



Relative-income effects on subjective well-being in the cross-section

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Abstract

Recent work suggests that a person's subjective well-being (SWB) depends to a large degree on relative-income. Focusing on the underlying identification, this paper makes four contributions to this literature: it describes the aggregation problem with past studies, implements an estimation strategy to overcome this problem, finds micro-level evidence in support of the hypothesis that relative-income does matter in individual assessments of SWB, and uses cross-section estimates to replicate the aggregate time-series. The evidence further indicates that relative-income effects may be smaller at low income levels. The results are obtained from ordered probit techniques and the general social survey (GSS). © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

According to Abramovitz (1979, p. 5):

I think one can sense a mood of disappointment in the achievement and, indeed, of increasing opposition to rapid growth in the future Let me give just one rather revealing illustration. At Stanford University, we arrange a gathering each year for our graduates. They spend several days at the University listening to lectures and taking part in seminars. For some years now one of the most popular seminars has been entitled "the rat race". Here, in the company of psychologists, sociologists, psychiatrists, etc. the graduates, young and old, conduct an inquest into their lives, and, as the title of the seminar suggests, the central question is why they find existence so frustrating, why they feel themselves on a treadmill.

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Economic growth is the main goal of most modern states because of the belief that an increase in incomes leads to an increase in welfare. Economists generally assume that having more goods leads directly to greater overall welfare, but recent empirical work has raised doubts about this simple assumption. In particular, this recent work has suggested that a person's subjective well-being (SWB) depends to a large degree on relative and not absolute income. As Easterlin (1995) suggests, "raising the incomes of all, does not increase the happiness of all, because the positive effect of higher income on SWB is offset by the negative effect of higher living level norms brought about by the growth in incomes generally" (p. 36).

If true, this conclusion raises serious questions concerning the relative importance of many of today's current policies. If economic growth only has minor effects on well-being then should other social goals receive more attention? Should equality of incomes be a more prominent social goal? Would a reduction in inequality increase dynamic efficiency? What is the proper way to index poverty? These questions and others have been posed in the literature. The answers, however, depend on our understanding of the influence of relative-income on well-being, yet our understanding is limited since past studies have focused on aggregated time-series trends that cannot identify the underlying dynamics of the relative-income effects. The structure of these effects is thus left undetermined. This study seeks to fill this gap in our understanding of relative-income effects.

The structure of this paper is as follows. In Section 2 the key ideas about SWB are discussed and the past empirical work is reviewed. The purpose of this section is to illustrate the need for an individual-level approach to test for relative-income effects. Section 3 presents the relevant econometrics. The past studies focused on aggregate time-series, but cannot exactly identify the underlying relative-income effects. A dynamic econometric model is presented which can be used to overcome these problems and test for relative-income effects using an ideal set of data, which is described. Section 4 then discusses the actual (and less-than-ideal) cross-section data used and discusses how to adapt our methodology from Section 3 to the cross-section. Section 5 discusses the results of the application of our econometric model using the data. Section 6 replicates time-series from the cross-section estimates to illustrate the path of well-being by age cohort. Section 7 summarizes and discusses the results.

This paper does not attempt a comprehensive treatment of the determinants of happiness. Instead, the focus of this paper is on the identification of what is driving the seemingly contradictory time-series. In this respect, this paper makes four important contributions. First, it describes how the aggregated nature of the past work leaves open the true nature of the relative-income effects. Second, it describes a simple estimation strategy that overcomes these problems, while being based on established research from psychology and sociology. The key point is that in investigating the relative-income effects on SWB this study focuses on the individual level and uses relevant concepts from the literature within and outside of the field of economics. Third, this study uses this micro-based approach to find evidence in support of the hypothesis that relative-income does matter in individual assessments of SWB, although, there is indication that these effects may be smaller at low income levels. Fourth, this paper shows that the time series trends can be obtained from the underlying structure estimated on the cross-section. These contributions mark a step towards

understanding the nature of SWB and provide direction for future theoretical and empirical work on the role of relative-income effects.

2. Key ideas and past work

2.1. Subjective well-being

The basis of this investigation rests on the validity of the ‘SWB’ concept and measures. This concept, which is common in the sociology and psychology literature, refers to an individual’s personal assessment of his own well-being according to his own opinion and not some objective measure. Economists tend to ascribe well-being to objective measures like income and life-expectancy, but the SWB concept is notably different. First, SWB is subjective to the individual in question. Second, SWB is an assessment by the individual of all parts of his life. Diener (1984) surveys the work on SWB and writes, “notably absent from definitions of SWB are necessary objective conditions such as health, comfort, virtue, or wealth. Although, such conditions are seen as potential influences on SWB, they are not seen as an inherent and necessary part of it” (pp. 543–544). It is completely left up to the individual to explain his SWB or level of happiness.¹

To capture and measure SWB in their polls, researchers design special questions. In the data used in this paper, respondents were directly asked, “taken all together, how would you say things are these days? Would you say that you are very happy, pretty happy, or not too happy?” Sometimes this question followed a question that asked the person to define happiness in his own words. After making such a description, the person can then assess his own life in relation to his own subjective definition.

Economists shy away from using such data for various reasons. Are the responses more reflective of the frequent ups and downs of life than overall SWB? Do respondents give honest answers? Is the concept of SWB consistent across studies? Do the questions suffer from framing effects? The most fundamental question asks if SWB is even a meaningful concept. These questions are confronted in the literature, and we will not attempt to address them here. Instead, we refer the reader to Easterlin (1974) and Diener (1984) to find responses to many of the questions and references to other sources. The overall conclusions made in literature are that SWB is a meaningful concept and the SWB measures are meaningful measures of the concept. We take these conclusions for granted and base our work on the assumption that the SWB measure is meaningful.

2.2. The empirical work and the relative-income hypothesis

As a benchmark, consider the standard textbook theory that an increase in individual i ’s income leads to an outward shift in i ’s budget constraint. This increase in income allows i to increase his consumption which leads to an increase in i ’s utility. How would this look over the life-cycle? If i ’s utility was only a function of i ’s consumption then we might naively expect his utility to follow a time path similar to his income path. With this in mind, let us examine the results from examinations of the income–SWB relationship.

¹ The terms ‘SWB’ and ‘happiness’ will be used interchangeably in this paper.

The results can be divided into within-country relationships and inter-country relationships. Because of the complicated nature of international comparisons (cultural and political variations and influences), we will consider the within-country relationships. Consider the following two relationships.

Relation (1): “in a country at a given point in time”, those at higher income levels tended to report higher levels of happiness. This supports the standard textbook theory.

Relation (2): “in a given country over time”, the evidence indicates no clear trend in happiness. In the United States from 1972 to 1991, real GDP per capita more than doubled, yet levels of happiness remained constant. Japan’s case is even more striking. Japan’s real GDP per capita in 1987 is five times higher than in 1958, yet there was no increase in SWB.²

Clearly, there is a powerful influence that eliminates the effect that an increase in income should have on happiness. It is this effect that suggests the operation of what we will call “relative-income effects” on SWB. These relative-income effects have been postulated in the literature as what we will call the relative-income hypothesis (RIH). The RIH can be simply stated:

as a person’s income (consumption) increases relative to his income standard, so does his SWB. The higher the person’s income is relative to the standard (or norm), the greater his happiness. As the economy grows, so do income standards, and this rise in standards acts to deflate the effect of the increased income.

The basis of this conclusion is the combination of relations (1) and (2), which are depicted in Fig. 1. Notice the two aspects of this consumption standard: (1) there is a comparison made by an individual to his consumption norm and (2) there is a change in the consumption norm over time. Also notice that the standard intuition concerning an increase in income holds in the cross-section (i.e., those with higher incomes are happier), but breaks down in the dynamic case since it does not account for the change in the norm. Easterlin (1974) suggests a simple model, where the utility of individual i depends on i ’s consumption relative to a weighted average of other people’s consumption.

$$U_i = U_i \frac{C_i}{\sum_{j \in J} a_{ij} C_j} \quad (1)$$

where C_i is i ’s consumption, a_{ij} the weight given by i to j ’s consumption C_j , and J the set of individuals that i compares himself with. If i is American and weighs each and every individual American’s consumption equally, then i ’s utility depends on the ratio of his consumption to American consumption per capita. A similar model was used in a recent paper to examine the effects of this comparison utility on the dynamics of endogenous growth (Carroll et al., 1997).

This simple model provides an idea of how consumption (and/or income) norms can effect an individual’s utility. In this paper we will model SWB in a manner similar to the modeling of utility. This methodological issue deserves much greater attention than will be given here (see Section 7). We assert that SWB is the true measure of interest from a policy perspective, because we are interested in how changes will affect a person’s overall

² A third intranational relationship is that over the life-cycle by cohorts, happiness tends to remain stable even though incomes rise then fall over the life-cycle (Easterlin, 1999).

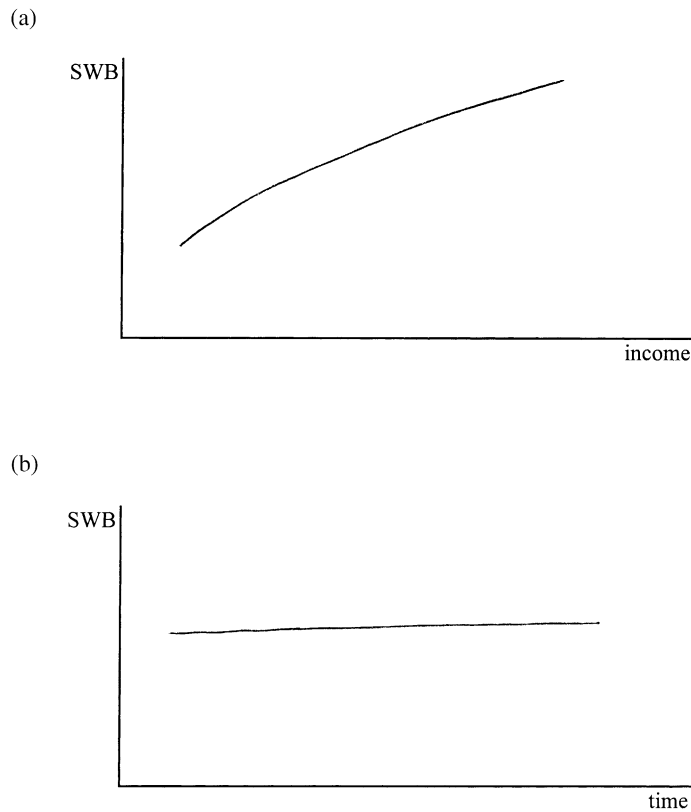


Fig. 1. SWB in cross-section and over time: (a) SWB as a function of income; (b) average SWB of population over time.

well-being. With this in mind, let us now look closer at the types of norms and their potential effects on SWB.

2.3. *Consumption/income norms*

Many factors have been found to affect SWB (see Diener, 1984). Demographic variables such as age, gender, race, employment status, religion, and marital status have all been found to affect happiness in certain degrees. Personality, behavior, and health also appear to influence happiness. On the surface it appears a mess, and below the surface it appears even less clear. However, survey responses overwhelmingly emphasize concerns such as “adequacy of income, family matters, or health, rather than broader national or social issues such as pollution, political power, or even threat of war. Furthermore, economic worries appear to be especially important among lower income persons” (Easterlin, 1974, pp. 113–114). And people of all income groups indicate their top three worries are economic, family, and health (Easterlin, 1974, p. 114).

Our focus is on the influence of income. Diener points out that it is not just the influence of income but that satisfaction with income is also important (p. 553). He further suggests that this satisfaction depends on comparison. We have identified two general types of comparison norms described in the literature. First, there is a direct social comparison as represented in Eq. (1). Individual i compares his income to those in his cohort. His cohort could include people of similar age, gender, race, region, etc. This comparison is sociological and outwardly oriented, since it depends on his comparison with other individuals in his reference group. We will call this the ‘external’ or ‘sociological’ norm. Second, there is an adaptive, psychological comparison. This comparison is made based on the individual’s personal consumption experience. For example, an individual who grows up in a wealthy household will likely have a higher consumption standard than an individual who grew up in poverty. We will call this the internal or psychological norm.³ Identification of these influences will be discussed below.

There is a large literature in sociology and psychology that acknowledges these factors. In sociology, there are the concepts of relative deprivation, relative status, and social frame of reference. What these concepts share is the notion that individuals operate within ‘reference groups’. In Eq. (1), the reference group is the set J . In psychology, there are concepts like habituation and aspirations, and there is also adaptation-level theory. Even within the field of economics, there has been recognition of these influences on theoretical levels even though general discussion of these influences has only increased recently.⁴

Whereas this paper uses SWB as a direct measure of well-being in looking at relative-income effects, there are indirect ways to examine relative-income effects. Such an indirect approach was used by van de Stadt et al. (1985), who suppose that an individual’s welfare depends on his ranking in a specially weighted income distribution. The income distribution is calculated using reference weights that attach the relative importance of others in the distribution. Under this assumption, they estimate equations based on moment conditions and obtain results indicating that relative-income effects are present. As stated above, the approach in this paper is different, because it directly estimates parameters instead of using moment conditions and an income-distribution based welfare function.

Please note that in this paper the term ‘relative-income’ is used to mean both income relative to a reference group (external) and income relative to past experience (internal). This usage is broader than in some past studies, where the term means only the income relative to a reference group. Also note that we use the term ‘norm’ to mean the standard of achievement or comparison. Norms may be more specifically thought of as the aspirations shaped by personal experience and social comparisons.

³ Carroll et al. (1997) use the ‘internal’ versus ‘external’ norm distinction, but their norms are slightly different than those described here. The reason for using the terms ‘psychological’ and ‘sociological’ is more for giving the reader intuition concerning the norms than presenting a sophisticated understanding of the two types of norms.

⁴ Adam Smith referred to the admiration of riches as deceiving mankind into continually propelling industry forward, and Veblen coined the term ‘conspicuous consumption’ (Clark (1991)). Duesenberry (1949) suggested that dissatisfaction with some goods occurs when superior goods are demonstrated. Scitovsky (1976) wrote a whole book on consumer dissatisfaction. A more recent example is the book of Frank (1985) on the choice of reference groups. Also see the recent symposia in the 1997 *Economic Journal* and the 1998 *Journal of Public Economics*.

3. Econometric issues

In this section, we first outline the theoretical difficulties in estimation of relative-income effects. Attention is given to the two immediate problems (Section 3.1): observational equivalence and lack of data on norms. Next, we link the theory to the empirics by describing the ‘ideal dataset’ and an econometric model that can be used to overcome the two problems (Section 3.2). Section 3 deals only with the ‘ideal’ and discussion of the cold realities of estimation will be postponed until the next section. This current discussion will provide a theoretical foundation to test for relative-income effects, and it will lay solid groundwork and justification for the estimation carried out in this study.

3.1. Estimation difficulties

The basic problem with the RIH is that many theoretical constructions can give rise to the relations shown in Fig. 1. Consider the following highly simplified (and non-exhaustive) cases. In each case assume that individuals have the same utility (or SWB) function, log-incomes are distributed normally in the cross-section, individual incomes follow a hump-shaped time path, aggregate average income rises over time, preferences are stable⁵ and derived from a utility function $f(\cdot)$ that is increasing in its argument, and births and deaths over time are offsetting.

Case 1. No relative-income effects

$$U_{it} = f(y_{it})$$

where y_i is the log of i 's income. With hump-shaped income paths, persons with higher incomes would report higher happiness. Relation (1) would result. Aggregate happiness would increase over time since per capita incomes are increasing over time. The plot of happiness over time would follow a similar time path as income over time. Fig. 2 illustrates the individual and aggregate SWB plots for case 1 and the other cases below. As illustrated in Fig. 2.1(b), case 1 violates relation (2) since the evidence shows no rise in aggregate SWB over time despite increases in per capita incomes over time.

Case 2. A fixed internal norm

$$U_{it} = f\left(\frac{y_{it}}{p_i}\right)$$

where p_i is the fixed internal (or psychological) norm that is formed in a manner consistent across agents. For example, a consumption norm for i that is fixed to the standard of living of his parents or a norm that is fixed to his first income such that $p_i = y_{i0}$. In this case, the cross-section would show that persons with higher incomes have higher SWB since the norm only makes an initial shift in happiness. Since p_i is fixed for i over time, i 's plot of SWB over time, as seen in Fig. 2.2(a) is just like in Fig. 2.1(a) except that p_i acts to shift the

⁵ We mean by stable preferences that utility functions do not change over time and other behavioral factors are held constant.

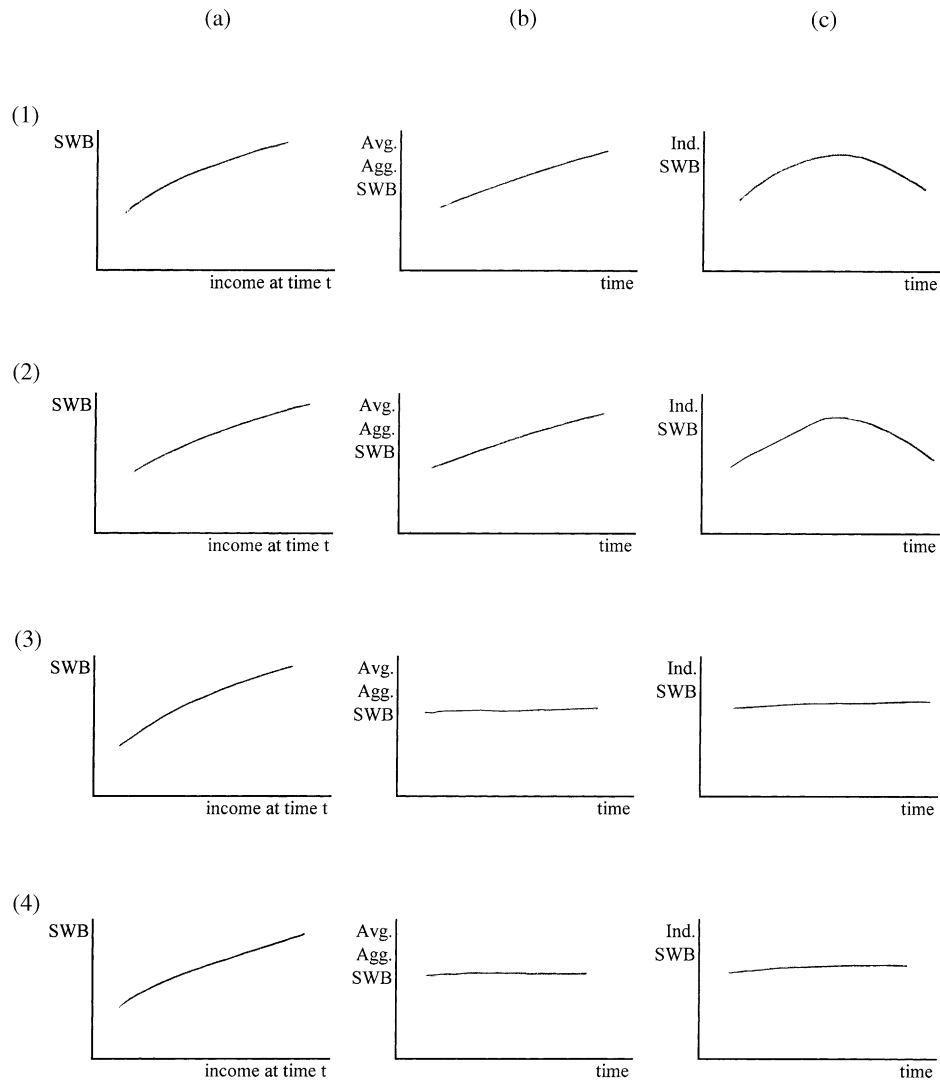


Fig. 2. Possible SWB–income relations: (a) SWB in cross-section; (b) average aggregate SWB over time; (c) individual SWB over time. (1) Case 1: no relative-income effects; (2) case 2: a fixed internal norm; (3) case 3: an external norm; (4) case 4: an internal and external norm.

SWB curve up or down. Aggregate SWB could remain constant over time if p_i increases over time for succeeding generations in a manner to offset the rising per capita incomes over time. This realization is shown in Fig. 2.2(b). Notice that restrictive requirements are placed on the formation of p_i in order to get this relationship. Since p_i acts to deflate SWB, the individuals path of SWB over time would be a vertical shift of the time path of income, as shown in Fig. 2.2(c).

Case 3. An external norm that is the average income of people with the same age as i

$$U_{it} = f\left(\frac{y_{it}}{k_{ijt}}\right)$$

where $k_{ijt} \equiv \text{avg}_{j \in C_i}(y_{jt})$ and C_i is the set of individuals with age equal to i 's age.⁶ Higher SWB would be associated with higher incomes holding the cohort average constant, but since younger generations have higher incomes, there will be some $U_{it} < U_{jt}$ with $y_{it} > y_{jt}$ when $j \notin C_i$. This means that there will be variation in a simple plot of SWB versus income. Our positive relation in the cross-section would still result, as shown in Fig. 2.3(a). Even though per capita incomes rise with each succeeding generation, the effect on utility is offset, because this per capita income is exactly the external norm. As shown in Fig. 2.3(b), a constant aggregate SWB path would result. We can also get a constant time-path of SWB as shown in Fig. 2.3(c).

Case 4. Both the internal norm from case 2 and the external norm from case 3

$$U_{it} = f\left(\frac{y_{it}}{g(p_i, k_{ijt})}\right)$$

where $g(\cdot)$ is some function that is increasing in both norms. SWB plots could be similar to those in case 3 (see Fig. 2(4)).

We reiterate that these examples are not exhaustive, and that different SWB plots could be obtained by alterations of the assumptions. However, these simple cases serve to illustrate the important point that different theories at the individual level can be used to explain the relations in Fig. 1. We can see that cases 3 and 4 can both produce the relations depicted in Fig. 1. This means that relations shown in Fig. 1 cannot completely tell us the underlying structure of relative-income effects and begs the question, “what is the right explanation?” The model in (1) is one of many possible explanations for seemingly contradictory results in Fig. 1. We need evidence at the individual level to identify the underlying structure and evolution of SWB and the correct role of relative-income effects.

3.1.1. Problem 1: observational equivalence

Estimation difficulties are immediately apparent from this discussion. If the econometrician focuses only the cross-section and aggregated average time-series from Fig. 1, then important information that separates one possible case from another will be missed. The intuition is that the econometrician is only observing columns (a) and (b) in Fig. 2. Assuming case 4 is the true case, the econometrician cannot separate case 3 from case 4 since they have the same cross-section and aggregate time-series plots. This makes cases 3 and 4 observationally equivalent to the econometrician.

This example illustrates what we call problem 1. In short, “the shortcoming of the past studies is that multiple causes can give rise to the constant aggregate SWB time path as seen in Fig. 1”. This is the standard econometric problem of ‘observational equivalence’, since different models of individual utility functions can give the same picture observed in

⁶ We are assuming here that i 's cohort group does not change over time.

the aggregate relation (2). This problem suggests that for stronger conclusions to be made concerning the role of relative-income effects there must a study at the individual level. This focus on the individual level is needed to see how relative-income effects at the ‘micro’ level can give rise to the aggregated results. The recognition of this problem is the main motivation for this study.

3.1.2. *Problem 2: lack of direct data on norms*

Observational equivalence is not the only problem. Consider the following. First, in cases 2 and 4, the econometrician does not have direct data on p_i nor the knowledge on how p_i is formed. Second, in cases 3 and 4, the econometrician does not have direct data on k_{ijt} . Because, we suspect the type of reference norm to be vital to the types of results obtained, we will pay special attention to the reference norm that we use in our econometric specification. We will draw on the empirical work mentioned above and the relevant concepts in sociology and psychology to model SWB. In Section 3.2, we present a model that can capture these relative-income effects and outline our estimation procedures.

3.2. *Overcoming the estimation difficulties*

3.2.1. *The ideal dataset*

The ideal dataset is certainly a mythical creature, but considering ideal data allows us to pinpoint what to look for in real (and imperfect) data. Our ideal dataset consists of variables that can be used to separately identify the underlying process that determines SWB.

The first variable of importance is a measure of SWB. Ideally, this measure would be continuous since that would allow a greater array of econometric techniques. Also, the SWB measure would contain the characteristics of the SWB measures mentioned earlier, that is, it would be subjective and would be based on the individual’s overall assessment of his life.

The next measures of importance are continuous measures of income and consumption. It is not clear if an individual compares his income with his cohort or compares his consumption with his cohort. The two are likely to be highly correlated, however. Arguments can be made for using either, so we would ideally have both to examine.

We also want the norm measures. There are different things to consider as internal norms. One particular variable would act as proxy for the individual’s assessment of how his standard of living compares with his parents’ standard of living. This would be a subjective measure. Another variable would be a consumption or income measure of his parents — an objective measure that is potentially equivalent to the subjective measure. Another variable would represent the individual’s standard of living in the previous time periods, which would be an objective measure. Having this measure suggests the importance of having panel data. We will come back to this point in a moment. Such a measure could capture the adaptive nature of consumption. An individual can get used to a particular standard of living and find it hard to settle for anything less. It would be ideal to have all of these variables so that we can examine more specifically what factors come into play when an individual makes an internal comparison. In particular, if the first internal (subjective) norm was found to be significant, we could examine different objective measures to find an objective norm that matched effect of the subjective norm.

The other norm is the external comparison norm. We want a variable that would act as proxy for the individual's assessment of his standing relative to those persons in his cohort. Again, this is a subjective measure. We also want an objective measure of the standard of living of the individual's cohort. This requires knowledge of the cohort. We suspect comparison cohorts to vary across individuals, but if we first identified the presence of the norm effect, we could then test for equivalence of the subjective and objective measures just like we mentioned for internal norm.

We should also consider roles for other individual characteristics like health, sex, race, and family status. We would want demographic characteristics in our ideal dataset, too. As mentioned above, we are concerned with the individual level and, more particularly, the time-path of SWB at the individual level. To estimate this, our ideal dataset would be longitudinal, which would have observations that followed specific individuals over their lifetimes.

3.2.2. The data generating process

The ideal econometric model is one that can separately identify one case from another. We can deduce such a model using a variant of the Cobb–Douglas utility function such that

$$h_{ict} = \log \left(A_{it} \frac{Y_{it}^{\beta_1}}{P_{it}^{\beta_2} K_{ict}^{\beta_3}} \right)$$

where h_{ict} is the happiness or SWB at time t of i who has cohort c , A_{it} is an individual specific effect that varies over time, Y_{it} is i 's income at time t , P_{it} is his internal norm, K_{ict} is his external cohort norm, with $\beta_1 > 0$ and $\beta_2, \beta_3 < 0$. This becomes

$$h_{ict} = \log A_{it} + \beta_1 y_{it} + \beta_2 p_{it} + \beta_3 k_{ict}$$

where lower case letters represent log values (i.e. $y_{it} \equiv \log Y_{it}$).

If we know β , i.e. $\beta \equiv (\beta_1, \beta_2, \beta_3)'$, then we can deduce i 's utility from his income, norms, and personal fixed effect. If $\beta_1 > 0$ and $\beta_2 = \beta_3 = 0$, then we have (loosely speaking) case 1 from Section 3.2. Case 2 would be represented by $\beta_1 > 0, \beta_2 < 0$ and $\beta_3 = 0$. Case 3 would be represented by $\beta_1 > 0, \beta_3 < 0$ and $\beta_2 = 0$. Case 4 would be represented by $\beta_1 > 0$ and $\beta_2, \beta_3 < 0$.

Of course, we would not have data on A_{it} , but we can use the existing literature on SWB to get clues concerning the non-income characteristics that affect happiness and approximate them using demographic variables. Assume $\log A_{it} = \alpha_{it} + \alpha_t + \varepsilon_{ict}$. We can then specify this model as having the data generating process

$$h_{ict} = \alpha_{it} + \alpha_t + \beta_1 y_{it} + \beta_2 p_{it} + \beta_3 k_{ict} + \varepsilon_{ict} \quad (2)$$

where α_{it} is his individual specific effect that can vary over time, α_t a fixed time effect, and ε_{ict} a random shock on i 's happiness that we assume to be i.i.d. Notice that p_{it} captures the habit formation or adaptive aspect and k_{ict} captures, the interdependent aspect described above. All variables are assumed to be continuous.

Estimation of the parameters would require panel data, but as we alluded to above even the best dataset will not have measures for α_{it} or α_t , so further assumptions are required.

Consider assuming a certain process for α_{it} . For example, we assume α_{it} has a linear specification such that

$$\alpha_{it} = a_i + \gamma' z_{it} + \xi_{it}$$

where $\xi_{it} \sim$ i.i.d. In this case, z_{it} is a vector of i 's attributes at t . Then, we can use standard panel data techniques to consistently estimate β by subtracting group means and time means from each side and adding overall means to each side. This procedure eliminates the α_i and α_t parameters. In this case, the group mean for income would be $\bar{y}_i \equiv (1/T) \sum_{t=1}^T y_{it}$, the time mean for income would be $\bar{y}_{\cdot t} \equiv (1/N) \sum_{i=1}^N y_{it}$, and the overall mean for income would be $\bar{y}_{\cdot\cdot} \equiv (1/NT) \sum_{i=1}^N \sum_{t=1}^T y_{it}$. Given our previous discussion, we would expect $\beta_1 > 0$ (straightforward), $\beta_2 < 0$ (i.e. if his past living standard increases relative to his current living standard, then his happiness decreases), and $\beta_3 < 0$ (i.e. if his cohort living standard increases relative to his living standard then his happiness decreases). One drawback of this procedure is that the subtraction of group means would eliminate the elements of γ corresponding to variables in z_{it} that do not change over time (i.e. sex or race).

4. Estimation with the general social survey

4.1. The GSS data

We use 1994 general social survey (GSS) data to test for the presence of relative-income effects. The GSS is an annual survey of US households conducted by the National Opinion Research Center. The survey is conducted by personal interview of the respondents. These data and information about the survey are publicly available from the GSS web-site on the Internet.⁷ The GSS survey was chosen because it is publicly available and has SWB and other measures we can use to test for relative-income effects.

We started with well over 2000 observations of the 1994 survey, but had to eliminate many observations that were unusable. We removed observations that met one or more of the following criteria: income over \$75,000, no education recorded, no health status recorded, no marital status recorded, no happiness measure recorded, and no response to the question about parents' standard of living. We also only used observations where the respondent was 25 years or older in age because our proxy for the external cohort norm begins at age 25 (see below). This clean-up procedure left us with 324 usable observations. The means and standard deviations of some of the variables are shown in Table 1.

For the measure of SWB, the respondent was asked to respond that he was 'very happy', 'pretty happy', or 'not too happy'. We have arranged these in order so that 'very happy' is recorded as a 2, 'pretty happy' is a 1, and 'not too happy' is a 0.⁸ Since this measure is discrete, we will use discrete dependent variable methods of estimation (see Section 4.2).

⁷ See the GSS web-site at www.icpsr.umich.edu/gss/.

⁸ The variables were originally ordered from 1 signifying 'pretty happy' to 3 signifying 'not too happy', but have been reordered so that a higher value corresponds to a higher reported level of happiness.

Table 1
Sample means and standard deviations of selected variables^a

	SWB = 0 mean (S.D.)	SWB = 1 mean (S.D.)	SWB = 2 mean (S.D.)	All observations mean (S.D.)
SWB	–	–	–	1.136 (0.639)
AGE	44.915 (15.497)	45.774 (15.380)	47.549 (15.166)	46.148 (15.318)
LOGINC	9.702 (1.057)	10.133 (0.839)	10.356 (0.754)	10.133 (0.873)
DPARSOL5	0.128 (0.337)	0.032 (0.177)	0.022 (0.147)	0.043 (0.204)
DPARSOL4	0.106 (0.312)	0.140 (0.348)	0.066 (0.250)	0.114 (0.319)
DPARSOL3	0.191 (0.398)	0.253 (0.436)	0.275 (0.449)	0.250 (0.434)
DPARSOL2	0.383 (0.491)	0.339 (0.475)	0.253 (0.437)	0.321 (0.468)
COHINC	10.253 (0.248)	10.241 (0.248)	10.215 (0.251)	10.236 (0.249)
Observations	47	186	91	324
Percent of total	15	57	28	100

^a The summary statistics of the dummies for marriage, gender, race, and health are not listed. All data except COHINC are from 1994 GSS, COHINC data are from 1994 CPS (see Section 4.1).

The income measure has problems. Respondents did not record exact income figures, but were asked to identify which income range they fell into, and respondents that made over \$75,000 in the survey year were all grouped together. We removed all data in this very high income group and consider only respondents who received \$75,000 or less. This may sound problematic at first, but we justify this move with two reasons. First, our intuition suggests that relative-income effects should be high at high income levels (well past subsistence levels), so if we find the presence of relative-income effects at lower income levels then that lends that much more power to the argument that relative-income matters. Second, since there is evidence that suggests the presence of relative-income effects even in developing countries with poverty-line income levels (Easterlin, 1974), we expect to find relative-income effects in the United States among lower income respondents. In order to obtain a log income measure for y_i we created a new income variable (LOGINC). We made i 's LOGINC equal to the natural log of the middle income of his income group. For example, if i is in income group 45,000–\$55,000, then i 's LOGINC is equal to the natural log of 50,000.

As a proxy for i 's internal consumption habituation norm, we use a subjective “parents’ standard of living” discrete measure. The question asked is, “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?” We coded four dummy variables DPARSOL2–DPARSOL5 to capture the responses from ‘somewhat better’ to ‘much worse’. For example, DPARSOL5 takes the value one when the respondent believes his standard of living is much worse than his parents’ standard of living when they were his age. We justify using this as an internal norm by assuming that this variable correlates closely with the standard of living the respondent had while growing up as a child. With this interpretation, the variable does in principle capture exactly what we want a measure of an internal norm to capture, namely, a subjective assessment of how his current standard of living compares to past standard of living.

Variables in z_i include dummies for sex, race, marriage, and health. The sex dummy takes on the value one if the respondent is female (DFEM). The race dummy variable takes on the

value one if black (DBLACK). The marriage dummy variable takes on the value one if the respondent is currently married (DMARRY). The health variable is a subjective response that takes on four values, ranging from poor to good health (DHEALTH1-3). The lowest health response is left out.

For i 's cohort norm, we need to know what makes up i 's reference group. Since there is no direct measure in the GSS data, we must make an assumption as to i 's reference group. We proceed by assuming that i compares his income with the average income of everyone from 5 years younger than him to 5 years older than him (COHINC). For example, if i is 35-year-old, his external norm is the natural log of the average income of all the people, who are 30–40-years-old. Mathematically,

$$\text{COHINC}_i = \log \left(\frac{1}{N_i} \sum_{j \in C_i} Y_j \right)$$

where $C_i \equiv \{n : \text{age}_n \in [\text{age}_i - 5, \text{age}_i + 5]\}$, N_i is the number of individuals in C_i , and age_i is i 's age in years. The idea is that i associates most with people of his own age and, as a result, compares his income to theirs. Because, the income measure in the GSS data is so poor, we use income measures from the 1994 current population survey.⁹ The first 20,000 observations of data from the year 1994 were used to calculate the natural log of the income averages for each 10-year-age group. Income measures in the GPS are also cut off at about \$75,000, but we justify using these as the income measure to find the log of average incomes, because incomes exhibit a log-normal distribution. Because of problems associated with averaging incomes at very low and high ages, we obtain the age cohort averages for ages 25–85. All those over 85 years of age were assigned the cohort average of an 85-year-old.

4.2. Estimation specifics

With only cross-section data, the estimation will necessarily be different from that described in Section 3.2. Since there is only one time period, we know that α_t is fixed. We can proceed by making an assumption similar to our assumption above, namely, assume $\alpha_{it} + \alpha_t = a_i + \gamma'z_i + \xi_i$ at time t . We do not know α_i , so we assume $\alpha_i = \alpha$ with all unobservable information captured in a random error term ξ . These assumptions claim that all individual specific attributes are captured in the z_i variables and error term. Now we can consistently estimate β and all elements of γ .

Under our new assumptions, our data generating process in a given time period is then

$$h_{ic} = \alpha + \gamma'z_i + \beta_1 y_i + \beta_2 p_i + \beta_3 k_{ic} + \epsilon_{ic} \quad (3)$$

where $\epsilon_{ic} = \xi_i + \varepsilon_{ic}$. Eq. (3) is the basic equation we will use to test for the presence of relative-income effects as suggested by the RIH. The basic idea is that if either $\beta_2 \neq 0$ or $\beta_3 \neq 0$ then we reject the null hypothesis of no relative-income effects.

We estimate Eq. (3) by maximum likelihood using the ordered probit procedure. This procedure is used for two reasons. First, SWB is measured discretely, and doing the probit

⁹ The data were downloaded from <http://ferret.bls.census.gov/>.

procedure does not assume that an increase in SWB from ‘not too happy’ to ‘pretty happy’ is the same as an increase from ‘pretty happy’ to ‘very happy’. Second, since the SWB measure has an inherent ordering that would not be accounted for using a standard multinomial probit procedure, we will use the ordered probit procedure that does account for such ordering.

We actually estimate two constants because our discrete dependent variable takes on three values. This follows from the latent variable formulation of the ordered probit model. The true value of happiness, h_{ic}^* , is not observed, but we do observe

$$\begin{aligned} h_{ic} &= 0 & \text{if } h_{ic}^* \leq c_1 \\ h_{ic} &= 1 & \text{if } c_1 < h_{ic}^* \leq c_2 \\ h_{ic} &= 2 & \text{if } c_2 < h_{ic}^* \end{aligned}$$

where c_1 and c_2 are the two cutoff values for the latent variable that are estimated.

We will break down our calculations into two areas: (1) examination of the marginal effects of income and relative-income and (2) specification tests of the ordered probit procedure.

4.2.1. Marginal effects

To ascertain the marginal effects of income and relative-income norms, we perform a number of regressions. Regression 1 is maximum likelihood estimation of the ordered probit of Eq. (3)

$$h_{ic} = B'X_{ic} + \epsilon_{ic}$$

where $B' \equiv (\gamma' \beta')$ is the vector of coefficients, X_{ic} comprises the independent variables, and ϵ_{ic} the i.i.d. error term that is distributed normally across the observations. Regression 2 is an ordered probit of Eq. (3) without the external norm ($\beta_3 = 0$). Regression 3 is an ordered probit of Eq. (3) without the internal norm ($\beta_2 = 0$). Regression 4 is an ordered probit of Eq. (3) with no relative-income norms ($\beta_2 = \beta_3 = 0$).

In this specification, the marginal effect of a change in a regressor is not simply the coefficient, so interpretation of the coefficients is not straightforward. In ordered probit model, the marginal effects for continuous independent variables are

$$\begin{aligned} \frac{\partial \Pr(h_{ic} = 0)}{\partial B} &= -\phi(B'X_i - c_1)B \\ \frac{\partial \Pr(h_{ic} = 1)}{\partial B} &= [\phi(B'X_i - c_1) - \phi(B'X_i - c_2)]B \\ \frac{\partial \Pr(h_{ic} = 2)}{\partial B} &= \phi(B'X_i - c_2)B \end{aligned}$$

where $\phi(\cdot)$ is the standard normal density. Notice that the coefficient has the opposite sign of $\partial \Pr(h_{ic} = 0)/\partial B$ and the same sign of $\partial \Pr(h_{ic} = 2)/\partial B$. However, the sign of $\partial \Pr(h_{ic} = 1)/\partial B$ may be either positive or negative. This makes interpretation of the coefficients complicated, and necessitates special calculations. We follow the technique described by

Greene (1997)¹⁰ in calculating $\partial \Pr(h_{ic} = j) / \partial B$ for $j = 0, 1, 2$ at the sample mean of X_i (see Greene, 1997, pp. 926–931). The probabilities should sum to 1, and the marginal effects should sum to 0.

For example, the marginal effect $\partial \Pr(h_{ic} = 0) / \partial y$, thus tells us the estimated change in the probability of a respondent reporting that he is ‘not too happy’ (SWB = 0) when his income increases one unit, which we expect to be negative. On the other hand, we expect $(\partial \Pr(h_{ic} = 2) / \partial y) > 0$, which would mean that the respondent is more likely to report he is ‘very happy’ (SWB = 2) with an increase in income. The sign of $\partial \Pr(h_{ic} = 1) / \partial y$ may be either positive or negative and depends on the relative shift in the densities.

For dummy variables, the calculation is even more complicated since the variable is not continuous. In this case, we do not look at the marginal effect directly. Instead, we must look at the predicted probabilities (again using \bar{X} at the sample means) for each realization of the dummy variable.

4.2.2. Specification tests

We perform two specification tests to test two of the assumptions of our model. These two assumptions are the ordering of the SWB measure and the stability of the parameters at different income levels.

Even though the ordered nature of the SWB is not in question, we test the ordered nature of the discrete SWB measure. We perform two Hausman tests using the parameter and covariance estimates from two binary probit regressions. In the first of these, we do a binary probit with

$$\begin{aligned} h_{ic} &= 1 & \text{if} & \text{ SWB} = 2 \\ h_{ic} &= 0 & \text{if} & \text{ SWB} = 0 \text{ or } 1 \end{aligned}$$

and recover the binary probit estimates of the coefficients and the variance–covariance matrix, B^P and V^P . Under the null hypothesis that the ordering is true, the estimated coefficients and variance–covariance matrix of the ordered probit (regression 1), B^O and V^O , are both consistent and efficient, while the binary estimates are consistent but inefficient. Under this hypothesis, we can then form the Hausman test statistic

$$H = (B^O - B^P)'(V^P - V^O)^{-1}(B^O - B^P)$$

This test statistic is distributed with a Chi-squared distribution with degrees of freedom equal to the number of regressors. We reject the null hypothesis of the ordering at high values of the test statistic. In doing this procedure, we omit the cutoffs, since it is the estimates on the non-constant terms that are in question. The second probit is similar to the first except the dependent variable has

$$\begin{aligned} h_{ic} &= 1 & \text{if} & \text{ SWB} = 1 \text{ or } 2 \\ h_{ic} &= 0 & \text{if} & \text{ SWB} = 0 \end{aligned}$$

A similar Hausman test statistic is formed. The second specification test concerns the structural stability of the parameters. In doing our regressions we assume that the parameters

¹⁰ For derivation and detailed discussion of these marginal effects, see pp. 926–931 in Greene (1997).

remain stable for all values of the independent variables. In particular, we assume that relative-income effects are just as strong (or weak) at low income levels as they are at high income levels. There has been debate on this point,¹¹ so it is important to pay some attention to this issue. To perform this test we perform two additional ordered probit regressions. The data were divided into low and high income groups. One regression uses the low income group and the other uses the high income group. We recover the estimated coefficients and variance–covariance matrixes, $(B^L V^L)$ and $(B^H V^H)$, respectively. Under the null hypothesis that the two regressions have the same coefficients, $B^H - B^L$ has mean 0 and variance $V^H + V^L$. We can then form a Wald statistic

$$W = (B^H - B^L)'(V^H + V^L)^{-1}(B^H - B^L)$$

which has a Chi-squared distribution with degrees of freedom equal to the number of regressors. We reject the null hypothesis of no structural change at high values of the test statistic.

5. Results

A cursory glance at Table 1 suggests that relative-income effects are important. The average (natural log) income of respondents that reported being very happy ($SWB = 2$) is 10.356 and decreases as respondents report lower levels of happiness. This corresponds with the graph in column (a) of Fig. 2. Respondents whose parents' standard of living was much higher than their own report lower SWB. This is seen because $DPARSOL5$ has mean 0.128 when $SWB = 0$ and has mean 0.022 when $SWB = 2$. As the respondents' standards of living increase relative to their parents', the proportion reporting $SWB = 2$ relative to reporting $SWB = 1$ increases. $DPARSOL5$ means that the respondent's standard of living was much lower than his parents' standard of living. Respondents with $SWB = 2$ also have lower cohort norms. $COHINC$ is lower for $SWB = 2$ than for 1 and 0.

The estimated coefficients from regressions 1–4 are listed in Table 2. It is immediately seen that the signs on $LOGINC$ and $COHINC$ are positive and negative, respectively. These signs are expected. In each case, we perform a likelihood ratio test of the joint significance of the coefficients, and in each case we reject the null hypothesis that the coefficients are jointly insignificant. The likelihood ratios range from 78 in regression 4 to 91 in regression 1, as indicated in Table 2. The percent correctly predicted is about 60 percent in each regression. Table 3 shows that more predictions tend to be incorrectly predicted as $SWB = 1$ than any other incorrect prediction in each case. This point is likely related to the fact that 57 percent of the observations do have $SWB = 1$. Our model only predicts about 3 percent more observations correctly than does the simple model that predicts $SWB = 1$ for each observation, but our likelihood ratio tests indicate that our model does have explanatory power. Since we cannot interpret the coefficients directly as the marginal effects, we must look at the calculated marginal effects. These calculations for $LOGINC$ and $COHINC$ are shown with the dummy specific probabilities for $DPARSOL2$ – $DPARSOL5$ in Table 4.

¹¹ For example, Easterlin's (1974) analysis implies that relative-income effects are present at all income levels, but Veenhoven (1991) disagrees vehemently.

Table 2
Ordered probit regression estimates with SWB as dependent variable^a

	Regression 1	Regression 2	Regression 3	Regression 4
LOGINC	0.085 (0.101)	0.059 (0.098)	0.128 (0.086)	0.096 (0.085)
DPARSOL5	-0.801 (0.316)	-0.896 (0.303)	-	-
DPARSOL4	-0.258 (0.269)	-0.343 (0.261)	-	-
DPARSOL3	-0.102 (0.194)	-0.160 (0.191)	-	-
DPARSOL2	-0.388 (0.186)	-0.436 (0.175)	-	-
COHINC	-0.448 (0.323)	-	-0.589 (0.299)	-
DMARRY	0.696 (0.161)	0.691 (0.161)	0.682 (0.155)	0.681 (0.154)
DFEM	-0.011 (0.139)	-0.003 (0.138)	-0.028 (0.136)	-0.025 (0.135)
DBLACK	-0.408 (0.177)	-0.431 (0.177)	-0.447 (0.176)	-0.477 (0.179)
DHEALTM3	0.878 (0.457)	0.758 (0.442)	0.873 (0.438)	0.711 (0.438)
DHEALTII2	0.348 (0.440)	0.241 (0.425)	0.316 (0.423)	0.167 (0.422)
DHEALTH1	-0.352 (0.450)	-0.439 (0.442)	-0.339 (0.430)	-0.454 (0.435)
Constant 1	-4.589 (3.109)	-0.412 (1.059)	-5.393 (3.006)	0.176 (0.920)
Constant 2	-2.604 (3.110)	1.565 (1.061)	-3.442 (3.001)	2.111 (0.931)
Percent correctly predicted	60.5	61.1	59.9	59.6
Likelihood of $(-2) \times \log$	527.803	530.229	536.421	540.981
Likelihood ratio of joint significance	91.251	88.825	82.633	78.073

^a Standard errors are in parentheses. Likelihood ratios have Chi-squared distributions with degrees of freedom equal to the number of coefficients (not counting the two constants). The null hypothesis that the coefficients are jointly insignificant is always rejected with $(-2) \times \log$ likelihood for the restricted model equal to 619.054. All data except COHINC are from 1994 OSS, COHINC data are from 1994 CPS (see Section 4.1).

There are variations in the marginal changes in SWB across regressions, but an increase in LOGINC increases the probability of reporting high SWB in each case. This suggests that income does have a positive effect on happiness as our common notion of utility suggests, although the effect appears to be small. This result is not surprising since this model does not account for the labor supply decision that the respondent makes. For example, an increase in income has two effects: a positive direct effect due to increased consumption and a negative indirect effect due to an increase in undesirable labor supply that must occur for income to increase. More will be said on this in Section 7. Changes in LOGINC have the smallest impact in regression 2 and the biggest impact in regression 3. Positive marginal changes in the probability the respondent is very happy (SWB = 2) range from 0.018 to 0.040, with the marginal change equal to 0.027 in regression 1.

The predicted probabilities under different realizations of the DPARSOLs do not change much from regression 1 to regression 2. In both cases as respondents go from reporting DPARSOL = 2 to DPARSOL5, we see that the probabilities for reporting SWB = 1 do not change much, but the probabilities for SWB = 0 and 2 do change as would be expected given this relative-income effect. The probabilities go from about 0.14 to about 0.25 for SWB = 0, and they go from about 0.19 to 0.10 for SWB = 2. The interpretation is that as the respondent goes from DPARSOL2 to DPARSOL5, his current standard of living becomes worse relative to that standard of living of his parents, and this change has a negative effect on his SWB. In other words, the respondent's SWB depends on how his current standard of living compares with his past standard of living.

Table 3
 Predicted probabilities for ordered probit regressions^a

Observed	Predicted			Total
	SWB = 0	SWB = 1	SWB = 2	
Regression 1				
SWB = 0	6	41	0	47
SWB = 1	5	159	22	186
SWB = 2	1	59	31	91
Total	12	259	53	324
Regression 2				
SWB = 0	5	42	0	47
SWB = 1	5	159	22	186
SWB = 2	1	56	34	91
Total	11	257	56	324
Regression 3				
SWB = 0	5	42	0	47
SWB = 1	6	161	19	186
SWB = 2	0	63	28	91
Total	11	266	47	324
Regression 4				
SWB = 0	5	42	0	47
SWB = 1	5	163	18	186
SWB = 2	0	66	25	91
Total	10	271	43	324

^a All data except COHINC are from 1994 OSS, COHINC data are from 1994 CPS (see Section 4.1).

An increase in the respondent's cohort norm COHINC has a negative effect on SWB. In both regressions 1 and 3, the increase in COHINC leads to a greater probability of the respondent being 'not very happy' and a lower probability of being 'very happy'. The probability of reporting SWB = 2 decreases by 0.140 in regression 1 and decreases by 0.185 in regression 3. Conversely, the probabilities of reporting SWB = 0 or 1 increase in regressions 1 and 2. If the respondent already reports SWB = 1 and suffers an increase in his COHINC, we cannot say what the respondent's survey response will be concerning his SWB, but the probability of it decreasing has gone up. The interpretation is that as the income of the respondent's comparison cohort increases while holding the respondent's income constant, the respondent's SWB decreases. In other words, the respondent's SWB depends on how his income compares with the income of persons near his own age.

In testing the ordering of the SWB measure, we do not reject the null hypothesis that the ordering is correct. The Hausman Chi-squared statistics for the first and second of these (as they are described in Section 4.2.2) are 5.419 and 7.813, respectively (these are not shown in the tables). Although these statistics are very small, this result is not surprising since the question posed to the respondent has an implicit order. Respondents are supposed to recognize the ordering, and they are also to give answers that reflect the ordering.

The marginal effects and Wald Chi-squared statistic for testing the structural stability of the parameters at high and low income groups are shown in Table 5 (regression

Table 4
Ordered probit marginal effects of change in independent variable on SWB^a

	Pr (SWB = 0)	Pr (SWB = 1)	Pr (SWB = 2)
Regression 1			
LOGINC ^b	-0.015	-0.012	0.027
DPARSOL			
DPARSOL2	0.135	0.676	0.190
DPARSOL3	0.082	0.641	0.277
DPARSOL4	0.108	0.665	0.227
DPARSOL5	0.245	0.657	0.098
COHINC ^b	0.079	0.061	-0.140
Regression 2			
LOGINC ^b	-0.010	-0.008	0.018
DPARSOL			
DPARSOL2	0.136	0.674	0.189
DPARSOL3	0.085	0.642	0.272
DPARSOL4	0.117	0.667	0.215
DPARSOL5	0.262	0.648	0.090
Regression 3			
LOGINC ^b	-0.023	-0.017	0.040
COHINC ^b	0.106	0.078	-0.185
Regression 4			
LOGINC ^b	-0.018	-0.013	0.030

^a See Section 5 for a derivation of the marginal change. Rounding error causes the marginal changes for some variables to not sum to 0. All data except COHINC are from 1994 GSS, COHINC data are from 1994 CPS (see Section 4.1).

^b Marginal change.

coefficients not shown). Consider the regression using the high income group. The coefficient of LOGINC is not only smaller than that of the full sample, but it even takes on a negative value. We can see this, because the marginal effects indicate that an increase in income will decrease the probability that the respondent answers SWB = 2. This goes against the intuition of a standard income effect, but is probably due to a negative indirect effect stronger than the positive direct effect. The changes in predicted SWB change in the expected manner with changes in DPARSOL. At high incomes, the COHINC marginal effects are much larger than with the full sample. Now consider the regression using the low income group. The marginal changes from an increase in LOGINC are about the same as that of the full sample. The changes in predicted SWB change much less due to changes in DPARSOL in the low income sample than in the full sample. The marginal effect of a change in COHINC is much smaller and even takes on a positive value. The Wald Chi-squared statistic under the null hypothesis that the coefficients are the same across both income samples is 18.151. This is very close to 18.55, which is the 90 percent Chi-squared critical value with 12 d.f.

These results in Tables 2–5 do represent evidence of the presence of relative-income effects on SWB, but we should not interpret these results as being conclusive. There are

Table 5
Results from test of structural stability^a

	Pr (SWB = 0)	Pr (SWB = 1)	Pr (SWB = 2)
(a) Ordered probit marginal effects on SWB using high and low income groups			
Using high incomes (228 observations)			
LOGINC ^b	0.023	0.033	−0.055
DPARSOL			
DPARSOL2	0.103	0.702	0.195
DPARSOL3	0.048	0.629	0.324
DPARSOL4	0.049	0.293	0.004
DPARSOL5	0.703	0.293	0.004
COHINC ^b	0.134	0.196	−0.330
Using low incomes (96 observations)			
LOGINC ^b	−0.017	−0.012	0.030
DPARSOL			
DPARSOL2	0.091	0.651	0.258
DPARSOL3	0.098	0.656	0.246
DPARSOL4	0.180	0.677	0.143
DPARSOL5	0.129	0.673	0.198
COCHINC ^b	−0.003	−0.002	0.005
(b) Wald test statistic under null hypothesis that the parameters are the same for both income groups			
Chi-squared (12) under null hypothesis			18.151

^a High (low) income group composed of all observations with incomes greater (less than or equal) than \$20,000. Chi-squared (12) critical value at 90 percent level is 18.55. All data except COHINC are from 1994 GSS, COHINC data are from 1994 CPS (see Section 4.1).

^b Marginal change.

various reasons for being cautious. First, the standard errors of the income coefficients (β) tend to be high relative to the coefficients (Table 2). Second, there is indication that relative-income effects might change as incomes rise (Table 5). An increase in income appears to have a larger effect on SWB for those in lower income groups as might be expected, and the relative-income variables appear to have less effect. Conversely, the effects of increases in the internal and external norms are much greater in the high income sample, while the effect of an increase in income is much smaller. Third, the non-rejection of the null hypothesis of no structural change (Table 5(b)) is possibly do to the explanatory power of the DMARRY, DBLACK, and DHEALTH variables and not the income related variables. This point supports the notion of structural change in the parameters across income groups.

6. Back to the time series

Let us put the paper up to this point in perspective. First, looking at aggregate time-series does not tell us the underlying structure of the dynamics of happiness, so we must look at the individual level. Second, using the GSS cross-section data, we find support in favor

of both internal and external influences on SWB. But now, let us bring the paper back to square one by replicating the time-series trend (of virtually constant average happiness) using the parameters identified off the cross-section. Tables 6 and 7 show such replication. These tables use individual level GSS data between 1972, 1977, 1982, 1986, 1992, and 1996.¹²

Table 6(a) is constructed in the following manner. Individuals were assigned into seven cohorts by their ages in 1972. The first cohort comprises those aged 56–65 in 1972. Successive cohorts go down to the cohort aged –4 to 5 in 1972. These cohorts are fixed throughout all tables. An advantage of using GSS data is that the survey questions on the variables remain the same for most variables. We construct the income, marriage, sex, race, and health variables as before.¹³ The average income of the cohort is calculated by taking the average income over all individuals in the cohort. We use real income at 1984 prices.

Complications arose in calculating the DPARSOL variables. We do not have these variables in these GSS data for these years, so we had to construct this variable. In Table 6(a), we assume that the individual compares his current income with the median family income of 25 years before the survey date. We set $DPARSOL5 = 1$, if the respondent's income is 50 percent less than the median income 25 years before, $DPARSOL4 = 1$, if it was between 50 and 82.5 percent, $DPARSOL3 = 1$, if between 82.5 and 117.5 percent, and $DPARSOL2 = 1$, if between 117.5 and 150 percent. Table 6(b) is the same as Table 6(a) except $DPARSOL2 = 1$ for all variables.

Table 6(c) treats each cohort as if it was a single individual. We proxy for income using the average income over all observations at that time period. We proxy for cohort income using the same cohort average used in Table 6(a) and (b). The dummy for parents' standard of living is created like in Table 6(a) except for using the average income of the sample as the income. The individual characteristics are held constant: $DMARRY = 0.6$, $DFEM = 0.5$, $DBLACK = 0.25$, and $DHEALTH2 = 1$. Table 6(d) is the same as Table 6(c) except $DPARSOL2 = 1$ for all cohorts.

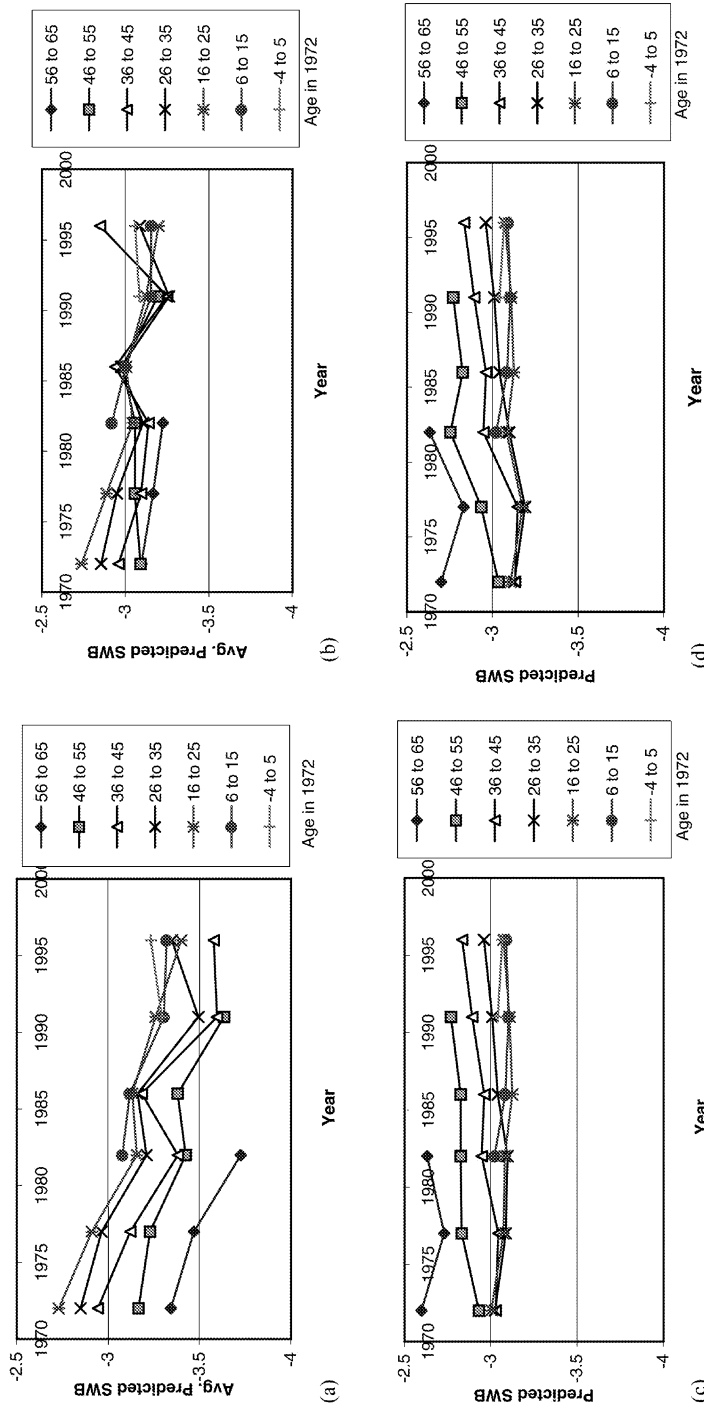
Table 7 puts the population averages from Table 6(a)–(d) on the same graph. In the lines graphing the population averages from Table 6(a) and (b) to 7(a), a single point signifies the average SWB for the whole sample at that year. In plotting the population averages from Table 6(c) and (d), each point is weighted according to the size of the cohort. Table 7(b) is the same as Table 7(a) except each cohort is given equal weight in plotting the population averages from Table 6(c) and (d).

Easterlin (1999) shows evidence indicating that the average happiness for a cohort is constant over time using GSS data. Table 6(b)–(d) in this paper lend support to that conclusion. However, Table 6(a) deserves closer attention, since it does not match well with the constant cohort happiness graphs. Table 6(a) suggests that cohort happiness was decreasing during the last two decades. This result might be due to the data used. The GSS data used have the individual's income, whereas we use median family income in creating the DPARSOL variable. Using family income instead of individual income or normalizing the family income by the number of family members who earned income could yield different results. Also, the constant graph in Easterlin (1999) assumes a linear relationship between

¹² These data were obtained from the SDA archives at <http://csa.berkeley.edu:7502/>.

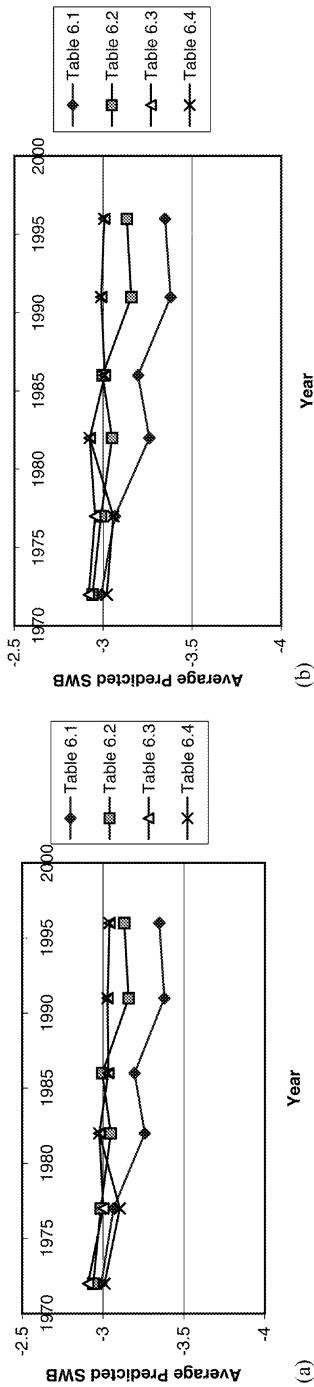
¹³ The health variables were missing for the 1986 data, so $DHEALTH2 = 1$ for all 1986 observations.

Table 6
Predicted SWB by cohort^a



^a (a) Average predicted SWB by cohort (1972–1996): uses predicted SWB at individual level and aggregates to cohort. (b) Average predicted SWB by cohort (1972–1996): uses predicted SWB at individual level and aggregates to cohort, holding DPARSOL3 = 1 for all observations. (c) Predicted SWB by aggregated cohorts (1972–1996): uses average income of all individuals as proxy for income, DPARSOL3 = 1 for all observations. (d) Predicted SWB based on median family income 26–35 of previous, and holds marriage, sex, race, and health constant across all cohorts. (e) Predicted SWB by aggregated cohorts (1972–1996): uses average income is the same as (c) except DPARSOL3 = 1 for all cohorts. Further note that for all 1986 observations in (a), DPARSOL3 = 1 since that question was not available in the GSS that year. Parameter estimates are from Table 2. Data for Table 6 are obtained from 1972, 1977, 1982, 1986, 1991, 1996 GSS (see Section 6).

Table 7
 Predicted SWB for population^a



^a (a) Average SWB of population for Tables 6.1–6.4; uses population averages from calculation used in Table 6 and each cohort is weighted by cohort sample size. (b) Average SWB of population from Tables 6.1–6.4; is the same as (a) except each cohort is weighted equally. Data are from Table 6 (see Section 6).

‘not too happy’, ‘pretty happy’ and ‘very happy’, and graphs the simple average of the discrete responses. Because that happiness measure is discrete, some information (i.e. variation within the discrete answers), can be lost. Using the continuous predicted value, we can show greater variation within the responses that might not get picked up in the discrete responses.

Another factor could be that the coefficient on DPARSOL2 is more negative than the coefficient on DPARSOL3, whereas we expect the opposite to be true. We expect the opposite since DPARSOL2 is when the person has a standard of living better than his parents’ while DPARSOL3 is when they are the same. The effect this has on the tables is such that when the dummy variable goes from DPAROSL3 to DPARSOL2, the predicted SWB actually decreases while we expect it to increase.

Normalizing the family income by number of workers would only affect the later years since the rise of women in the workforce occurred largely during and after the 1960s. Making this adjustment for the 1992 and 1996 data points would shift up average cohort well-being in those periods and stop the downward trend in Table 6(a). This marks an interesting connection between this graph and Easterlin’s (1980) hypothesis that more women will enter the workforce when they perceive their future incomes to be smaller relative to past experience due to increased birth cohort sizes of the baby boom. If the downward trend in SWB was recognized then, according to Easterlin’s theory, more women would look for work in order to increase their standards of living.

Nonetheless, these tables bring us back to the initial purpose of this paper. These tables replicate the time series using parameters identified off the cross-section at the individual level. These tables show that there is micro-level support to the hypothesis that relative-income comparisons do matter in individual’s assessments of SWB. The parameters identified off the cross-section can be used to replicate the time-series trends while still providing the underlying structure required for a more complete theory of SWB.

In terms of our ideal panel data approach, these tables suggest that the coefficients might be stable over time. Panel data would of course give us the advantage of testing this hypothesis directly by comparing a pooled regression with a standard unpooled panel regression. If our guess is correct, we should find the parameters to be stable across time, so that the pooled and unpooled regression should yield similar estimates. This result concretely obtained would lend added justification to the cross-section approach used here out of necessity in addition to providing an interesting insight into the determination of SWB.

7. Summary and discussion

Recent literature has addressed the role that relative-income plays in individual assessments of subjective-well being. Focusing on the underlying identification, this study makes four important contributions to that literature. First, we illustrate the problem of aggregation with the past studies. This problem is characterized by observational equivalence, which makes it impossible to identify the underlying data generating process. Second, we describe and implement a simple estimation strategy designed to overcome the problem of observational equivalence. This implementation is done using concepts from

psychology and sociology as relative-income norms. Third, we obtain results that indicate that relative-income does affect a person's SWB. Fourth, we replicate the time-series using parameters estimated off the cross-section data.

We proxy for relative-income norms using subjective responses about the respondent's parents' standard of living and a calculated average of incomes for persons near the respondent in age. Using these proxies, we find that increases in income affect SWB positively, while increases in the relative-income norms affect SWB negatively. These results are in line with the hypothesis that has been suggested to explain time-series trends. The strength of these effects may change as the respondent's income increases, so that relative-income effects are much stronger at higher income levels. At low income levels, the relative-income effects appear to be smaller and income becomes more important. Even though we do find evidence of relative-income effects, these results should not be considered conclusive as to the specific nature of these relative-income effects. Our caution stems from the large standard errors relative to the coefficients and possible structural change.

There are many directions that future work can take. The results in Table 5 may be driven by the log specification. This suggests the importance of considering other econometric specifications. An especially important extension of this paper would be the incorporation of a labor supply decision. Such an extension would make it possible to separately identify the direct and indirect effects of an increase in income.

Theoretical work is needed that examines dynamic optimization by agents that have utility functions with relative-income arguments. These models might try to incorporate aspirations which can provide a more primitive justification for relative-income effects. Such theoretical work should give many new insights into better ways of understanding relative-income effects. An interesting question concerns the connection between the permanent-income hypothesis and the hypothesis that SWB depends on relative-income. Theoretical models can lend insights and testable restrictions to see which hypothesis receives greater empirical verification.

Further research into the relationship between age and cohorts is important. Does an individual's reference cohort change over time? For example, do people make different comparisons as their incomes change? As an aside, we mention that we ran the regressions using age as an independent variable and left out COHINC. The estimated coefficient on age was positive and had a small standard deviation, but this effect is exactly what we want to understand. Our guess was that COHINC could account for this age effect, and when we then included both age and COHINC, the coefficient on age was close to zero as expected while the coefficient on COHINC was negative as expected. This insight raises the question as to the connection between an individual's age and his reference group. Future work can focus on this question.

Perhaps the most important work to be done would be to gather an 'almost-ideal' dataset. Having a good income or consumption measure is vital, and the income measure that we used was truncated. We also want to have many different possible proxies for relative-income. Subjective responses as to standard of living comparisons would be nice. We would also like objective measures concerning the parents' incomes when the respondents were children. Another good variable would be last year's income, which would capture another adaptive aspect of relative-income. We would prefer all this data to be longitudinal, too. And even

before such data gathering takes place, a careful search through the relevant psychology and sociology literature would provide good insights into collecting such data. The questioner needs to know what questions should be asked and how the questions should be asked to avoid framing effects. It must be remembered that longitudinal data does suffer from the problem of attrition, and this problem might limit the use of panel data techniques. ‘Pseudo-panel data’ techniques using synthetic cohorts might then be used and compared with the approach used in this paper.

Getting a more ‘ideal’ dataset can help greatly in making more conclusive statements about the exact role of relative-income on SWB. Nevertheless, this study using a very limited set of data does provide individual level support for the hypothesis that relative-income does matter in individual assessments of SWB. Future work that ascertains a more exact understanding of relative-income effects will provide the foundation for those questions we mentioned at the start of this study. What is the correct way to index poverty? Should equity issues be more prominent in current policy debate? And, perhaps most importantly, how important is economic growth as a social objective? If gaining a better understanding of relative-income effects is important to answering these questions, then further work can be done for reasons much grander than intellectual interest. Such work can provide insights into the nature of our lives and perhaps help us get off of what has been called the ‘hedonic treadmill’ (Brickman and Campbell, 1971). Or maybe after all has been said and done we will conclude that it is the ‘pursuit’ in ‘the pursuit of happiness’ that really matters.

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