Adaptation or Social Comparison? The effects of income on happiness.

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Abstract

Two mechanisms have attracted considerable attention from researchers studying the effects of income on happiness: adaptation and social comparison. In this paper we study both mechanisms using a panel of British households. Besides dealing with the UK case in detail, the paper contributes to the literature by considering the two mechanisms together and testing for them both separately and jointly. Our results strongly support the existence of adaptation effects but find only weak evidence in favour of social comparison.

Keywords: Income and happiness, adaptation, social comparison, BHPS.

1 Introduction

The effects of income on happiness has been one of the main areas of research of the rapidly expanding economics of happiness[1]. In contrast to the unambiguous effects that factors such as health, marital status or employment

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[1] Useful reviews of the literature are Argyle (1999), Di Tella and MacCulloch (2006) and Clark et al. (2008). Clark et al. (2008) discuss the relationship between income and happiness in greater detail.

status have on happiness, the effects of income appear to be more difficult to discern.

Two well-documented empirical results guide our understanding in this area. First, income has repeatedly been found to have a positive effect on happiness in cross-sections of individuals (see Argyle 1999 for a review of this literature). Rich people tend to be happier than poor people at any given moment of time, even after controlling for many other variables influencing happiness.

Second, average levels of happiness in a country do not increase over time despite very large increases in average levels of income. This is the so-called Easterlin Paradox (Easterlin 1974, 1995) and has been document for the United States, Japan, the United Kingdom and several other rich nations.

There is considerable agreement among researchers in the area regarding the explanation for these two related phenomena: by and large, it is relative rather than absolute levels of income that make people happy. Relative incomes are calculated with respect to a certain norm; if that norm has been growing roughly at the same rate as absolute income over the last few decades then happiness would have remained approximately constant over time, explaining the Easterlin Paradox. Moreover, at any given moment in time absolute income would be highly correlated with relative income, explaining the cross-sectional results.

If we accept that relative income is the key variable in this context, we still have to determine what do people compare themselves with. Income is to be considered in relative terms, but relative to what? The literature has not yet reached a consensus on this question, but the two main answers that researchers in the area have been studying over the last few years are

linked to the mechanisms of *adaptation* and *social comparison*[2][3].

Under the social comparison mechanism the norm that individuals use to evaluate their income in relative terms is the income of a comparison group. There are many possible definitions of this comparison group: the average of the society, people of similar socioeconomic characteristics, neighbours, family, etc. The logic of the mechanism, however, is always the same: we are happy if we have more than the others and unhappy otherwise. If this mechanism is present a proportional increase of all incomes in an economy would leave average happiness unaffected, in line with the Easterlin Paradox.

The adaptation mechanism posits that relative incomes are calculated with respect to the individual's own income in the recent past. In other words, a one-off increase in our income would produce only a temporary effect in happiness; lasting only the time needed for individuals to get used to their new level of comfort[4]. If incomes are growing at a constant rate, as they have done to a first approximation in countries such as the US, we would find that our current income is always higher than our income of the last few years, but the relative distance between the two would be constant. Happiness levels would also be constant, providing another reasonable explanation for the Easterlin Paradox[5].

[2] In this paper we will study adaptation and social comparison with respect to income. Both phenomena, but most particularly adaptation, can be studied with relation to other areas such as marital status, employment status or health. Good examples of papers studying adaptation in these contexts are Lucas et al. (2003, 2004), Lucas (2005), Wu (2001) and Oswald and Powdthavee (2008). Easterlin (2003) discusses the literature on adaptation to several life events other than a changing income.

[3] This paper will be concerned with the empirical literature on adaptation and social comparison effects. For some recent theoretical contributions to this literature the interested reader may consult Clark et al. (2008), Rayo and Becker (forthcoming) and Rablen (2008).

[4] Alternatively, people may be characterized by partial adaptation, which would imply that a one-off increase in income would produce a long-run effect on happiness which, although smaller than the initial effect, is still positive.

[5] The adaptation mechanism is related to the concept of growing aspirations, which has also figured in the literature. In both cases a one-off increase in income has temporary effects: either because we adapt to the new level or because we revise the amount of income that we aspire to.

The empirical literature has found considerable evidence in favour of these two mechanisms. Recent papers providing support for the adaptation mechanism are Clark (1999), Di Tella et al. (2003), Burchardt (2005), Grund and Sliwka (2007) and Di Tella et al. (2007). Clark (1999) and Grund and Sliwka (2007) study the effects of wage increases on employees and find adaptation effects. Di Tella et al. (2003) show that the happiness effects of a rise in GDP per capita tends to disappear after two years. Di Tella et al. (2007), using the German Socio-Economic Panel (GSOEP), estimate that two thirds of the initial effect of income on happiness is lost after four years, giving us an order of magnitude with which to compare our findings.

The evidence of these recent studies on adaptation is consistent with an earlier literature using individuals' assessments of what constitutes a "sufficient" level of income. The amount of money that people regard as "sufficient" or "required" turns out to grow in proportion with the respondents' own income (Layard 2005). This is exactly what would be expected under the adaptation hypothesis: more and more consumption items are regarded as "required" as our income grows and we take them for granted.

Similarly, an important number of recent papers provide support for social comparison: Clark and Oswald (1996), Ferrer-i-Carbonel (2005), McBride (2001), Luttmer (2005), Blanchflower and Oswald (2004), Senik (2004), Knight et al. (2007), Graham and Felton (2006) and Vendrik and Woltjer (2007). In these studies the comparison group used to construct individuals' relative incomes has been very diverse: people living in the same country, region or village (Graham and Felton 2006, Blanchflower and Oswald 2004, Knight et al. 2007), people of similar age (McBride 2001), neighbours (Luttmer 2005) and people with similar socioeconomic characteristics such as age, education and place of residence (Clark and Oswald 1996, Ferrer-i-Carbonel 2005, Vendrik and Woltjer 2007).

This paper analyzes the existence of adaptation and social comparison effects in the United Kingdom using the British Household Panel Survey

(BHPS). In so doing, it contributes to the ongoing literature in two important ways:

(i) It adds to our knowledge of adaptation and social comparison effects by studying the case of the United Kingdom in detail. Social comparison effects have been studied with UK data by Clark and Oswald (1996), but considering only the effects of wages on job satisfaction in a cross section of workers. The adaptation mechanism has been studied for the UK by Clark (1999) and Burchardt (2005). Clark (1999) focuses again on the labour market only whereas Burchardt (2005) looks at overall income and life satisfaction but with a different approach from the one followed here.

(ii) We test for both adaptation and social comparison with a single dataset. In particular, we carry out joint tests for the adaptation and social comparison mechanisms in addition to the separate tests that are common in the literature. This departs from the rest of the literature, where only one of the two effects is considered in turn.

Considering the two effects together is only natural since they are alternative explanations for the same empirical observations: the Easterlin Paradox and the cross-sectional results of absolute income on happiness. Moreover, joint tests of adaptation and social comparison may be of importance since the observational consequences of these two mechanisms can be quite similar. A person whose income is high in relation to his own past income will tend to be also a person whose income is high in relation to his comparison group. In other words, we may mistakenly conclude that social comparison is in place in a world where only adaptation exists and vice versa.

Identifying whether adaptation, social comparison or both are responsible for the complex relationship between income and happiness is of importance because the two mechanisms have markedly different consequences for public policy. Social comparison implies that income distribution should be a major consideration of public policy. The adaptation mechanism, on

the other hand, suggests that income distribution is of no consequence to individual happiness.

As pointed out by Fayard (2005), social comparison implies that there exists a negative externality to income-generating activities. The gain in happiness that we experience when we earn more is accompanied by a loss in happiness of those in our comparison group. Standard economic arguments would then imply that income-generating activities ought to be taxed to internalize such externalities. The adaptation mechanism does not have such straightforward consequences, though one may argue that people could tend to work too much if they base their time allocation decisions on short-term happiness gains. Another area of public policy where this distinction may matter is the proper measurement of poverty (absolute vs. relative measures).

Overall, we find strong support for the adaptation mechanism but only weak support for social comparison. When tested separately, adaptation effects are always strong and statistically significant while social comparison effects tend to disappear when we control for absolute income. When tested jointly, the data clearly favours adaptation effects over social comparison ones.

The rest of the paper is organized as follows. The next section describes the data and the empirical methodology to be used. Section 3 presents and discusses our empirical results. The last section offers some concluding remarks.

2 Data and methodology

Our data source is the British Household Panel Survey (BHPS), waves 1 to 15. The BHPS follows a representative group of British households over time and collects a wealth of socioeconomic information on a yearly basis. The first year of the survey was 1991 (referred to as wave 1) and covered

about 5,000 households and 10,000 individuals. The sample has been subsequently expanded to include more people from Scotland and Wales (in 1999) and from Northern Ireland (in 2001); for a current total of about 9,000 households and 15,000 individuals. The last year of data we had available corresponds to 2005 (wave 15).

The richness of the BHPS has been exploited in the literature to study the effects on happiness of factors such as obesity (Oswald and Powdthavee 2007), age (Clark 2006), intra-family effects (Powdthavee 2004) and to "price" several major life events according to their effects on happiness (Clark and Oswald 2002). The BHPS provides us with a measure of happiness, a measure of income and a rich set of control variables which the literature has identified as the main determinants of happiness.

In accordance with the literature, we use as measure of happiness the answers to a question on life satisfaction. In the BHPS, this question is stated as follows: "Using the same scale, how dissatisfied or satisfied are you with your life overall?". The scale, which was previously introduced in the questionnaire, ranges from 1 to 7 with 1 being "Not satisfied at all" and 7 being "Completely satisfied".

This type of variable has been used repeatedly in the literature on the determinants of happiness by economists and social scientists alike and can be found in slightly different forms in surveys around the world[6]. The question induces an overall assessment of one's life, presumably taking all relevant social and economic aspects into consideration[7].

Our measure of income, the total annual household income, needs to be adjusted on two accounts to allow for proper comparisons across individuals

[6] For example, the United States' General Social Survey (GSS) asks the question: "Taken all together, how would you say things are these days, would you say that you are (3) very happy, (2) pretty happy or (1) not too happy?" while the German Socio-economic Panel (GSOEP) asks the question: "Please answer according to the following scale: 0 means completely dissatisfied and 10 means completely satisfied: How satisfied are you with your life, all things considered?"

[7] See Kahneman and Krueger (2006) for an insightful discussion of the strenghts and weaknesses of this type of measures.

and over time. First, we use an equivalence scale to allow for the differences in household size and composition. The equivalence scale is provided by the BHPS and takes a two-adult household as its base (see Taylor 2007). Second, we adjust for inflation using CPI data from the Office of National Statistics (UK). The variable thus obtained, and which will be referred to as "income" throughout the paper, could be described more precisely as "annual household income, in equivalent terms, in constant 2005 British pounds". This variable, as all relative income variables to be introduced later, will be used in logarithmic form in the empirical applications.

Besides income, the other determinants of happiness that will be included as control variables in our regressions are listed below:

- Health (self-assessment of health status). Individuals have five possible answers - "Excellent", "Good", "Fair", "Poor" and "Very Poor" - to the question "Please think back over the last 12 months about how your health has been. Compared to people of your own age, would you say that your health has on the whole been...". We create four dummy variables identifying the four top answers, the excluded category corresponds to the answer "Very Poor".

- Marital status. We create dummy variables for people describing themselves as being "married", "living as couple", "widowed", "divorced" and "separated". The excluded category consists of people who "never married".

- Education (highest academic qualification achieved). We construct dummy variables for each of the academic qualifications of the British system. These are, in decreasing order, postgraduate degree, first university degree, HND or HNC, A Level, O Level and CSE. The excluded category is "None of these".

- Dummy for unemployed persons (created from a question on current labour force status).

- Number of children living in the household.
- Religiosity (attendance at religious services). We create a dummy for people who are highly religious (attendance at religious services once a week or more) and another one for people who are mildly religious (attendance at least once per month or at least once per year). The excluded category corresponds to people who attend religious services "practically never" or "only for weddings/funerals".
- Age
- Sex
- Region within the UK. We create dummy variables for people living in London, Scotland, Wales and Northern Ireland. The excluded category is England outside London.

Following the literature, the baseline empirical specification that we use for studying the determinants of happiness will be as follows:

$$h_{i,t} = \alpha + \beta \log(y_{i,t}) + BX_{i,t} + \varepsilon_{i,t} \tag{1}$$

In equation (1), $h_{i,t}$ is a measure of happiness, $y_{i,t}$ a measure of income and $X_{i,t}$ a vector of control variables. The equation may be estimated by different procedures (OLS, Logit, Tobit) and can include individual-specific fixed effects and time dummies.

Equation (1) can be thought of as the empirical counterpart of a happiness function of the form $h(y, X)$, with y and X defined as above. Income is used in log form since happiness is usually assumed to be concave in this variable. If we assume that it is not absolute but relative levels of income that matter we would consider a happiness function of the general form $h(\frac{y}{\widetilde{y}}, X)$; where $\widetilde{y}$ would be the income of a comparison group under the social comparison hypothesis or the individual's own past income under the adaptation hypothesis. We will test such happiness function with the following empirical specification:

$$h_{i,t} = \alpha + \gamma \log(\frac{y_{i,t}}{\widetilde{y}_{i,t}}) + BX_{i,t} + \varepsilon_{i,t} \tag{2}$$

Additionally, we may posit that individuals care about both absolute and relative levels of income. Having more than our peers or more than our own selves in the past may make us happier, but that does not preclude that higher income levels are also good per se. This would suggest a happiness function of the form $h(y, \frac{y}{\widetilde{y}}, X)$, which would be tested with the empirical specification:

$$h_{i,t} = \alpha + \beta \log(y_{i,t}) + \gamma \log(\frac{y_{i,t}}{\widetilde{y}_{i,t}}) + BX_{i,t} + \varepsilon_{i,t} \tag{3}$$

As equations (2) and (3) make clear, the norm used to calculate relative incomes, $\widetilde{y}_{i,t}$, is allowed to differ across individuals and over time. Equation (3) may also be described as a version of equation (2) where we control for absolute income. The next section will use equations (2) and (3) to test for adaptation and social comparison separately. In addition, we will test adaptation using a less constrained version of (3). Equation (3) may be rewritten as

$$h_{i,t} = \alpha + (\beta + \gamma) \log(y_{i,t}) - \gamma \log(\widetilde{y}_{i,t}) + BX_{i,t} + \varepsilon_{i,t}$$

Let us now assume that, in the context of the adaptation mechanism, $\widetilde{y}_{i,t}$ is a geometric average of income over the s previous years. In that case the above equation can be rewritten as:

$$h_{i,t} = \alpha + (\beta+\gamma) \log(y_{i,t}) - \gamma \frac{1}{s} \log(y_{i,t-1}) - \gamma \frac{1}{s} \log(y_{i,t-2}) - ... - \gamma \frac{1}{s} \log(y_{i,t-s}) + BX_{i,t} + \varepsilon_{i,t}$$

This last equation corresponds to a dynamic model in which income has an initial positive effect on happiness, determined by $\beta + \gamma$, followed by a series of negative effects in the s subsequent years, determined by $\gamma \frac{1}{s}$. An

unconstrained version of this equation would be given by:

$$h_{i,t} = \alpha + \lambda_0 \log(y_{i,t}) + \lambda_1 \log(y_{i,t-1}) + \lambda_2 \log(y_{i,t-2}) + ... + \lambda_s \log(y_{i,t-s}) + BX_{i,t} + \varepsilon_{i,t} \tag{4}$$

Equation (4) was used by Di Tella et al. (2007) in their study of adaptation effects in Germany and we'll use it alongside (2) and (3) in our context. The long-term effect of income on happiness can be calculated by the sum of coefficients $\sum_{j=0}^{s} \lambda_j$. A sum of coefficients that is positive but smaller than λ_0 would denote partial adaptation.

Before proceeding it is useful to note that equation (3), which can be found in works like Ferrer-i-Carbonel (2005) or Blanchflower and Oswald (2004), is not the only way to test for the effects of relative income controlling for absolute income. Several papers use the alternative specification:

$$h_{i,t} = \alpha + \theta \log(y_{i,t}) + \delta \log(\widetilde{y}_{i,t}) + BX_{i,t} + \varepsilon_{i,t} \tag{5}$$

Standard algebra shows that there is a one-to-one relationship between the coefficients of equations (3) and (5), given by $\theta = \beta + \gamma$ and $\delta = -\gamma$. One would thus reach identical conclusions using (3) or (5). We prefer to use equation (3) because it gives us directly the effect of absolute income on happiness after the effects of relative income have been netted out (parameter β). This effect is of importance since Easterlin's Paradox would predict it to be zero: a positive value is not compatible with the flat trend in average happiness in all developed countries. With equation (3) we can readily test how close this parameter is to zero in statistical terms.

3 Empirical results

3.1 Baseline results

We start by analyzing the determinants of happiness in our data without relative income variables. There is by now a considerable degree of consensus in the literature regarding what variables affect happiness the most.

Health, marital status and employment status are usually found to have the largest effect on individuals' answer to life satisfaction questions while age, education, religious attitudes and income also play sizeable roles.

Table 1 presents the results from estimating equation (1) under four alternative econometric methodologies: pooled OLS, fixed effects estimation, ordered probit and ordered logit; all regressions include time dummies.

Most results are similar across the four methodologies. Health has always a large and positive effect on happiness; although at a decreasing rate. Married people and those living in couples are happier than people who have never married, while those divorced or - worse still - separated score markedly lower. Unemployed persons are universally found to be less happy.

We also find, in accordance with the literature, that highly religious people are happier than non-religious ones and that the partial relationship between age and happiness is U-shaped. In this baseline regressions income is included only in absolute terms. As expected, income exerts a positive effect on happiness in all regressions. Since income is measured in log terms the associated coefficients can be interpreted as the semi-elasticities of happiness with respect to income. The effects of income are smaller than those of health or marital status. A 10% increase in income would rise happiness by just 0.015 points according to the pooled OLS estimates and by 0.005 according to the fixed effects estimate.

Our preferred methodology is the fixed effects estimation of column 2. The main reason for this is that unobservable person-specific factors such as genetics or early childhood experiences are likely to be major explanatory factors of happiness. Columns 1, 3 and 4, which do not include fixed effects, manage to explain at most 17% of the variation in the data whereas the fixed effects regression in column 2 explains 65% of it. Moreover, these person-specific factors are likely to be correlated with several explanatory variables such as health, income or marital status. Indeed, think of some genetic feature that makes us more optimist when facing problems. It is to

be expected that such a convenient trait would make us happier but also more likely to be healthy, rich and married.

Under these circumstances, failure to include fixed effects is likely to lead to an upward bias in most coefficients. Indeed, when we compare the size of the coefficients in columns 1 and 2 we find that most of them are considerable smaller once fixed effects are included in column 2[8]. To put it in other words, we should not deduce the effect of an event like marriage on happiness by comparing married persons with unmarried ones because people who are happy to begin with tend to marry more often. Instead, we should use the within-person variation in the data to deduce the effect that getting married has on the happiness of a given individual. The rest of this paper will use fixed effects estimation to analyze the adaptation and social comparison mechanisms.

3.2 Adaptation and social comparison: separate tests

Before estimating equations (2) and (3) to test for adaptation and social comparison effects we need to define $\widetilde{y}_{i,t}$, the norm with respect to which individuals compare their income to.

In the case of adaptation, $\widetilde{y}_{i,t}$ will be an average of the individual's own income over the last few years. We'll use a simple average over the previous 3 years, i.e. $\widetilde{y}_{i,t} = \frac{1}{3}\sum_{s=1}^{3} y_{i,t-s}$. The ratio $y/\widetilde{y}$ will be referred to as "income relative to past income". We have also used the average over the previous 5 years and have obtained almost identical results.

As discussed above, when using equation (5) to test for adaptation we are implicitly assuming a geometric average of past incomes as the norm.

[8] An interesting case is that of our education variables, which have a negative effect in the abscence of fixed effects but a positive one when these are included. This implies that more educated people tend to be less satisfied with their life than less educated ones; but that increasing your education level (obtaining a university degree, for instance) does rise your life satisfaction. The result is intuitive: it is probably the sense of not being satisfied that pushes people to follow longer educational paths. In other words, intrinsically unsatisfied people self-select themselves into higher education.

We estimate equation (5) with four lags of income in order to have results that are directly comparable with Di Tella et al. (2007).

In the case of social comparison we use two alternative definitions of $\widetilde{y}_{i,t}$. First, and in line with Blanchflower and Oswald 2004, Graham and Felton 2006 or Knight et al. 2007, we use the average income of the individuals's region of residence. We call the resulting ratio "income relative to regional income". The regions we consider for the UK are London, Scotland, Wales, Northern Ireland and England outside London.

Second, we use a methodology closer in spirit to Ferrer-i-Carbonel (2005) or Vendrik and Woltjer (2007) to account not just for the individual's region of residence but for the diverse socioeconomic characteristics that may determine his comparison group. We calculate for each person a "predicted" level of income using the fitted values of a regression of income on age and its square, education, marital status, real GDP per capita, number of children and a dummy for London. The variable reflects well the idea that people of a certain education or age will compare themselves with other individuals of similar characteristics. The ratio of income to this variable will be called "income relative to predicted income" in what follows.

Table 2 presents the results of using equation (2) to test separately for adaptation and social comparison effects, while table 3 presents the corresponding results using equations (3) and (5).

In table 2 we find evidence favouring both adaptation and social comparison when each of them is tested separately. Column 1 tests for adaptation and finds a clearly significant effect of income relative to past income on happiness. In columns 2 and 3 we run similar tests using income relative to regional income (column 2) and income relative to predicted income (column 3). In both cases we obtain a positive effect that is statistically significant. The size of the coefficient is very similar for the two alternative definitions of comparison group that we use.

Table 3 presents a different picture. Once we control for absolute income using equation (3), we find that only the adaptation mechanism is supported by the data. In column 1 we see that the coefficient on income relative to past income is somewhat smaller than previously (0.027 instead of 0.035 in table 2) and statistically significant at the 10% level. The changes in the coefficients capturing social comparison effects are more radical. They are both very different from the values taken in table 2 and none of them is statistically significant.

The failure of social comparison effects to survive this test is somewhat surprising. Equation (3), or a very similar version of it, has been estimated using German data by Ferrer-i-Carbonel (2005) and using American data by Blanchflower and Oswald (2004). Ferrer-i-Carbonel (2005) finds that the effect of relative income remains positive and statistically significant whereas absolute income becomes statistically not significant and its coefficient falls by more than half. Blanchflower and Oswald (2004) find that both relative and absolute income have a positive and statistically significant effect when included simultaneously[9]. Our estimates imply that these earlier results cannot be confirmed for the United Kingdom.

It is also interesting to note that absolute income has a very small and not significant coefficient when included alongside income relative to past income, in the first column of table 3. As we discussed previously, this is precisely what would be expected given Easterlin's Paradox. This result strengthens the case in favour of adaptation effects in our data.

The last column of table 3 tests for adaptation effects once again by using equation (5). Once again the results are favorable to this hypothesis, since the dynamic pattern revealed shows a large positive effect of absolute income on impact followed by several years where the effects are negative. In other words, the initial increase in happiness "wears down" over time as we get used to our new income. Notice, however, that the sum of coefficients on

[9] We are referring to table 3 in Ferrer-i-Carbonel (2005) and table 8 in Blanchflower and Oswald (2004).

all income variables is still positive (although not statistically significant). A sum of coefficients of 0.021 suggest that adaptation is only partial, and that about half of the initial effect of 0.044 is lost after four years. We cannot, however, rule out the possibility of total adaptation on statistical grounds: an F-test for the sum of coefficients on current income and all its lags being equal to zero does not reject the null hypothesis. This, incidentally, is very similar to the findings of Di Tella et al. (2007) for Germany. These authors find that slightly more than two-thirds of the initial effect of income is lost after four years and that the possibility of total adaptation cannot be ruled out since the sum of coefficients is not statistically significant.

3.3 Adaptation and social comparison: joint tests

The final empirical exercises that we carry out are joint test for the adaptation and social comparison mechanisms. Let us note $\widetilde{y}_{i,t}^{A}$ the norm with respect to which incomes are compared under the adaptation hypothesis and $\widetilde{y}_{i,t}^{SC}$ the corresponding norm under social comparison. Then, the empirical specification that we will use for our joint tests is as follows:

$$h_{i,t} = \alpha + \mu_A \log(\frac{y_{i,t}}{\widetilde{y}_{i,t}^{A}}) + \mu_{SC} \log(\frac{y_{i,t}}{\widetilde{y}_{i,t}^{SC}}) + BX_{i,t} + \varepsilon_{i,t} \tag{6}$$

where all other variables have been previously defined.

We estimate equation (6) twice: with $\widetilde{y}_{i,t}^{SC}$ defined as income relative to regional income and with $\widetilde{y}_{i,t}^{SC}$ as income relative to predicted income. Results are reported in table 4. The two alternative definitions of $\widetilde{y}_{i,t}^{SC}$ give very similar results: in both cases we find that it is income relative to past income that exerts an effect on happiness, with income relative to regional income (column 1) or income relative to predicted income (column 2) having an effect close to zero and statistically not significant. The coefficient on income relative to past income is not only statistically significant but of similar size to the corresponding estimates from tables 2 and 3.

Overall, the results of these joint tests are consistent with those obtained

previously and clearly argue in favour of adaptation, and against social comparison, as the main mechanism explaining Easterlin's Paradox and relating income to happiness. Income relative to past income appears to be a robust predictor of happiness; its effects are clearly present when we control for the effects of absolute income and for income relative to a comparison group. This is not the case for income relative to regional income or income relative to predicted income, the two measures of social comparison we have used here, and the relevance of this latter mechanism is therefore in doubt, at least within our data.

4 Concluding Remarks

This paper adds the United Kingdom to the set of countries on which the effects of income on happiness have been studied in the search for adaptation and social comparison effects. It has the particularity that adaptation and social comparison are investigated with the same set of data and subjected to both separate and joint tests.

The paper offers the possibility of interesting comparisons with the rest of the literature. We find, for instance, a very similar pattern of adaptation effects as the one estimated by Di Tella et al. (2007) using a panel of German households. Like them, we find that the effect of income on happiness losses about two thirds of its initial effect after four years. While this indicates an adaptation effect that is still not complete, the null hypothesis of full adaptation cannot be rejected at conventional confidence levels.

A different outcome is obtained in the case of social comparison. Here our results differ from the literature since we find that income relative to a comparison group does not appear to have an effect on happiness once we control for absolute income or for adaptation effects. While this result does not overcome the comparatively larger evidence in favour of social comparison it does ask for further test; particularly tests which, as here, consider both mechanisms together.

A final note of caution is in order. We have wished to test and compare the two main mechanism explaining how income and happiness relate to each other: adaptation and social comparison. Social comparison, however, is a very flexible concept given the many possible definitions of the comparison group. The evidence in this paper favours adaptation over social comparison using two particular definitions of the comparison group, although it must be noted that these two definitions have been used repeatedly in the literature. It is still the case, however, that a different definition of the comparison group may give different results. Not only that, but social comparison and adaptation can be observationally equivalent if the comparison group is defined as "people with similar income as me". In this case, the income of the comparison group would grow as the individual's own income grows, just as in the case of adaptation. Moreover, such a comparison group may not be all too unlikely: it would be not very different from the income of our neighbours if people move to wealthier neighbourhoods as they become richer. It is apparent, then, that research in this area is far from being over.

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Table 1
Baseline results, determinants of happiness in Britain

	Dependent variable: Life Satisfaction *Specification: equation (1)*			
	Pooled OLS	*Fixed effects estimation*	*Ordered Probit*	*Ordered Logit*
Absolute income (in logs)	0.156**	0.056**	0.107**	0.201**
Male	-0.053**		-0.059**	-0.107**
Age	-0.037**	-0.013	-0.035**	-0.066**
Age^2	0.000**	-0.000*	0.000**	0.001**
Health: excellent	2.038**	0.978**	1.648**	3.035**
Health: good	1.693**	0.855**	1.304**	2.434**
Health: fair	1.198**	0.621**	0.881**	1.680**
Health: poor	0.620**	0.346**	0.441**	0.867**
Married	0.331**	0.061*	0.288**	0.516**
Living in couple	0.257**	0.124**	0.224**	0.399**
Widowed	0.025	-0.150*	0.009	0.015
Divorced	-0.169**	-0.100*	-0.130**	-0.237**
Separated	-0.393**	-0.324**	-0.307**	-0.554**
Educ.: postgrad	-0.226**	0.144	-0.257**	-0.429**
Educ.: university	-0.219**	0.109	-0.251**	-0.415**
Educ.: hnd, hnc	-0.154**	0.152	-0.192**	-0.329**
Educ.: A level	-0.138**	0.179*	-0.174**	-0.302**
Educ.: O level	-0.117**	0.144+	-0.147**	-0.261**
Educ.: CSE	-0.037+	0.148	-0.061**	-0.115**
Unemployed	-0.384**	-0.281**	-0.291**	-0.553**
Number of children	-0.074**	-0.017+	-0.067**	-0.113**
Religious: high	0.197**	0.100**	0.190**	0.320**
Religious: mid	0.057**	0.021	0.048**	0.078**
London	-0.096**	-0.044	-0.082**	-0.142**
Scotland	-0.001	0.064	0.012	0.01
Wales	0.033**	0.096	0.045**	0.080**
Northern Ireland	0.064**	-0.077	0.082**	0.152**
Observations	88928	88928	88928	88928
R^2	0.17	0.65		

Note: +,* and ** denote statistical significance at the 10%, 5% and 1% level using robust standard errors.

Table 2
Social Comparison and Adaptation: separate tests

	Dependent variable: Life Satisfaction *Specification: equation (2)*		
	Adaptation	*Social Comparison*	
Income relative to past income (in logs)	0.035** (3.69)		
Income relative to regional income (in logs)		0.025** (2.91)	
Income relative to predicted income (in logs)			0.022** (2.66)
Age	0.008	-0.013	-0.013
Age^2	-0.000**	-0.000*	-0.000*
Health: excellent	1.025**	0.978**	0.979**
Health: good	0.908**	0.855**	0.855**
Health: fair	0.681**	0.622**	0.621**
Health: poor	0.409**	0.346**	0.346**
Married	0.06	0.061*	0.066*
Living in couple	0.144**	0.124**	0.130**
Widowed	-0.083	-0.150*	-0.148*
Divorced	-0.099+	-0.100*	-0.101*
Separated	-0.329**	-0.324**	-0.329**
Educ.: postgrad	0.255+	0.144	0.164
Educ.: university	0.251*	0.109	0.126
Educ.: hnd, hnc	0.202	0.152	0.164+
Educ.: A level	0.321**	0.179*	0.188*
Educ.: O level	0.127	0.144+	0.151+
Educ.: CSE	0.114	0.148	0.151
Unemployed	-0.285**	-0.281**	-0.282**
Number of children	-0.020+	-0.017+	-0.019*
Religious: high	0.094*	0.100**	0.104**
Religious: mid	0.009	0.021	0.02
London	-0.092	-0.038	-0.038
Scotland	0.114	0.063	0.064
Wales	0.157	0.092	0.097
Northern Ireland		-0.08	-0.073
Observations	65747	88928	88838
R^2	0.66	0.65	0.65

Notes: All regressions include time dummies and person-specific fixed effects. T-statistics using robust standard errors are given in parenthesis for income variables. The signs +,** and *** denote statistical significance at the 10%, 5% and 1% levels.

Table 3
Social Comparison and Adaptation: separate tests, controlling for absolute income.

	Dependent variable: Life Satisfaction			
	Specification: equation (3)			*Specification: equation (4)*
	Adaptation	*Social Comparison*		*Adaptation*
Income relative to past income (in logs)	0.027+			
	(1.74)			
Income relative to regional income (in logs)		0.090		
		(0.54)		
Income relative to predicted income (in logs)			-0.088	
			(0.090)	
Absolute income (in logs)	0.011	-0.065	0.113+	
	(0.062)	(0.39)	(1.74)	
Absolute income (in logs) at time:				
t				0.044**
				(3.53)
t-1				-0.013
				(1.12)
t-2				-0.003
				(0.27)
t-3				-0.010
				(0.93)
t-4				0.003
				(0.32)
Sum of coefficients on absolute income (in logs)				0.021
				(0.30)[#]
Age	0.008	-0.014	-0.016	-0.002
Age^2	-0.000**	-0.000*	0	-0.000**
Health: excellent	1.025**	0.979**	0.979**	1.075**
Health: good	0.908**	0.855**	0.855**	0.959**
Health: fair	0.681**	0.622**	0.621**	0.727**
Health: poor	0.409**	0.346**	0.346**	0.442**
Married	0.058	0.061*	0.036	0.045
Living in couple	0.142**	0.124**	0.097**	0.148**
Widowed	-0.085	-0.150*	-0.171**	-0.112
Divorced	-0.099+	-0.100*	-0.095*	-0.110*
Separated	-0.330**	-0.324**	-0.322**	-0.376**
Educ.: postgraduate	0.252+	0.144	0.079	0.259
Educ.: university	0.249*	0.109	0.053	0.314*
Educ.: hnd, hnc	0.201	0.152	0.11	0.257+
Educ.: A level	0.321**	0.179*	0.147+	0.367**
Educ.: O level	0.127	0.144+	0.118	0.162
Educ.: CSE	0.112	0.147	0.132	0.139
Unemployed	-0.284**	-0.281**	-0.282**	-0.300**
Number of children	-0.019+	-0.017+	0.003	-0.018
Religious: high	0.095*	0.100**	0.104**	0.099*
Religious: mid	0.01	0.021	0.02	0.015
London	-0.093	-0.024	-0.059	-0.069
Scotland	0.115	0.059	0.064	0.167
Wales	0.158	0.081	0.096	0.18
Northern Ireland		-0.087	-0.077	--
Observations	65747	88928	88838	56595
R^2	0.66	0.65	0.65	0.65

Notes: All regressions include time dummies and person-specific fixed effects. Robust standard errors are given in parenthesis for income variables. The signs *,** and *** denote statistical significance at the 10%, 5% and 1% levels. #: p-value of an F-test on the sum of coefficients on current and lagged income being equal to 0.

Table 4
Social Comparison and Adaptation: joint tests

	Dependent variable: Life Satisfaction Specification: equation (6)	
Income relative to past income (in logs)	0.027+ (1.70)	0.035* (2.26)
Income relative to regional income (in logs)	0.012 (0.67)	
Income relative to predicted income (in logs)		0.0 (0.02)
Age	0.008	0.007
Age^2	-0.000**	-0.000**
Health: excellent	1.025**	1.026**
Health: good	0.908**	0.908**
Health: fair	0.681**	0.681**
Health: poor	0.409**	0.410**
Married	0.058	0.058
Living in couple	0.142**	0.143**
Widowed	-0.085	-0.087
Divorced	-0.099+	-0.097+
Separated	-0.330**	-0.333**
Educ.: postgraduate	0.252+	0.258+
Educ.: university	0.249*	0.253*
Educ.: hnd, hnc	0.201	0.203
Educ.: A level	0.321**	0.322**
Educ.: O level	0.127	0.128
Educ.: CSE	0.112	0.114
Unemployed	-0.284**	-0.286**
Number of children	-0.018+	-0.017
Religious: high	0.095*	0.101**
Religious: mid	0.01	0.01
London	-0.09	-0.09
Scotland	0.114	0.114
Wales	0.156	0.157
Northern Ireland		
Observations	65747	65685
R^2	0.66	0.66

Notes: All regressions include time dummies and person-specific fixed effects. Robust standard errors are given in parenthesis for income variables. The signs *,** and *** denote statistical significance at the 10%, 5% and 1% levels.