from higher future consumption reduces savings, which makes the case for subsidies on savings. Again though, the equilibrium under α <1 cannot be solved analytically because of the coordination issue mentioned above. Abel thus mainly concentrates on cases with α >1, under which general productivity increases, leading to higher future reference incomes $\tilde{c}_{t+1}$, actually *increase* the future marginal return to consumption, yielding a case for taxes on savings.

Carroll et al. (1997, 2000) make a different point by adopting a utility function where the reference position only depends on the consumption of the individual herself in the past:

$$U_t = \frac{(c_t)^{(1-\eta)(1-\alpha)}}{1-\alpha} * (\frac{c_t}{\tilde{c}_t})^{\eta(1-\alpha)}$$
$$\tilde{c}_t = \int_{-\infty}^{t} e^{-\rho(s-t)} c_s ds \qquad (15)$$

This is the same utility function as Abel (1990, 2005) but with what we called an 'internal reference' point in Section 3. Carroll et al. also concentrate on cases with α >1 and generically argue that there will be upward pressure from technological growth on savings, as individuals anticipate that the marginal return to future consumption will be higher. However, in the specification of the reference position $\tilde{c}_t$, there is another effect, related to the speed at which the reference point adjusts to current consumption. When the rate of adaptation to consumption changes, ρ, is high, individuals essentially only compare to their own recent consumption, and when ρ is small (although always positive), adjustment is slow and consumption in the distant past remains important. Again, the value of this critical variable, the speed of adjustment, can in principle be measured in happiness regressions by the coefficients of past consumption on current happiness.

Carroll et al. (2000) also show that when adaptation is slow, it makes sense for individuals to save more as economic growth increases, despite the fact that future reference consumption levels will be higher. The intuition is that under slow adjustment, individuals wish to 'smooth out income increases' more than under fast adjustment. On the contrary, if the reference position adjusts quickly, individuals essentially want to enjoy the status benefit of higher productivity immediately. This model is used to rationalise the empirical regularity that high-growth countries also have high savings rates. It is difficult to reconcile this empirical fact with a model without reference positions affecting utility: in the latter, the marginal utility of future consumption is always lower as economic growth increases because future consumption is higher, leading to lower savings rates. Why save now if we are all going to be rich tomorrow anyway? Carroll et al.'s answer is that individuals want to adjust slowly to ever higher consumption patterns, and it therefore makes sense to save more now, simply to avoid getting used to high consumption too soon. This provides the link between savings and the speed of adaptation of reference consumption in happiness regressions.

Constantinides (1990) and Gali (1994) use a similar utility function to address the equity premium puzzle. Constantinides notes that the existence of internal reference points over consumption provides an additional reason for individuals to only slowly adjust their consumption over time. Deaton (1992) confirms this prediction by showing in US data that

individuals over-smooth consumption after permanent income shocks. Constantinides goes further by arguing that the presence of $\tilde{c}_t$ creates a bias in conventional estimates of risk-aversion, which are based on the tradeoffs people make over time: without $\tilde{c}_t$ then high risk-aversion would imply that the savings rates of the rich would be greater than those of the poor. The fact that savings rates vary only little across income groups may lead us to conclude that risk-aversion is actually quite low. Constantinides shows that the presence of $\tilde{c}_t$ breaks this logic, in that even with high risk-aversion the presence of a moving reference point leads all individuals to smooth income over time in a similar manner. This provides a rationale for empirical instances of observed high instantaneous risk-aversion, in particular the large premium that individuals are prepared to pay for risk-free assets versus risky higher-return assets i.e. the equity premium puzzle. Campbell and Cochrane (1999) extend this idea to further types of asset pricing puzzles and argue that models including a reference point $\tilde{c}_t$ exhibit superior predictive power over models without such a term.

Reference point models have also been used to explain financial contagion where reference effects are usually termed 'habit formation'. The main observation that this literature addresses is the Asian financial crisis, whereby a whole set of countries saw their exchange rates and economies collapse in sequence (see for a description Eichengreen et al., 2001). A puzzling feature for more standard models is that during the Asian financial crisis the risk premia for holding a financial asset went up in all of the countries involved when the currency of another country collapsed, whereas in standard theories one would expect capital flight from the affected country to the other countries which would reduce risk premia. Boschi and Goenka (2006), who adopt the utility function of Cambell and Cochrane (1999) which is very similar to Abel's (1990) specification, argue that this increase in risk premia may be due to the fact that if own wealth comes close to the reference wealth level (due to losses incurred in another country) the curvature of the utility function increases. The greater the curvature of the utility function, the more compensation investors needs to keep investing in a country, meaning that the risk premia go up which in turn may lead to the collapse of a currency. This general idea can also be seen in Figure 8: the 'steepness' reduces faster when reference incomes are relatively high relative to own income and thus risk aversion is stronger. The same principle applies with wealth if individuals realise that making a loss on current wealth may reduce consumption below reference consumption. Whilst Boschi and Goenka (2006) claim such increases in risk premia due to wealth effects cannot be explained by standard (CARA) utility functions, it may of course be the case that financial contagion works via channels other than wealth effects in combination

with habit formation. We could for instance alternatively argue that the collapse of one country is informative about 'fundamentals' in a similar country. This is therefore a good example of a situation where reference group effects may explain an observable outcome but where it is hard to dismiss other possibilities that do not involve reference groups; there are indeed dozens of other competing theories (see the lengthy discussion in Boschi and Goenka, 2006). This underlines the importance of laboratory evidence on the influence of reference groups for this literature, since only then can we be sure that there are no other factors involved and that reference groups really do have independent effects on choice behaviour.

One particular strand of the empirical income-happiness literature fits in well with savings models, namely the so-called 'tunnel-effect'. The original idea is attributed to Hirschman (1973), who argued that individuals could actually derive utility from others' higher incomes if they consider them to be informative about their own future income. Senik (2004) uses this argument to explain why in Russian panel data (RLMS) individual happiness was positively linked to reference group income, rather than negatively as a relative utility function would suggest. Equally, Senik (2005) finds that higher reference group income reduces life satisfaction in Western Europe, but raises life satisfaction in the post-Transition countries of Eastern Europe (and the United States). The potential importance of the information role is underscored by the finding that reference group income is more strongly positively correlated with life satisfaction for those in more uncertain situations (as measured by the volatility of their income and the probability of losing their job, for example).

The simplest model in which a tunnel effect can arise is a two-period model where individuals only derive utility from their own consumption, but face the problem of saving in period 1 in order to consume in period 2. For example, consider:

$$\begin{aligned} & U = u(c_1) + u(c_2) \\ & c_1 + \frac{c_2}{1+r} = y_1 + \frac{y_2}{1+r} \\ & \rightarrow u'(c_1) = (1+r)u'(c_2) \rightarrow \frac{dc_1}{dy_2} > 0 \end{aligned} \tag{16}$$

where lifetime utility U is now simply the sum of happiness in period 1, which depends only on period 1 consumption, and happiness in period 2, which depends only on period 2 consumption. The budget constraint (with an interest rate of r) links period 1 consumption to period 2 income: the higher is period 2 income, the higher is period 1 consumption because of a reduced need for savings. Now imagine that period 2 income is in fact unknown by the individual decision-maker,

who estimates her next-period income from the incomes of 'reference' individuals around her who share the same observable characteristics (region, education, gender, age, etc.). This produces a reduced-form lifetime happiness function in the first period that depends positively on the observed incomes of reference individuals. Neither adaptation nor social comparisons are needed to produce a relationship between happiness and others' income; although equally, under certain parameterisations, tunnel effects can be observed even if relative income or consumption matters.

The tunnel-effect model provides several pointers as to what we should expect to observe empirically: (*i*) we should see a positive relationship between reference group income and own current consumption, over and above the effect of own income (because the higher is others' income, the lower are one's own savings); and (*ii*) we should observe happiness being positively correlated with reported expected future income, and that the positive effect of reference group income on one's own happiness transits via expected future income. These tunnel-effect predictions are yet to be empirically tested.

5.7 Migration

Consider the decision whether to migrate or not. Without a $U_2(y_t \mid y_t^*)$ term in the utility function, then all those who find more attractive income and leisure combinations in another country will leave. This conclusion changes if we allow for comparisons, and consider that migration might lead to changes in y_t^*. For instance, if y_t^* equals average income in the local neighbourhood or the average income of people like yourself at your workplace, then someone who fears ending up with low relative income in another country might not migrate, even if both leisure and the absolute income she could earn there are higher. Stark and Taylor (1991) appeal to this idea to explain why the elites in poor countries do not emigrate: the elite are at the top of the income distribution in the country where they currently live, but may well not be so if they emigrate. Stark and Taylor further introduce the notion of different economic migrant types. In terms of equation (1), they argue that we would expect those with relatively high earnings potential in another country to move abroad e.g. those whose skills are relatively undervalued in the country of origin. Furthermore, we expect those who can keep individuals in their home (poorer) country as their reference group to be more likely to emigrate than those whose reference income adapts to the new country. The former can become high-status in their home country by earning more in the host country, yet they remain in a status sense part of the home country. This line of thinking can help to explain why many migrants continue to visit their home country: this is when they can cash in as relatively high earners compared to those in the

home country, making it irrelevant whether those same incomes are considered as high in the host country.[36]

This kind of analysis yields two distinct possible migration dynamics. In the first, those who migrate do so voluntarily in spite of adaptation in the $U_2(y_t \mid y_t^*)$ element of their utility function. That is, they have exceptionally high skills and can become high-status even in the host country and want to compare themselves to persons in the host country anyway. The first group of voluntary migrants is therefore made up of high-status assimilators, who Stark identifies with the brain-drain phenomenon. The networks of these early migrants may lead to more migration of the same variety, but the fast assimilation of early migrants implies that they are not preoccupied by this, as their networks will not primarily consist of other migrants from the same home country. The second migration pattern is very different, and may well result from exceptionally low consumption in the home country (i.e. by $U_1(c_t)$). For example, we can think of the Irish in the US being driven by the potato famine back home, forced migration in general, or the 'guest worker phenomenon' of the European Union where whole villages were essentially transplanted to other countries in the 1960's. These individuals will by design be less likely to assimilate, and have strong incentives to carry on comparing themselves to individuals in the home country. This results from their high wages relative to those in the home country and low wages relative to the host country. These migrants may for the same reason try to attract more low-skill individuals from the home country, as these latter do not detract from their own status but rather increase it by reducing the reference income they face in the host country. The two types of immigration, associated with two different parts of the income/happiness gradient, will therefore have very different cultural and economic implications for the host country. Countries such as Canada and Australia, which operate a points system whereby potential migrants have to offer something exceptional to the host country in order to attain a visa, arguably attempt to attract the first type of economic migrant. Countries in the EU that are introducing legislation trying to stop 'family reunions' could be interpreted as trying to reduce the second kind of economic migrant. More empirical work on the relationship between happiness and reference

[36] It could be argued that the same observation could be rationalised by a standard utility function without relativity in a situation where prices are low in the home country, but wages are high in the host country. Migrants going home for the holidays would then simply be taking advantage of the higher purchasing power of their income in the home country. That would then, however, beg the question as to why the non-migrants of that host country do not also visit the 'home' country in large numbers. If it is really an issue of prices, there would be no inherent reason for migrants to return to their home country: they could equally go to any other low-price country. We can, of course, object to this line of thinking by saying that migrants return to their home country because of specific ties with family or others that further lowers the price of some goods for them. It is possible to derive alternative rationalisations of return migration that do not depend on relative considerations.

incomes, especially looking at the differences across migrant groups in reference incomes, would greatly inform this debate.

5.8 Normative Implications

Section 5.5 discussed the tax implications of relative utility. These arise due to externalities between individuals. Somewhat more subtle are the policy implications of adaptation, which can be thought of as externalities within individuals. We discussed above how changing reference incomes can affect inter-temporal trade-offs in consumption, wage profiles, and the costs and benefits of migration. In general, events to which individuals adapt quickly only have a happiness payoff in the short run, while events where adaptation is slow (or absent), have long-run happiness payoffs. The impact of a particular circumstance on current happiness is then only a snapshot of the stream of effects on happiness associated with that circumstance, and is therefore in principle not necessarily informative about life-time trade-offs.

What is often not well-understood is that as long as individuals are rational, the mere presence of adaptation is no reason for policy intervention unless it is accompanied by an externality (such as those found in social comparisons). We may not necessarily want to counteract activities which produce only a short-lived happiness 'buzz' at the expense of a long-run happiness cost, unless we believe that individuals are unaware of the fact that the 'buzz' may indeed only be ephemeral.

When individuals do not in fact realise that they will get used to some things (but not to others), a basic paternalistic question arises. This has been well-stated by many, including Kahneman et al. (1997, 1999) and Rabin (1998): Should we only care about what Self 0 (who makes the decisions) wants or should we also care about what Self 1 (in the future) experiences? Individuals who care only about their desires at time 0 (i.e. Self 0) will take decision utility as the normative reference point. If instead we were to take the experiences of Self 1 as the guiding principle for policy design, we would potentially act against the explicit wishes of an 'ignorant' (Self 0) electorate by taxing activities that lead to only short-run happiness gains. An interesting political economy question then arises of how governments can do so without being voted out of office by myopic Self 0's. This question only arises when individuals mis-forecast their degree of adaptation. However, the empirical literature is still only beginning to grapple with the questions of differential paces of adaptation to life events. While there is now growing evidence regarding the misprediction of adaptation (see Riis et al., 2005, and the research reviewed in Loewenstein and Ubel, 2006), the information required to advocate paternalism is currently far from complete.

6. Conclusions

One of the exciting developments within economics over the last decade has been the booming 'economics of happiness' literature, which has expanded in both theoretical and empirical directions. The basis for the empirical work has been the increasing evidence from both psychologists and economists that measures of individual well-being collected in surveys contain 'valid variability', in the sense that current happiness or satisfaction is a strong predictor of future behaviour. The wider acceptance of subjective well-being measures as a direct proxy for utility has consequently opened up a wide-range of opportunities to further inform theory and policy design. The happiness literature has in the last few years began to make major inroads in this respect. The analysis of subjective well-being data provides a valuable alternative, but complementary, approach to the revealed-preference framework that dominates the discipline of economics.

The two specific issues that have generated the most interest in the literature are (*i)* the effect of labour market status, and especially unemployment, on happiness, and (*ii)* the relationship between income and happiness. This paper has focussed on the latter, motivated by its central importance to economists and policy-makers. Our contribution has been to provide a new overview of the theoretical and empirical literature on income and happiness, bringing together the most recent research, and showing how the traditional utility function framework can be readily generalised to incorporate a range of observed behaviours. In particular, our main challenge has been to align the widely-cited Easterlin 'Paradox', that of increasing real incomes in developed countries but with no noticeable increase in average happiness, with the large empirical survey literature that has found that income and happiness are positively related.

The broad consensus in the literature is that the paradox points to the importance of relative considerations in the utility function, where higher income brings both consumption and status benefits to an individual. Comparisons can either be to others or to oneself in the past. Utility functions of this type can explain the positive slope found in much of the empirical literature. However, since status is a zero-sum game, only the consumption benefit of income remains at the aggregate level. Since the consumption benefit approaches zero as income rises, happiness profiles over time in developed countries are flat. Carlyle's pitifulest whipster will indeed be made happier by higher income, but only at the expense of someone else or his own future self.

We have appealed to the growing literature to show that happiness is indeed negatively related to others' incomes and to own past income. We are aware though that it will never be possible to prove that happiness measures utility. We thus also discuss the reasons why we

believe the two are related, and review evidence consistent with relative utility from non-happiness sources.

Going beyond the paradox that initiated the literature, this paper has attempted to connect the economics of happiness literature with theoretical economic models of taxation, labour supply, economic growth, savings, wage profiles, migration, and consumption. We have identified how the outcomes of mainstream theoretical models hinge on key behavioural parameters that could in principle be identified from the empirical analysis of happiness data. Some examples of these parameters include:

i. The degree of risk-aversion and the complementarity between own income and reference income, which are important for the savings literature;

ii. The malleability of reference groups, which is key to migration decisions and education decisions;

iii. The kink in utility functions around the reference position, which is important for wage policies and career decisions; and,

iv. The existence and extent of material and non-material status races, which are paramount for optimal taxation policy.

The interaction between economic theory and happiness is therefore the next milestone for the developing economics of happiness literature. However, it is clear that the empirical literature on happiness still faces several challenges, many of which are shared with other empirical literatures. Two of the key challenges are to deal with a general inability of survey data to precisely time changes in income with changes in happiness over long time periods, and the difficulty in mapping incomes into current and expected consumption. It is also the case that most datasets do not contain reliable (if any) *ex ante* information regarding the group (the reference point) to which individuals compare themselves. Similarly, no dataset can contain all the variables of importance, so that researchers will continue to face the issue of endogeneity with respect to income and other variables such as marriage, education, and the reference group. Finally, natural experiments producing exogenous variation in income are only rarely observed, making the issue of establishing the causal effect of income on happiness a major challenge.

Our final conclusion is that taking relative income seriously is an important step towards greater behavioural realism in Economics, such that our models and empirical analysis move closer to how real people feel and behave. Some may not like the insertion of additional arguments into individual utility, and remark that any behaviour can be rationalised by an

appropriate manipulation of the utility function. While this is formally true, it does not apply wholesale to the issue of relative income. As we have tried to demonstrate, utility functions including relative income terms produce a wide variety of testable predictions regarding both well-being (measured by survey or neurologically) and observable behaviours: it is not true that "anything goes". To our mind, this is precisely why we need to appeal to both direct measures of utility and observed behaviour in order to obtain a better idea of what the utility function looks like, and make policy recommendations in the best interest of society. Testing these predictions not only allies theory and empirical analysis in economics, it also spills across many disciplines in the social and natural sciences; it is arguably the most important and the most promising of the research avenues open to this thriving literature.

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