SATISFACTION, INFORMATION AND COMPARISON
A TWICE RELATIVE APPROACH[⊥]

Georgios A. Panos[*] gpanos@abdn.ac.uk
Ioannis Theodossiou theod@abdn.ac.uk

Department of Economics, University of Aberdeen Business School
& Centre for the European Labour Market Research

April 2008

Abstract:

Using longitudinal data of British employees we present empirical evidence in accordance with the unifying evolutionary theory of a twice relative happiness function suggested by Rayo and Becker (2007). The evidence can explain one of the prominent discrepancies in the well-being literature, in particular that related to social comparisons and the divergence between rivalry and the hirschmanian tunnel effect. Reference earnings approximations are found to exert a positive transitory effect on job satisfaction, dominant for groups facing greater income uncertainty and mobility prospects. However, individuals tend to adapt more quickly to rises in peer earnings and the permanent effect of peer comparisons on job satisfaction is negative. The evidence thus stresses the link between social comparisons and income uncertainty, as well as job mobility and future expectations.

Keywords: Job Satisfaction, Reference Income, Tunnel Effect.

JEL Classification Codes: C23, C25, D84, J28, J31

[⊥] This study has benefited from *EPICURUS*, a project supported by the European Commission through the 5th Framework Programme "Improving Human Potential" (contract number: HPSE-CT-2002-00143). The authors are grateful to seminar participants in the University of Aberdeen, Universitat Jaume I, several EPICURUS Workshops, SGPE 2007, EALE 2007, the SIRE Health and Well-Being Conference, and the Royal Economic Society 2008 Conference. They would particularly like to thank Jonathan P. Thomas for creative discussion. The usual disclaimer applies.

[*] Corresponding Author: Department of Economics, University of Aberdeen Business School & Centre for the European Labour Market Research, Edward Wright Building, Dunbar Street, AB24 3QY, United Kingdom. Telephone: +44 (0)1224 273534, Fax +44 (0)1224 272181, e-mail: gpanos@abdn.ac.uk.

1. Introduction

A number of recent studies suggest that job satisfaction and well-being are reference dependent and the reference level is determined by the individual's own achievement in the past and/or the achievement of some relevant group such as neighbours, relatives or colleagues. Yet, the effect of peer income is still ambiguous. It might be negative, as the quest for status gives rise to feelings of envy if others earn more. Indeed, a number of empirical studies examining social comparisons have found supporting evidence for the importance of relative deprivation (Runciman, 1966) for satisfaction with work and life. Alternatively, it could also be positive either because individuals anticipate that in times of need they can obtain help from friends, relatives, neighbours or colleagues who are better off or because the upward mobility of others supplies information about an increasing probability of the individual's own advance. The latter is known as the "*tunnel effect*" which comes into play in an environment of economic uncertainty (Hirschman, 1973).

An economist's typical view of reference-dependent utility indicates a number of methodological difficulties. The primary concern is that the introduction of this hypothesis requires an exogenous mechanism through which concerns about the income of others are incorporated in the utility function. Samuelson (2004) uses an evolutionary explanation of peer imitation to overcome this difficulty, where nature, as the principal, provides the individual, as the agent, with such a mechanism to compensate for incomplete information provided by the environment. More recently, Rayo and Becker (2007a, 2007b) propose a unifying evolutionary theory of happiness. In their model, utility (happiness) is viewed as a biological measurement instrument that guides the agent's decisions and evaluates economic success in relative terms against a reference point that evolves over time and integrates information from the individual's own past levels of output and the output of his or her peers. Rayo and Becker (2007a) model a process where individuals compare their own current status with both the status of their peers, in order to obtain an estimate of their relative social position, and with their social position during the previous year. The model predicts a twice relative happiness function, where an advance in social position increases happiness, but the effect is only short-lived as individuals adapt to improved circumstances. Thus, in their model, the process of habituation extends to the output of peers.

Besides suggesting an evolutionary argument of twice relative happiness, this unifying approach by is in line with psychological views about the components of well-being, prominently that of

Veenhoven (1991). Veenhoven distinguishes between two components of well-being: first, the cognitive component or contentment, *i.e.* the degree to which an individual perceives his aspirations to be met and second, the affective or hedonic component, *i.e.* the degree to which the various affects a person experiences are pleasant. Interpreting both views and combining them with the two strands of recent evidence concerning the impact of social comparisons on well-being, one can think of a conciliatory view incorporating the notions of information and comparison. In a more dynamic setting, this would be a process where increasing peer income provides a signal of near future advancement to at least some employees, such as those faced with greater uncertainty about their future. This gives rise to a positive temporary satisfaction flow, a tunnel effect of a temporary cognitive nature. However, individuals quickly adapt to this process of increasing standards and high aspirations eventually make individuals worse off, as they probably entail more sacrifices that become a source of distress to the affective component of well-being. This view can explain the discrepancy in the literature, concerning the impact of peer income comparisons on job satisfaction and subjective well-being.

In the next sections, empirical evidence in favour of that view is presented. Using micro-data from British employees, it is shown that groups with higher peer earnings are less satisfied with their job in the pooled sample. However, using panel data techniques and a permanent-transitory effect decomposition for both earnings and reference income, it is found that rises in peer earnings at a point in time exert a positive temporary impact on job satisfaction. The evidence suggests this is an information signaling effect, as it is found to be correlated with age, future expectations, household income volatility, and job mobility. Furthermore it is found to be statistically significant only for employees who do not know their future income path with certainty, *i.e.* those whose contracts do not include arrangements for an annual increase in pay. However, the permanent effect of peer income on job satisfaction is significantly negative, in accordance with the conjectures of the twice relative theory of happiness that habituation extends to the output of the peers and positive information effects are likely to be short-lived.

The remainder of this paper is organized as follows: Section 2 presents the background to the discussion and reviews the literature. Section 3 describes the data and the methodology used to estimate job satisfaction and obtain reference earnings approximations. Section 4 reveals the empirical strategy, the main hypotheses and the corresponding specifications. The results and their implications are discussed in Section 5, and Section 6 concludes.

2. Background

The status quo in the well-being literature so far was that the accumulation of wealth in a society operates as a source of a negative externality to well-being after some point. Layard (2003) describes this as a "*rivalry process*" where individuals compare what they have to what other people have and if others get more, then they also need more to feel as good as before. The empirical evidence in support of the theory of relative deprivation is ample, both with respect to job satisfaction (Hamermesh, 1977; 2001; Cappelli and Sherer, 1988; Clark and Oswald, 1996; *inter alia*), and satisfaction with life as a whole (van de Stadt *et al.*, 1985; McBride, 2001; Blanchflower and Oswald, 2004; Ferrer-i-Carbonell, 2005; Luttmer, 2005) with data from several countries, mostly from the west.

However, a second strand of recent empirical evidence suggests rises in peer income might actually have a positive impact on well-being. Theories of social capital can justify such an effect (Hirschman, 1958). Rises in peer income might increase individual well-being via an "*increased security effect*". The gain is derived from the help people feel they can get from friends, relatives or neighbours who are better off in time of crisis or when in need. Such help requires a community where the members support each other, so that friends and neighbours are part of one's social capital. Ravallion and Lokshin (2005) put forth a model of interdependent preferences with risk sharing, applicable to underdeveloped/developing countries. Their empirical evidence from Malawi verifies such an increased security impact on well-being, from the higher income of friends and neighbours.

Within the context of social capital, a second view suggests individuals can derive potentially influential information from social comparisons in an environment of economic uncertainty. It was Hirschman again who defined this as a "tunnel effect" (Hirschman, with Rothschild, 1973), operating because upward mobility of others supplies information to the individual about a high probability of own advance. However, this effect is likely to be short-lived. If expectations are not realized after some time, then relative deprivation might dominate. Empirical investigation of the tunnel effect revealed that preferences for redistribution in Russia are as important for the poor as for the rich who view the future with uncertainty (Ravallion and Lokshin, 2000). Furthermore, Senik (2004) found a significantly positive effect of comparison income on life satisfaction in Russia, evidence in favor of the tunnel effect operating in a volatile and unstable economic and political environment.

While the past literature suggested a dichotomy between the developed and the underdeveloped world, identifying transition and development as they key determinant of the context placed on social comparisons, some recent works have shed new light onto the topic. Senik (2006) reports a divide in the comparison income effect between old European countries on the one hand, where uncertainty and mobility is low, and transition countries in Eastern Europe as well as the United States on the other. The latter is interpreted as a difference in the preferences for redistribution, based on the degree of uncertainty and mobility in the economy. Furthermore, Senik (2004) reports the tunnel effect is higher for individuals experiencing greater income volatility in Russia. Recently, Panos and Theodossiou (2007) present evidence from British employees suggesting that individual-specific financial circumstances and uncertainty can give rise to tunnel effects on job satisfaction. Finally, Clark *et al.* (2007) show that the key variable that determines how the reference income affects job satisfaction is the level of the correlation between an individual's own future earnings and current reference group income. Their model shows that average wages within the firm exhibit a positive impact on job satisfaction and the empirical evidence from Denmark supports this 'tunnel effect' conjecture.

In labour market research, differences in the context of wage comparisons are not entirely new in the literature. Rees (1993) reviews survey evidence indicating that the wages earned by others are a powerful force in determining labour market outcomes, increasing worker aspirations and their demands in individual and collective bargaining. On the other hand, an interesting case study from Italy (Galizzi and Lang, 1998) indicates that conditional on the worker's own wage, the average wage for similar workers in the establishment is negatively related to quits. The authors find that this variable predicts future wage growth and workers compare the long-run value of employment opportunities when making quit decisions. This latter observation can also be explained by a tournament theory view of salaries as prizes (Lazear and Rosen, 1981).

Incorporating the notions of information and comparison affecting well-being at a point in time requires a process where individuals take their future into account, so that their satisfaction response today includes information on how they expect their income in the future. The model by Clark *et al.* (2007) can accommodate this conjecture in a two-period setting. Positive anticipatory feelings caused by higher expectations (Caplin and Leahy, 2001) are documented in the literature, particularly in transition countries (Senik, 2004; Graham, 2005). A common interpretation is that prospects of an individual's own upward mobility can dominate inequality aversion depending on the mobility expected by individuals (Benabou and Ok, 2001). Graham (2005) suggests that tolerance for

inequality is higher when such prospects are perceived, even if not real. On the contrary, the threat of downward mobility is more likely to cause social unrest among frustrated achievers (Graham and Pettinato, 2002). Clark (2003) finds a positive correlation between inequality and subjective well-being in the U.K., which is sharper for those whose incomes have shown more variability and those who are on steeper income profiles.

In a more dynamic setting a conciliatory view incorporating the notions of information and comparison can be fitted into the recent works by Rayo and Becker (2007a; 2007b). The key difference is that in their model habituation extends to the output of peers, giving rise to a twice relative happiness function, where an advance in social position increases happiness, and vice versa, but this effect is only short-lived. This is a consequence of the fact that individuals adapt to new situations, by adjusting their expectations in accordance with social science theories of habituation - adaptation (Helson, 1964). In the psychological literature such phenomena are called "hedonic treadmills" (Brickman and Campbell, 1971)[1]. Thus, positive satisfaction flows from peer comparisons at a point in time are transitory cognitive effects, but the permanent effect of social comparisons and increasing standards has a negative affective impact on well-being.

In the next section, the data and the empirical strategy are discussed. The aim is to depart from the previous literature on job satisfaction and incorporate the notions of information and comparison, through a process of habituation that extends to the output of the peers.

[1] In the 1970's pioneering work by the "Leyden School" on individual welfare functions describe this behavioural pattern as the "Preference Shift Parameter" (van Praag and Kapteyn, 1973). Recent economics works on adaptation mechanisms have examined preferences over wage profiles (Loewenstein and Sicherman, 1991; Frank and Hutchens, 1993), the impact of wages on job satisfaction (Clark, 1999; Groot and van den Brink, 1999; Grund and Sliwka, 2001), and adaptation to types of work contracts (Pouliakas and Theodossiou, 2007). Adaptation can also be related to rational addiction (Becker & Murphy, 1988).

3. Data and Methodology

This study uses fifteen waves of the British Household Panel Survey (BHPS, 1991-2005)[2] to distinguish between permanent and transitory effects of changes in earnings and relative income on job satisfaction or the utility from work. The strategy to identify these effects is discussed below.

3.1 The Data

The BHPS is a nationally representative household survey providing rich information on individual job satisfaction, earnings and various demographic and socioeconomic characteristics. The sample is an unbalanced panel of 11,152 individuals (74,833 observations) in paid employment, aged between 20 and 60 at the time of the interview. In order to examine the impact of changes in an individual's own and reference income, the main criterion for inclusion is continuous presence in the sample for at least two consecutive years. The average statistical life in the sample is 6.6 years. Details on the variables used are given in the appendix 1.

[Insert Figure 1 about here]

The job satisfaction measure is derived from the question: "*Overall, how satisfied are you with your job as a whole?*" The answers in the BHPS range from 1 indicating complete dissatisfaction to 7 indicating complete satisfaction. *Figure 1* presents the distribution of job satisfaction responses in the pooled sample. In line with the literature, the distribution is skewed towards the top three categories. *Table 1* presents the matrix with the transition probabilities between satisfaction categories during the panel. The Table reveals significant mobility across satisfaction categories, with the only exception of response category 6, where 61% of the individuals giving that response are likely to give the same response again. The data is in line with a "coherently arbitrary" interpretation of job satisfaction (Ariely et al., 2003; 2005), i.e. that of a relative valuation based on a reference point.

[Insert Table 1 about here]

[2] The BHPS data was made available through the ESRC Data Archive. The data was originally collected by the ESRC Research Centre on Micro-social Change, at the University of Essex. The original collectors of the data, the Data Archive and the affiliated institutions bear no responsibility for the analyses or interpretations presented here.

Subjective variables such as job satisfaction are to some extend treated with suspicion by economists on the grounds that they are likely to measure what people say, rather than what they do or even feel (Bertrand and Mullainathan, 2001) or that individuals "anchor" their scale of response at different levels (Winkelmann and Winkelmann, 1998). However, Ferrer-i-Carbonell and Frijters (2004) review experimental evidence from studies in psychology that shows a significant positive correlation between satisfaction responses and emotional expressions or brain activity and that the reported satisfaction is predictive of human behaviour. Studies also confirm that individuals are able to accurately predict satisfaction levels of others – even from different cultural communities (Sandvik *et al.*, 1993). Moreover, van Praag (1991) presents significant evidence in favour of inter-personal comparability of satisfaction responses within the same language communities.

3.2 Estimating Job Satisfaction: The COLS Approach

The job satisfaction measure is an ordered categorical variable (*S*). Job satisfaction is assumed to be described by a latent variable (S^*) of an individual *i* reporting a job satisfaction level *S* at a point in time *t*, *i.e.*:

$$S_{it}^{*} = f\left(a + \beta\, y_{it} + \gamma\, y_{it}^{r} + \sum_{j} \delta_j z_{j,it} + \varepsilon_{it} \right) \qquad (1)$$

where *f* is an increasing function from 1 to 7, with domain $(-\infty, +\infty)$. z_{it} is a set of *j* exogenous personal and work related characteristics of individual *i* in time *t*. *y* represents earnings, y^r is the reference income term and ε is the usual error term. Equivalently, reported job satisfaction can be described by the model equation:

$$S_{it} = f^{-1}(S_{it}^{*}) = \alpha + \beta\, y_{it} + \gamma\, y_{it}^{r} + \sum_{j} \delta_j z_{j,it} + \varepsilon_{it} \qquad (2)$$

The latent job satisfaction S^* is observed to be in one of the intervals $(-\infty, \mu_1]$, $(\mu_1, \mu_2]$, ..., (μ_6, ∞), which partition the real axis in 7 intervals, with $-\infty < \mu_1 < \mu_2 < ... < \mu_6 < \infty$. *S* is observed categorically as:

$$S = \begin{cases} 1, \ if \ S^* \le \mu_1 \\ 2, \ if \ \mu_1 < S^* \le \mu_2 \\ \dots \\ 7, \ if \ S^* \ge \mu_6 \end{cases}$$

Traditionally in the literature such discrete choice models are analyzed by means of Ordered Probit or Logit techniques. Alternatively, one can adopt an appropriate linearization of the ordinal evaluation responses. The great merit of such a strategy is that it enables the researcher to control for unobserved heterogeneity, minimizing computational costs. The linearization used in the context of this study is the Cardinal OLS (COLS) approach (van Praag and Ferrer-i-Carbonell, 2004, chapter 2). This econometric model presumes that respondents are supplying a cardinal job satisfaction response, but it takes into account that they could not precisely give information about their valuation, due to the categorical format of the response categories. Their answers were restricted to the set of integer numbers between 0 and 7 instead. The assumption is that if someone gives a response of 5 for example, the true valuation lies somewhere between 4.5 and 5.5. If the true valuation is 4.3, the respondent would have answered 4. Hence, an answer of 5 implies that for the exact valuation S_{it} the following inequality holds: $4.5 < S_{it} \le 5.5$. Now assume $\frac{1}{7}S_n(.)$ to be a standard normal distribution function $N(.;0,1)$, where the first factor accounts for the normalization to the [0,7]-interval[3]. If $S_{0.45}$ is defined by $N(S_{0.45}; 0.1) = 0.45$, that is the 45%-percentile, and similarly for$S_{0.55}$, the previous inequality is equivalent with:

$$S_{0.45} < S_{it} = \alpha + \beta\, y_{it} + \gamma\, y_{it}^{r} + \sum_j \delta_j z_{j,it} + \varepsilon_{it} \le S_{0.55}.$$

Now the COLS approach replaces the inexactly known value S_{it} by its conditional expectation $\bar{S}_{it}$ (Maddala, 1983, p.366):

$$\bar{S}_{it} = E(S_{0.55} < S_{it} \le S_{0.65}) = \frac{n(S_{0.45}) - n(S_{0.55})}{N(S_{0.55}) - n(S_{0.45})} \qquad (3)$$

where $n(.)$ and $N(.)$ stand for the standard normal density and distribution functions, respectively. The use of this formula does not require previous estimation of the underlying model parameters. Thus, the equation to be estimated now becomes:

[3] The choice of the normal distribution function is irrelevant and could be replaced by any other distribution function that is a monotonically increasing function on a bounded interval.

$$\overline{S}_{it} = \alpha + \beta\, y_{it} + \gamma\, y_{it}^{r} + \sum_{j} \delta_{j} z_{j,it} + \varepsilon_{it} \qquad (4)$$

The great benefit of this linearization is that it minimizes computation time and allows for the bootstrapping of the standard errors in the estimation of (4). As discussed in the next sections, the latter is a desirable feature, since the measures of reference earnings obtained are the outcome of a first stage regression. Estimates using the COLS method have been shown to yield comparable results to the ordered probit and ordered logit methods, except for a factor of proportionality (van Praag and Ferrer-i-Carbonell, 2004).

Another important issue arising in the literature is that most surveys do not provide some income level that can be used as a reference income variable in empirical research. This imposes researchers with the need to seek some suitable approximation. A common approximation is generated by using predicted values from standard earnings regressions to derive a measure of reference income (Clark and Oswald, 1996; Senik, 2004; *inter alia*[4]). This is assumed to capture the level of earnings an individual should expect to earn given her personal and human capital characteristics (Drakopoulos and Theodossiou, 1997). For reasons of comparability with the previous literature, the preferred measure of reference earnings in this paper is derived by obtaining the predicted values from earnings estimates of the standard human capital form in cross-sectional regressions for all years in the panel. The dependent variable is the logarithm of real gross usual monthly earnings in 1991 values. The specification chosen is close to that in Clark and Oswald (1996). In order to ensure robustness of the findings presented in this study, a second measure of reference income is examined. The latter is obtained from an external data source, the Annual Source of Hours and Earnings (ASHE). It consists of real weekly earnings disaggregated by year, government region, gender, full-time/part-time status, and 2-digit occupation and industry. This information is available in a consistent format for a subset of the years in the panel, i.e. for the years 1997-2005. The derivation of both reference income measures is explained in detail in the appendix 2.

[4] A critical appraisal of this approach is discussed in Manski (1993, 2000).

4. Empirical Strategy

Given the aims of this study, the starting point is to estimate a version of equation (4) excluding the reference income term. This is performed in order to examine the comparability in the estimates of the determinants of job satisfaction in the U.K. between this study and the previous literature. This first specification is estimated via pooled COLS. Then, the second specification makes use of the panel structure of the dataset and incorporates fixed time effects and individual random effects in the estimation of (4). The fixed time effects control for the yearly changes that are the same for all individuals, such as the business cycle. The individual random effects account for the time-invariant and individual-specific unobservable characteristics. The rather strong assumption here is that these are uncorrelated with the explanatory variables. To treat this, and importantly, in order to perform the transitory/permanent effect distinction, this paper employs the decomposition suggested by Mundlak (1978) and also used in van Praag et al. (2003) and Ferrer-i-Carbonell (2005). This decomposition assumes that a subset of the individual characteristics, the income variables in this case, is correlated with a part of the individual random effect. This correlation operates through the mean value of the selected set of variables over the sample lifetime. Incorporating these notions, the equation to be estimated (including reference income for cohesion with equation (4)) becomes:

$$\overline{S}_{it} = \delta + \beta\, y_{it} + \widetilde{\beta}\, \widetilde{y}_i + \gamma\, y^r_{it} + \widetilde{\gamma}\, \widetilde{y}^r_i + \sum_j a_j z_{j,it} + \sum_{t=1}^{15} \zeta_t \tau_{it} + \omega_i + v_{it} \qquad (5)$$

where $\tilde{y}$ is the mean level of earnings and $\tilde{y}^r$ the mean level of reference earnings for each individual i, over the sample lifetime. The estimation of this specification yields within-groups effects, β and γ, and between-groups effects, $\tilde{\beta}$ and $\tilde{\gamma}$ for the variables that are included in the decomposition, namely y and y^r. To identify the transitory and permanent effects of earnings, the variable transformation suggested by van Praag et al. (2003) is used which transforms equation (5) to:

$$\overline{S}_{it} = \delta + \beta(y_{it} - \widetilde{y}_i) + (\beta + \widetilde{\beta})\, \widetilde{y}_i + \gamma\, (y^r_{it} - \widetilde{y}^r_i) + (\gamma + \widetilde{\gamma})\, \widetilde{y}^r_i + \sum_j a_j z_{j,it} + \sum_{t=1}^{15} \zeta_t \tau_{it} + \omega_i + v_{it} \qquad (6)$$

Hence, the coefficients β and γ reflect *shock or transitory* effects and the coefficients $(\beta + \tilde{\beta})$ and $(\gamma + \tilde{\gamma})$ measure *permanent* effects. In equation (6), τ indicates the year fixed effect. Thus, the second specification, estimated via COLS with random effects, allows us to distinguish between effects of

permanent and transitory earnings changes on job satisfaction. Conceptually this decomposition is similar to the permanent-transitory decomposition formulation for income and consumption introduced by Friedman (1957), and similar but not identical to Gottschalk *et al*. (1994).

The second stage of the analysis presents estimates of (4) including reference income. Again, two specifications are estimated, the first via pooled COLS, and the second with the inclusion of random effects and Mundlak's decomposition. The first specification is used in order to examine the comparability with studies presenting cross-sectional and pooled estimates of the effect of reference income on job satisfaction and well-being. In this second specification, the use of the decomposition implies that habituation extends to the observation of reference income. The assumption is that individuals adapt to changes in their earnings and the income of their peers. Conceptually, one could think of adaptation taking place with respect to other features as well, such as the hours of work. However, this is not of primary interest here, and imposing the decomposition on hours of work does not change any of the finding in the next section (results available upon request). The results in Panos and Theodossiou (2007) further suggest that the adaptation process is less likely to occur when it comes to working hours. In both specifications of this second set of estimates, the standard errors are bootstrapped to account for the fact that reference income is obtained as a predicted value from a first stage regression. Furthermore, in the specifications with reference income, the education variables are excluded. This is in order to ensure comparability with the results in Clark and Oswald (1996) who make use of this practice and provide its justification. Estimates with reference earnings and comparison income change the magnitude, but not the nature and interpretation of the results presented and discussed in the next section.

At the final stage of our analysis we present estimates of the specifications with reference income that include interaction terms for variables of intuitive interest, as well as estimates for population sub-groups. The aim is to examine the argument that the effect of a transitory change in reference income has a cognitive impact, signaling information for the future. The variables of interest are obtained from questions asking about financial expectations for the future, contractual arrangements, job mobility and age. The specifications and results are presented and discussed in detail in the next section.

5. Results and Discussion

5.1 The Correlates of Job Satisfaction

Table 2 presents the first set of estimates that do not control for reference income. The estimation method of the first specification is COLS. Coefficients and robust standard errors are presented, clustered at the individual level to correct for serial correlation within individuals (Wooldridge, 2002: p.328). The second specification introduces random effects in the COLS model, together with Mundlak's decomposition for own earnings. Results from the first specification are more or less typical estimates of the determinants of job satisfaction in the U.K., consistent with the literature. Female employees are much more satisfied with their jobs compared to men (Clark, 1997), job satisfaction is U-shaped in age with a minimum around the age of 37 (Clark, Oswald and Warr, 1996), and the higher educated are less satisfied (Clark and Oswald, 1996). Part-timers are more satisfied with their work, a result likely to be driven by women (Gregory and Connolly, 2008; Booth and van Ours, 2008) or self-selection. Furthermore, workers in small firms, healthier people and the married are more satisfied. Moreover, workers in London are the least satisfied ceteris paribus, and a negative trend in job satisfaction is prevalent in all years after 1991. Utilities and the financial sector appear to have the least satisfied employees.

The empirical evidence so far indicates a significantly positive effect of wages on job satisfaction, but not of a large magnitude. In specification 1, for the pooled model, the effect is indeed positive and significant at the 1% level and its magnitude is two thirds that of the negative impact of hours of work. The coefficient of LEARNINGS is 0.081. In specification 2, the wage effect is split into a transitory and a permanent component, using a decomposition of the effect within and between groups. Results indicate that a within-groups wage increase has a significantly positive effect on job satisfaction. The coefficient of the within-individuals effect is 0.113, while that between-groups is -0.072, yielding a permanent effect of 0.041 (=0.113-0. 072), significant at the 1% level. The latter comes from a test of the linear constraint that $\beta_{REFEARNINGS}+\tilde{\beta}_{MEAN[REFEARNINGS]}=0$). This result is in line with casual evidence showing that a rise in earnings initially increases job satisfaction, but as individuals become used to the new situation, their job satisfaction declines closer to its original level (Clark, 1999). The evidence in Frank and Hutchens (1993) and Loewenstein and Sicherman (1991) indicates workers indeed prefer increasing wage profiles. Individuals tend to adapt to new situations, such as higher earnings, by adjusting their expectations.

[Insert Table 2 about here]

5.2 *Job Satisfaction and Reference Income*

Table 3 introduces the specifications that incorporate the relative income measures. Two distinct reference earnings approximations are implemented at this stage. The first and main measure is from monthly earnings predictions based on human capital characteristics from within the BHPS. The second approximation is applied to ensure robustness, and uses predictions for a composite average of weekly earnings from an external data source (ASHE) for the years 1997-2005. Bootstrapped standard errors based on 1,000 replications are presented throughout, since one of the main explanatory variables, reference income, is the outcome of first-stage regressions.

Results from the first specification in both panels indicate a more or less a similar picture, consistent with the previous empirical literature that used cross-sectional and pooled data. The coefficient of relative income exhibits a negative and significant impact on job satisfaction. Its magnitude is comparable to that of own earnings. While the coefficient of own earnings is 0.056, that of reference income is -0.050 for the 1st measure and is significant at the 1% level. For the measure obtained from ASHE earnings, the coefficient of relative income is -0.048, significant at the 5% level, compared to a coefficient of 0.060 for own earnings. The common interpretation is that job satisfaction depends on a reference or comparison level of income, rather than own income from work per se.

The second specification in both panels explores the panel dimension of the data and examines the hypothesis that habituation extends to the output of the peers. The decomposition between transitory and permanent effects of changes in own and reference income is imposed. Examining own earnings, the pattern presented in Table 2 holds for both panels of table 3. The effect of a transitory change in own earnings is positive and of a higher magnitude than that of a permanent change. However, an interesting pattern emerges from splitting the effect of reference income into a permanent and a transitory component. The effect of a permanent change in reference income is negative and of a high magnitude comparable to that of a permanent increase in own earnings, but of opposite sign. However, a transitory change in reference income exhibits a positive coefficient of a considerable magnitude, but smaller than that of a transitory change in own earnings. This pattern is robust in both panels. There is a difference in the magnitude of this effect between the two reference income

measures, but not in terms of their significance. The coefficient of the transitory component of the BHPS reference measure is 0.065, significant at the 1% measure, while that of the ASHE measure is 0.031, significant at the 1% level. The difference in magnitude can be attributed to either the fact that the former is a monthly measure, while the latter is a weekly measure, or to the different time periods that the two measure cover. The rest of the results in Table 3 do not diverge from those in Table 2.

[Insert Table 3 about here]

There could be two possible explanations for this interesting divergence between the effect of a transitory and a permanent change in reference income. First, unobserved individual effects, such as ability or effort could be correlated with both the external norm of reference an individual sets for herself and job satisfaction, and thus be driving the switch in sign. The second explanation is of a behavioural nature. While individuals aspiring more are less satisfied with the outcome of their work on average, transitory shifts in their aspiration norm could be interpreted as a signal of own advance in the future and thus exhibit a positive temporary effect on job satisfaction. A temporary increase in the norm of comparison is interpreted as a positive signal, but individuals tend to adapt faster to peer comparisons, and on average those with higher targets are less happy with their own outcomes. If this second explanation is likely to be the case, then it is worth examining whether transitory shifts in peer earnings operate as information signals about future own wages. In the next sub-sections we examine this proposition, first by interacting the main reference income measure with variables capturing expectations, as well as income uncertainty and job mobility, and second, by distinguishing between groups of individuals with different income profiles.

5.3 Interaction Effects

The previous section revealed a positive effect of transitory reference income on job satisfaction. The literature examining the prevalence of the tunnel effect has highlighted its correlation with income uncertainty (Senik, 2004; Panos and Theodossiou, 2007) and future expectations (Clark at al., 2007). Thus, in this sub-section, interaction effects between reference income and household income volatility, age, job mobility and future financial expectations are presented.

[Insert Table 4 about here]

Panel (A) of *Table 4* introduces interaction terms between household income volatility and reference earnings. The model also includes a second interaction term with own earnings, as well as a variable measuring volatility. The latter is defined as the standard deviation of the logarithm of equivalized household income of an individual during the sample lifetime. Specification (1) represents COLS regressions, specification (2) is estimated via COLS with random effects, and so is specification (3) with the addition of interaction terms between volatility and the Mundlak terms. All 3 specifications verify that reference earnings exert a higher impact when income volatility is higher. The overall effect of reference income in specification (1) for the pooled model becomes positive and the transitory component in specifications (2) and (3) becomes much higher when income volatility is higher.

In *Panel (B)*, the same exercise repeated, including interaction terms between a dummy variable for age younger than 35 and reference income. The specifications are the same as above. The results suggest that the positive impact of reference income on job satisfaction is greater for the younger population. Senik (2004) suggests this is likely to be the case, as this group is faced with greater uncertainty about the future and higher mobility prospects. Further interaction terms with job transition variables in *panel (C)* suggest that reference earnings are more likely to exert a positive impact on individuals who moved to a new job or a new position in the same job during the last year, compared to individuals who stayed at the same job. Thus, these interaction terms agree with the information signaling conjecture for individuals in need of such information from their peers, i.e. those faced with new circumstances. Finally, the interaction terms in *panel (D)* suggest a positive correlation between better expectations about financial circumstances in the year ahead and reference income. This is likely to be the case, if financial uncertainty has already been resolved via the observation of peer income.

The evidence so far highlights the link between mobility and uncertainty about the future and the effect of reference income on job satisfaction. As a final test, in the next sub-section, the specifications of Table 3 are estimated for population sub-groups. The distinguishing criteria between groups are contractual arrangements such as incremental pay, job mobility and finally, financial expectations for the next year.

5.4 The Informational Content of Peer Group Comparisons

In line with the previous, this sub-section aims at examining the nature of the positive transitory impact of reference income, putting forward some direct tests of the proposition that it is an information signaling effect. The intuition is that not all individuals need to interpret the evolution of their reference income as an information signal of their own future advancement. Such an interpretation is more likely to occur among individuals that lack the information about their own future prospects; a candidate group of individuals is that in jobs where the contract does not specify the evolution of wages in the future explicitly. The BHPS includes a question about whether one's wage is set via a known formula, such as arrangements for annual increments. Thus, as a further test *Table 5.1* presents estimates for the two groups of workers; those whose pay is set via a known formula and those whose work contract does not involve annual increments, respectively. The former are more likely to know their future wage prospects with certainty. The results suggest that for workers in contracts without annual increment arrangements, the impact of transitory reference income changes is significantly positive and the effect is comparable in magnitude to that of own earnings. On the contrary, the effect is insignificant for individuals expecting to receive increments. A t-statistic, $\frac{\gamma_1-\gamma_2}{\sqrt{\sigma^2_{\gamma_1}-\sigma^2_{\gamma_2}}}$, for the difference between the two coefficients is equal to -2.31, statistically significant at the 1% level. The difference in the coefficients of the permanents effects of reference income is insignificant, equal to -1.10. Thus, the results verify that in a situation where an individual is uncertain about the association of her human capital to her salary, the observation of the typical salary of people sharing the same characteristics is likely to be a good indicator of what the individual can expect for herself. This is supporting evidence that individuals utilize the information provided by the evolution of the earnings of their reference group to form expectations about their own future. This information effect vanishes when there is certainty about the evolution of one's earnings path.

[Insert Table 5.1 about here]

Table 5.2 presents the same sets of estimates for individuals doing the same job as in the previous year and those who have moved to a new job with a different employer or a new position with the same employer. The interaction terms in Table 4 have already shown the effect of a transitory reference income change is greater for the latter two groups. Table 5.2 verifies the previous result. The coefficient of REFEARNINGS is positive but statistically insignificant for individuals in the

same job and equal to 0.118 and significant at the 1% level for those who have changed their position or employer. The difference between the two coefficients is statistically significant at the 1% level.

[Insert Table 5.2 about here]

Finally, *Table 5.3* distinguishes between groups based on the expectations for their financial situation in the next year. The results are again in agreement with the interaction terms in Table 4. The coefficient of REFEARNINGS is positive but statistically insignificant for individuals stating that they expect their financial future to be the same or worse. On the contrary, the coefficient is of a large magnitude and statistically significant at the 1% level for those stating that they expect the future to be better. The difference between the two coefficients is statistically significant at the 1% level. This result is in line with Clark et al. (2007) suggesting that the key to understanding how reference income affects one's utility is the strength of the correlation between one's own future earnings and current reference income

[Insert Table 5.3 about here]

6. Conclusions

The evidence presented suggests that the notions of 'rivalry' and the 'tunnel effect' can be combined in a process where increasing peer income provides a positive signal for near future advancement, especially to employees who face greater financial uncertainty and mobility prospects. However, individuals habituate to both their own income and increasing standards set by their peers and in the long term, rising standards become a source of distress. Intuitively, this is a very plausible explanation, as membership in a rising social group can be thought to give rise to positive anticipatory feelings. However, in the long run and in view of the other sacrifices one has to face in order to accommodate rising standards, higher reference income is likely to have a negative affective effect on well-being. This process is in line with the recent theoretical work by Rayo and Becker. It also accommodates Veenhoven's distinction of the affective and cognitive components of job satisfaction and well-being. This new evidence does not contradict Easterlin's (1974) time series evidence suggesting that economic growth does not appear to affect the population's long term well-being although there are transitory effects.

Thus, envy eventually dominates positive information, not only if individuals get stuck in the tunnel while others progress, but presumably also if individuals get into a constant race. Sedation by spurious satisfaction of unending novelty can lead to a rat race; full of happiness in view of the carrot, but ending up miserably exhausted at the end of the race. An implication of the habituation in increasing standards is that the duration of positive anticipatory feelings on well-being in transition economies is likely to depend on how long the transition process takes place. A main implication for labour markets in developed economies is related to mobility and labour market flexibility policies. If good expectations can increase morale in the short-run, then a labour market that creates confidence in mobility might have persistent effects on job satisfaction. Of course, Gurr (1970) warns that societal conditions that increase the average level of intensity of expectations without increasing capabilities eventually increase discontent (Graham, 2005).

This paper suggests a conciliatory behavioural view between the two opposite bodies of empirical evidence that have been presented in the subjective well-being literature. It presents empirical evidence from the British labour market, consistent with that view. It is found that the link between job satisfaction and peer income operates through income uncertainty and mobility prospects. This correlation is arguably far greater for groups of employees faced with greater income volatility, the young, people in new occupations and those expecting the future to be better. Furthermore, employees whose work contracts do not arrange for a fixed future wage path are more likely to interpret peer progression as a signal of own future advance. However, this effect is likely to be short-lived and individuals adapt to constantly increasing comparison standards. Employees with higher reference earnings are less satisfied with their jobs on average.

References:

Ariely, D., Loewenstein, G., and Prelec, D. (2003). 'Coherent arbitrariness: Stable demand curves without stable preferences'. *Quarterly Journal of Economics*, Vol. 118, pp73-106.

Ariely, D., Loewenstein, G., and Prelec, D. (2006). 'Tom Sawyer and the Construction of Value'. *Journal of Economic Behavior and Organization*. Vol 60, pp. 1-10.

Becker, G., and Murphy, K.. (1988). "A Theory of Rational Addiction", *Journal of Political Economy*. Vol. 96, Issue 4, pp. 675-700.

Benabou, R., and Ok, E. A. (2001). 'Social Mobility and the Demand for Redistribution: The POUM Hypothesis', *Quarterly Journal of Economics,* Vol. 116, No. 2, pp. 447-487.

Bertrand, M., and Mullainathan, S. (2001). 'Do People Mean what they Say? Implications for Subjective Survey Data', *American Economic Review,* Vol. 91, No. 2, pp. 67-72.

Blanchflower, D. G., and Oswald, A. J. (2004). 'Well-being Over Time in Britain and the USA', *Journal of Public Economics,* Vol. 88, No. 7, pp. 1359-1386.

Booth, A., and van Ours, J. S. (2008). 'Job Satisfaction and Family Happiness: The Part-Time Work Puzzle', *Economic Journal,* Vol. 118, No. 526, pp. F77-F99.

Brickman, P., & Campbell, D. (1971). 'Hedonic relativism and planning the good society', in M. H. Appley (Ed.), *Adaptation level theory: A symposium,* New York, Academic Press, pp. 287-302.

Caplin, A., and Leahy, J. (2001). 'Psychological Expected Utility Theory and Anticipatory Feelings', *Quarterly Journal of Economics,* Vol. 116, No. 1, pp. 55-79.

Cappelli, P., and Sherer, P. D. (1988). 'Satisfaction, Market Wages, and Labor Relations: An Airline Study', *Industrial Relations,* Vol. 27, No. 1, pp. 57-73.

Clark, A. E., 1997, "*Job Satisfaction and Gender: Why are women so happy at work?*" Labour Economics 4 (1997): 341-372.

Clark, A. E. (1999). 'Are Wages Habit-Forming? Evidence from Micro Data', *Journal of Economic Behavior and Organization,* Vol. 39, No. 2, pp. 179-200.

Clark, A. E. (2003). 'Inequality-Aversion and Income Mobility: A Direct Test', *DELTA Working Paper No. 2003-11*.

Clark, A. E., Kristensen, N., and Westergard-Nielsen, N. (2007). 'Job Satisfaction and Co-Worker Wages: Status Or Signal?', *Working Paper*.

Clark, A. E., and Oswald, A. J. (1996). 'Satisfaction and Comparison Income', *Journal of Public Economics,* Vol. 61, No. 3, pp. 359-381.

Clark, A. E., Oswald, A. J. and P. Warr, 1996, "Is *Job Satisfaction U-shaped in Age?*", Journal of Occupational and Organizational Psychology, 69: 57-81.

Drakopoulos, S. A., and Theodossiou, I. (1997). 'Job Satisfaction and Target Earnings', *Journal of Economic Psychology,* Vol. 18, No. 6, pp. 693-704.

Easterlin, R. A. (1974). 'Does economic growth improve the human lot? some empirical evidence', in P. A. David, and M. W. Reder (Eds.), *Nations and households in economic growth: Essays in honor of Moses Abramovitz,* New York and London, Academic Press, pp. 89-125.

Ferrer-i-Carbonell, A. (2005). 'Income and Well-being: An Empirical Analysis of the Comparison Income Effect', *Journal of Public Economics,* Vol. 89, No. 5, pp. 997-1019.

Ferrer-i-Carbonell, A., and Frijters, P. (2004). 'How Important is Methodology for the Estimates of the Determinants of Happiness?', *Economic Journal,* Vol. 114, No. 497, pp. 641-659.

Frank, R. H., and Hutchens, R. M. (1993). 'Wages, Seniority, and the Demand for Rising Consumption Profiles', *Journal of Economic Behavior and Organization,* Vol. 21, No. 3, pp. 251-276.

Friedman, Milton. 1957. *A Theory of the Consumption Function*, Princeton: Princeton University Press.

Galizzi, M., and Lang, K. (1998). 'Relative Wages, Wage Growth, and Quit Behavior', *Journal of Labor Economics,* Vol. 16, No. 2, pp. 367-391.

Gottschalk, Peter, Moffitt, Robert, Katz, Lawrence F., and Dickens, William T., 1994. 'The Growth of Earnings Instability in the U.S. Labor Market,' *Brookings Papers on Economic Activity*. pp. 217-72.

Graham, C. (2005). 'Insights on Development from the Economics of Happiness', *World Bank Research Observer,* Vol. 20, No. 2, pp. 201-231.

Graham, C., and Pettinato, S. (2002). 'Frustrated Achievers: Winners, Loosers and Subjective Well-being in New Market Economies', *Journal of Development Studies,* Vol. 38, No. 4, pp. 100-140.

Gregory, M., and Connolly, S. (2008). 'The Price of Reconciliation: Part-Time Work, Families and Women's Satisfaction', *Economic Journal,* Vol. 118, No. 526, pp. F1-F7.

Groot, W. and H. M. van den Brink (1999). "Job Satisfaction and Preference Drift". *Economics Letters*, 63, pp. 363-367.

Grund, C. & Sliwka D. (2001). "The Impact of Wage Increases on Job Satisfaction – Empirical Evidence and Theoretical Implications", *IZA Discussion Paper No. 387*.

Gurr, T. R. (1970). *Why Men Rebel,* Princeton, NJ, Princeton University Press.

Hamermesh, D. S. (1977). "Economic Aspects of Job Satisfaction", in: Ashenfelter O. C, Oates W. E. (Eds.): "*Essays in Labor Market Analysis*", Wiley, New York.

Hamermesh, D. S. (2001). 'The Changing Distribution of Job Satisfaction', *Journal of Human Resources,* Vol. 36, No. 1, pp. 1-30.

Helson, H. (1964). *Adaptation-Level Theory,* New York, Harper & Row.

Hirschman, A. O. (1958). *The Strategy of Economic Development,* New Haven, CT, Yale University Press.

Hirschman, A. O., and Rothschild, M. (1973). 'The Changing Tolerance for Income Inequality in the Course of Economic Development', *Quarterly Journal of Economics,* Vol. 87, No. 4, pp. 544-566.

Layard, R. (2003). *Happiness: Has Social Science a Clue?* Paper presented at: 'Lionel Robbins Memorial Lectures 2002/2003', London School of Economics.

Lazear, E. P., and Rosen, S. (1981). "Rank-Order Tournaments as Optimum Labor Contracts", *Journal of Political Economy*. Vol. 84, No. 5, pp. 841-864.

Loewenstein, G. F., and Sicherman, N. (1991). 'Do Workers Prefer Increasing Wage Profiles?', *Journal of Labor Economics,* Vol. 9, No. 1, pp. 67-84.

Luttmer, E. F. P. (2005). 'Neighbors as Negatives: Relative Earnings and Well-being', *Quarterly Journal of Economics,* Vol. 120, No. 3, pp. 963-1002.

Maddala, G. S. (1983). *Limited Dependent and Qualitative Variables in Econometrics,* Cambridge, Cambridge University Press.

Manski, C. F. (1993). 'Identification of Endogenous Social Effects: The Reflection Problem', *Review of Economic Studies,* Vol. 60, No. 3, pp. 531-542.

Manski, C. F. (2000). 'Economic Analysis of Social Interactions', *Journal of Economic Perspectives,* Vol. 14, No. 3, pp. 115-136.

McBride, M. (2001). 'Relative-Income Effects on Subjective Well-being in the Cross-Section', *Journal of Economic Behavior and Organization,* Vol. 45, No. 3, pp. 251-278.

Mundlak, Y. (1978). 'On the Pooling of Time-Series and Cross-Section Data', *Econometrica,* Vol. 46, pp. 69-85.

Panos, G. A., and Theodossiou, I. (2007). 'Reference Earnings and Job Satisfaction; The Informational Impact of Peer Comparisons', University of Aberdeen Mimeo.

Pouliakas, K., and Theodossiou, I. (2007). 'Measuring adaptation to non-permanent employment contracts using a conjoint analysis approach', University of Aberdeen Mimeo.

Ravallion, M., and Lokshin, M. (2000). 'Who Wants to Redistribute?: The Tunnel Effect in 1990s Russia', *Journal of Public Economics,* Vol. 76, No. 1, pp. 87-104.

Ravallion, M., and Lokshin, M. (2005). 'Who Cares about Relative Deprivation?', *World Bank Policy Research Working Paper No. 3782*.

Rayo, L., and Becker, G. S. (2007a). 'Evolutionary Efficiency and Happiness', *The Journal of Political Economy,* Vol. 115, No. 2, pp. 302-337.

Rayo, L., and Becker, G. S. (2007b). 'Habits, Peers, and Happiness: An Evolutionary Perspective', *American Economic Review Papers and Proceedings,* Vol. 97, No. 2, pp. 487-491.

Rees, A. (1993). 'The Role of Fairness in Wage Determination', *Journal of Labor Economics,* Vol. 11, No. 1, pp. 243-252.

Runciman, W. G. (1966). *Relative Deprivation and Social Justice,* London, Routledge and Kegan Paul.

Samuelson, L. (2004). 'Information-Based Relative Consumption Effects', *Econometrica,* Vol. 72, No. 1, pp. 93-118.

Sandvik, E., Diener, E., and Seidlitz, L. (1993). 'Subjective Well-being: The Convergence and Stability of Self and Non Self Report Measures', *Journal of Personality,* Vol. 61, pp. 317-342.

Senik, C. (2004). 'When Information Dominates Comparison: Learning from Russian Subjective Panel Data', *Journal of Public Economics,* Vol. 88, No. 9, pp. 2099-2123.

Senik, C. (2006). 'Ambition and Jealousy: Income Interactions in the "Old" Europe Versus the "New" Europe and the United States', *IZA Discussion Paper 2083*.

van de Stadt, H., Kapteyn, A., and van de Geer, S. (1985). 'The Relativity of Utility: Evidence from Panel Data', *Review of Economics and Statistics,* Vol. 67, No. 2, pp. 179-187.

van Praag, B. M. S., Frijters, P., and Ferrer-i-Carbonell, A. (2003). 'The Anatomy of Subjective Well-being', *Journal of Economic Behavior and Organization,* Vol. 51, No. 1, pp. 29-49.

van Praag, Bernard M.S. (1991). 'Ordinal and Cardinal Utility: An Integration of the Two Dimensions of the Welfare Concept', *Journal of Econometrics,* Vol. 50, No. 1, pp. 69-89.

van Praag, B. M. S., and Ferrer-i-Carbonell, A. (2004). *Happiness Quantified,* Oxford University Press.

Veenhoven R. (1991). “Is Happiness Relative?”. *Social Indicators Research*, 24, pp. 1-34.

Winkelmann, L., and Winkelmann, R. (1998). 'Why are the Unemployed so Unhappy? Evidence from Panel Data', *Economica,* Vol. 65, No. 257, pp. 1-15.

Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data,* Cambridge and London, MIT Press.

Figure 1
Frequencies of Job Satisfaction Responses (BHPS, Waves 1-15)

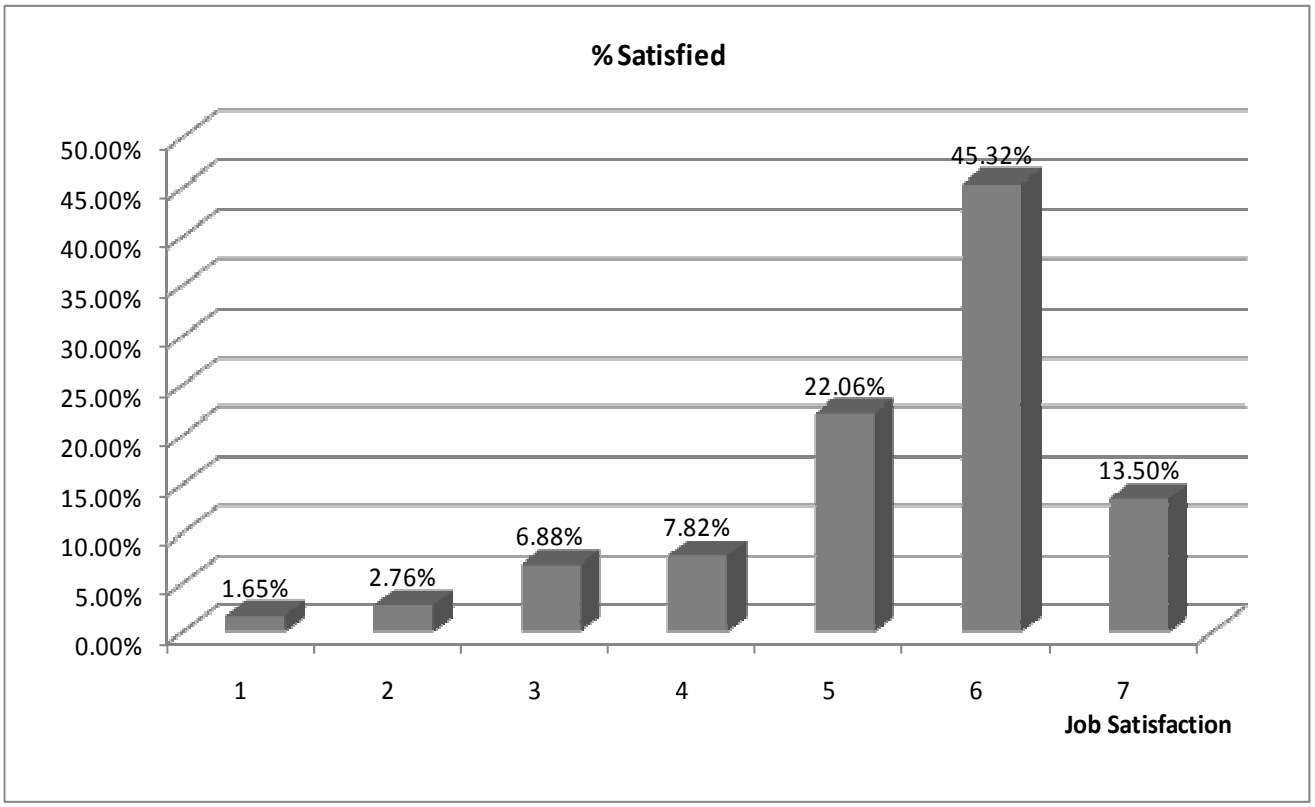

Table 1
Transition Matrix of Job Satisfaction Responses (BHPS, Waves 1-15)

JOBSAT	1	2	3	4	5	6	7	Total
1	16.47%	13.71%	13.81%	11.34%	14.20%	22.58%	7.89%	100%
2	7.46%	13.14%	18.76%	10.65%	19.59%	25.44%	4.97%	100%
3	3.21%	7.88%	23.13%	14.84%	24.53%	22.81%	3.60%	100%
4	2.46%	4.40%	13.73%	22.70%	29.31%	22.9%	4.48%	100%
5	1.14%	2.64%	8.60%	10.16%	35.33%	37.82%	4.30%	100%
6	0.62%	1.41%	3.71%	4.06%	19.74%	61.01%	9.45%	100%
7	0.92%	0.69%	1.33%	1.99%	7.50%	43.72%	43.85%	100%
% Total	1.54%	2.77%	7.14%	7.60%	22.45%	46.38%	12.12%	100%
#Obs	(1,232)	(2,060)	(5,133)	(5,835)	(16,450)	(33,797)	(10,069)	(74,576)

Table 2
The Determinants of Job Satisfaction in the U.K. (BHPS, Waves 1-15)

	Specification I *COLS*	**Specification II** *COLS Random Effects*		**Specification I** *COLS*	**Specification II** *COLS Random Effects*
LEARNINGS	0.081***	0.113***	TRADE	-0.018	-0.037**
	[0.009]	[0.008]		[0.020]	[0.015]
MEAN[LEARNINGS]	-	-0.072***	HOTELS	0.002	-0.018
		[0.010]		[0.024]	[0.019]
PERMANENT[LEARNINGS]^	-	0.041***	TRANSCOM	-0.071***	-0.033*
		[0.009]		[0.025]	[0.019]
LHOURS	-0.128***	-0.129***	FINANCE	-0.099***	-0.080***
	[0.017]	[0.012]		[0.024]	[0.019]
PDOVERTIME	0.006***	0.007***	BUSINESS	-0.039*	-0.032**
	[0.002]	[0.001]		[0.021]	[0.016]
LNKIDS	0.015***	0.013***	PUBLIC	0.001	0.002
	[0.003]	[0.002]		[0.022]	[0.017]
MALE	-0.104***	-0.094***	EDUCATION	0.025	0.026
	[0.010]	[0.010]		[0.024]	[0.018]
FULLTIME	-0.085***	-0.051***	HEALTH	0.050**	0.019
	[0.015]	[0.011]		[0.022]	[0.017]
AGE	-0.022***	-0.012***	OTHERIND	-0.012	-0.007
	[0.003]	[0.002]		[0.028]	[0.020]
AGESQ/1,000	0.295***	0.173***	PRIVATE	0.254***	0.106*
	[0.035]	[0.027]		[0.075]	[0.055]
NEWJOB	0.081***	0.135***	EXTRATERR	-0.055	-0.067*
	[0.008]	[0.007]		[0.051]	[0.038]
NEWPOST	0.086***	0.102***	RSEAST	0.042**	0.059***
	[0.007]	[0.006]		[0.018]	[0.016]
WHITE	0.028*	0.033**	EASTANGLIA	0.100***	0.113***
	[0.014]	[0.014]		[0.030]	[0.025]
CMARRIED	0.030***	0.012*	SWEST	0.066***	0.062***
	[0.009]	[0.007]		[0.021]	[0.019]
TRUNION	-0.049***	-0.023***	WMIDLANDS	0.069***	0.073***
	[0.009]	[0.006]		[0.022]	[0.020]
PRIVATE	-0.026**	-0.050***	EMIDLANDS	0.106***	0.096***
	[0.012]	[0.009]		[0.021]	[0.020]
HIGHDEGR	0.02	0.01	YORK&HUMBER	0.078***	0.086***
	[0.023]	[0.022]		[0.022]	[0.019]
HNDHNCTEACH	0.051***	0.039**	NWEST	0.050**	0.070***
	[0.017]	[0.017]		[0.021]	[0.019]
ALEVEL	0.067***	0.062***	NORTH	0.060**	0.062***
	[0.014]	[0.013]		[0.025]	[0.022]
OLEVEL	0.117***	0.105***	WALES	0.103***	0.127***
	[0.014]	[0.013]		[0.019]	[0.017]
CSE	0.151***	0.144***	SCOTLAND	0.037**	0.052***
	[0.022]	[0.020]		[0.018]	[0.016]
NOEDUC	0.194***	0.190***	W1992	-0.035***	-0.034***
	[0.018]	[0.016]		[0.013]	[0.012]
GOODHEALTH	-0.111***	-0.070***	W1993	-0.086***	-0.085***
	[0.007]	[0.005]		[0.014]	[0.012]

Table 2 continued in next page

Table 2 continued

POORHEALTH	-0.258***	-0.183***	W1995	-0.111***	-0.120***
	[0.018]	[0.012]		[0.015]	[0.012]
VPOORHEALTH	-0.240***	-0.180***	W1996	-0.090***	-0.103***
	[0.042]	[0.028]		[0.015]	[0.012]
FSIZE25_200	-0.067***	-0.040***	W1997	-0.077***	-0.091***
	[0.008]	[0.006]		[0.015]	[0.012]
FSIZE200_1000	-0.091***	-0.060***	W1998	-0.120***	-0.133***
	[0.011]	[0.008]		[0.014]	[0.012]
FSIZE_MT1000	-0.083***	-0.045***	W1999	-0.138***	-0.158***
	[0.013]	[0.010]		[0.015]	[0.011]
SKILNONMAN	0.008	-0.011	W2000	-0.133***	-0.157***
	[0.012]	[0.009]		[0.014]	[0.011]
UNSKILNONMAN	-0.022*	-0.044***	W2001	-0.120***	-0.147***
	[0.012]	[0.009]		[0.014]	[0.012]
UNSKILMAN	-0.074***	-0.102***	W2002	-0.142***	-0.171***
	[0.015]	[0.011]		[0.015]	[0.012]
AGRIFISH	0.077***	0.051**	W2003	-0.149***	-0.181***
	[0.028]	[0.021]		[0.015]	[0.012]
MINEQUARRY	0.01	0.004	W2004	-0.123***	-0.156***
	[0.039]	[0.032]		[0.015]	[0.012]
MANUFACTURING	-0.047**	-0.044***	W2005	-0.134***	-0.170***
	[0.019]	[0.014]		[0.015]	[0.013]
UTILITIES	-0.115***	-0.059**	CONSTANT	1.121***	1.162***
	[0.039]	[0.029]		[0.077]	[0.073]
No. of Observations	71583	71583	Between R2	-	0.095
No. of Individuals	10903	10903	Sigma	-	0.609
Wald x2	F=31.39***	2949.2***	Sigma u	-	0.357
Overall R2	0.068	0.063	Sigma e	-	0.493
Within R2	-	0.028	Rho	-	0.343

Notes:

* p<0.10, ** p<0.05, *** p<0.01

^ The coefficient and standard error of PERMANENT[LEARNINGS] is derived from a test of the linear constraint that $\beta_{\text{LEARNINGS}}+\tilde{\beta}_{\text{MEAN[LEARNINGS]}}=0$.

Table 3
Job Satisfaction with Reference Earnings (BHPS, Waves 1-15)

	Panel A		Panel B	
	Specification 1	**Specification 2**	**Specification 1**	**Specification 2**
	COLS	***COLS***	***COLS***	***COLS***
		Random Effects		***Random Effects***
LEARNINGS	0.056***	0.086***	0.060***	0.102***
	[0.010]	[0.008]	[0.010]	[0.009]
MEAN[LEARNINGS]		-0.010	-	-0.054***
		[0.016]		[0.015]
PERMANENT[LEARNINGS]		0.076***	-	0.049***
		[0.014]		[0.013]
Ref. Earnings Measure I: BHPS (Waves 1-15)				
REFEARNINGS[BHPS]	-0.050***	0.065***	-	-
	[0.017]	[0.014]		
MEAN[REFEARNINGS]		-0.160***	-	-
		[0.020]		
PERMANENT[REFEARNINGS]		-0.096***	-	-
		[0.020]		
Ref. Earnings Measure II: ASHE (Waves 7-15)				
REFEARNINGS[ASHE]	-	-	-0.048**	0.031**
			[0.020]	[0.015]
MEAN[REFEARNINGS]	-	-	-	-0.093***
				[0.020]
PERMANENT[REFEARNINGS]	-	-	-	-0.062***
				[0.022]
LHOURS	-0.100***	-0.117***	-0.095***	-0.091***
	[0.017]	[0.012]	[0.019]	[0.014]
MALE	-0.096***	-0.062***	-0.077***	-0.044***
	[0.011]	[0.011]	[0.011]	[0.011]
CMARRIED	0.036***	0.013*	0.038***	0.024***
	[0.009]	[0.007]	[0.010]	[0.008]
LNKIDS	0.016***	0.013***	0.013***	0.013***
	[0.003]	[0.002]	[0.003]	[0.003]
AGE	-0.020***	-0.012***	-0.021***	-0.018***
	[0.003]	[0.002]	[0.003]	[0.003]
AGESQ/1,000	0.290***	0.181***	0.279***	0.253***
	[0.036]	[0.028]	[0.038]	[0.033]
CONSTANT	1.527***	1.594***	1.400***	1.476***
	[0.106]	[0.091]	[0.132]	[0.122]
No. of Observations	69,268	69,268	49,335	49,335
No. of Individuals	10,758	10,758	9,568	9,568
Overall R2	0.063	0.060	0.056	0.053
Wald x2		2753.6***		1915.9***

Notes:
- Comments in Table 2 apply.
- Specifications include: TRUNION, PRIVATE, WHITE, PDOVERTIME, FULLTIME, NEWJOB, NEWPOST, and dummy variables for: HEALTH STATUS [4], FIRM SIZE [3], OCCUPATION [3], INDUSTRY [15], REGION [10], WAVE [14].
- Standard Errors are bootstrapped based on 1,000 replications.

Table 4
Interaction Effects

Interaction with {VARIABLE}:	***Specif.***	***{VARIABLE}***		***LEARNINGSx{VARIABLE}***		***REFEARNINGS x{VARIABLE}***		***#Obs.***	***Controls***
		Coef.	***S.E.***	***Coef.***	***S.E.***	***Coef.***	***S.E.***	***(#Groups)***	
(A) {VOLATILITY}	(1): COLS	-0.448**	[0.218]	-0.049	[0.044]	0.118**	[0.052]	69,249	LEARNINGS; REFEARNINGS;
	(2): COLS-R.E.	-0.422**	[0.183]	-0.039	[0.031]	0.102***	[0.039]	(10,747)	LEARNINGS; REFEARNINGS; Mundlak Terms
	(3): COLS-R.E.	-0.604**	[0.238]	-0.048	[0.035]	0.071*	[0.039]		LEARNINGS; REFEARNINGS; Mundlak Terms; Interactions with Mundlak Terms
(B) {YOUNG}	(1): COLS	-0.526***	[0.083]	0.030*	[0.017]	0.045**	[0.020]	69,268	LEARNINGS; REFEARNINGS;
	(2): COLS-R.E.	-0.281***	[0.063]	0.013	[0.013]	0.025*	[0.015]	(10,758)	LEARNINGS; REFEARNINGS; Mundlak Terms
	(3): COLS-R.E.	-0.119	[0.078]	0.023	[0.016]	0.066***	[0.020]		LEARNINGS; REFEARNINGS; Mundlak Terms; Interactions with Mundlak Terms
(C) {NEWJOB}	(1): COLS	-0.258***	[0.093]	-0.017	[0.021]	0.068***	[0.024]	69,268	LEARNINGS; REFEARNINGS;
{NEWPOSITION}		-0.234***	[0.074]	-0.015	[0.018]	0.062***	[0.021]	(10,758)	
{NEWJOB}	(2): COLS-R.E.	-0.157**	[0.075]	-0.003	[0.017]	0.048**	[0.020]		LEARNINGS; REFEARNINGS; Mundlak Terms
{NEWPOSITION}		0.029	[0.062]	-0.010	[0.015]	0.020	[0.018]		
{NEWJOB}	(3): COLS-R.E.	-0.020	[0.085]	0.035	[0.022]	0.096***	[0.028]		LEARNINGS; REFEARNINGS; Mundlak Terms;
{NEWPOSITION}		0.147**	[0.071]	-0.009	[0.020]	0.081***	[0.025]		Interactions with Mundlak Terms
(D) {BETTER EXPECTATIONS}	(1): COLS	-0.504***	[0.068]	0.037**	[0.015]	0.040**	[0.018]	69,268	LEARNINGS; REFEARNINGS;
{WORSE EXPECTATIONS}		0.057	[0.113]	-0.020	[0.025]	-0.014	[0.030]	(10,758)	
{BETTER EXPECTATIONS}	(2): COLS-R.E.	-0.324***	[0.053]	0.020	[0.012]	0.030**	[0.014]		LEARNINGS; REFEARNINGS; Mundlak Terms
{WORSE EXPECTATIONS}		0.054	[0.084]	-0.017	[0.020]	-0.007	[0.023]		
{BETTER EXPECTATIONS}	(3): COLS-R.E.	-0.288***	[0.060]	0.010	[0.017]	0.054***	[0.021]		LEARNINGS; REFEARNINGS; Mundlak Terms;
{WORSE EXPECTATIONS}		0.063	[0.092]	-0.039	[0.029]	0.010	[0.036]		Interactions with Mundlak Terms

Notes:
- * p<0.10, ** p<0.05, *** p<0.01
- Comparison groups are SAMEJOB and SAME EXPECTATIONS.
- The rest of the control variables are similar to Table 3, and comments on that Table apply here.

Table 5.1
Differences in the Impact of Reference Earnings:
Contractual Arrangements

	Increments		**No Increments**	
	COLS	***COLS-RE***	***COLS***	***COLS-RE***
LEARNINGS	0.046***	0.074***	0.071***	0.095***
	[0.014]	[0.013]	[0.013]	[0.011]
MEAN[LEARNINGS]	-	-0.003	-	-0.007
		[0.021]		[0.020]
PERMANENT[LEARNINGS]	-	0.071***	-	0.088***
		[0.019]		[0.018]
REFEARNINGS	-0.110***	0.011	-0.035	0.059***
	[0.023]	[0.021]	[0.023]	[0.020]
MEAN[REFEARNINGS]	-	-0.145***	-	-0.166***
		[0.026]		[0.026]
PERMANENT[REFEARNINGS]	-	-0.135***	-	-0.107***
		[0.026]		[0.026]
LHOURS	-0.048*	-0.070***	-0.136***	-0.141***
	[0.026]	[0.019]	[0.021]	[0.016]
No. of Observations	32,952		36,316	
No. of Individuals	7,996		8,626	

Notes:
Comments in Table 3 apply.

Table 5.2
Differences in the Impact of Reference Earnings: Job Mobility

	Same Job		**New Job**	
	COLS	***COLS-RE***	***COLS***	***COLS-RE***
LEARNINGS	0.064***	0.080***	0.044***	0.083***
	[0.012]	[0.010]	[0.014]	[0.016]
MEAN[LEARNINGS]	-	-0.007	-	-0.012
		[0.018]		[0.024]
PERMANENT[LEARNINGS]	-	0.073***	-	0.071***
		[0.016]		[0.020]
REFEARNINGS	-0.065***	0.027	-0.021	0.118***
	[0.021]	[0.017]	[0.024]	[0.026]
MEAN[REFEARNINGS]	-	-0.122***	-	-0.199***
		[0.023]		[0.030]
PERMANENT[REFEARNINGS]	-	-0.095***	-	-0.081***
		[0.023]		[0.029]
LHOURS	-0.111***	-0.118***	-0.085***	-0.105***
	[0.020]	[0.015]	[0.024]	[0.022]
No. of Observations	50,623		18,645	
No. of Individuals	9,890		7,891	

Notes:
Comments in Table 3 apply.

Table 5.3
Differences in the Impact of Reference Earnings:
Expectations about Financial Situation in the year ahead

	Better Expectations		**Same/Worse Expectations**	
	COLS	***COLS-RE***	***COLS***	***COLS-RE***
LEARNINGS	0.085***	0.110***	0.043***	0.071***
	[0.014]	[0.014]	[0.012]	[0.010]
MEAN[LEARNINGS]	-	0.010	-	-0.015
		[0.023]		[0.018]
PERMANENT[LEARNINGS]	-	0.119***	-	0.056***
		[0.020]		[0.017]
REFEARNINGS	-0.021	0.124***	-0.066***	0.028
	[0.024]	[0.024]	[0.021]	[0.017]
MEAN[REFEARNINGS]	-	-0.203***		-0.132***
		[0.030]		[0.023]
PERMANENT[REFEARNINGS]	-	-0.079***		-0.104***
		[0.029]		[0.023]
LHOURS	-0.089***	-0.119***	-0.100***	-0.097***
	[0.026]	[0.022]	[0.020]	[0.015]
No. of Observations	23,472		45,796	
No. of Individuals	7,980		9,535	

Notes:
Comments in Table 3 apply.

APPENDIX 1: Variable Definitions and Description

Table A1.1
Variable Definitions and Descriptive Statistics

British Household Panel Survey, 1991-2005, Total of 11,152 individuals – 74,833 observations

Variable Name	***Definition***	***Mean***	***(S.D.)***
JOBSAT	Categorical response to the question: "Overall, from a scale of 1 to 7 (1 indicating completely dissatisfied, and 7 completely satisfied), how satisfied are you with your job as a whole?"	5.36	(1.32)
JS_COLS	Cardinal Transformation of job satisfaction responses	0.59	(0.62)
LEARNINGS	Logarithm of respondent's usual gross pay per month in current job, transformed in 1991 British pounds using the ONS GDP Deflator	6.74	(0.73)
REFEARNINGS	Predicted values from an earnings equation (Broad specification - Main)	6.76	(0.61)
REFASHEARNINGS	Average Weekly Earnings, by year, region, gender, full-time/part-time status, 2-digit industry and 2-digit occupation codes (Source: Annual Survey of Hours and Earnings, years 1997-2004)	5.45	(0.51)
LHHINCOME	Logarithm of equivalized annual household income in 1991 £U.K.	9.80	(0.53)
LHOURS	Logarithm of the number of hours normally worked per week	3.48	(0.40)
POVERTIME	Logarithm of the number of hours worked per week as paid overtime	-1.25	(1.85)
LKIDS	Logarithm of the number of children in household	-1.16	(1.40)
VOLATILITY	Standard deviation of individual log equivalized household incomes through sample lifetime	0.27	(0.19)
INCREMENTS	DV= 1 if one's pay includes negotiated annual increments, 0 if not	47.47%	(0.50)
FEXPBETTER	DV= 1 if the respondent says he/she thinks he/she will be better off financially in a year from now	34.70%	(0.48)
FEXPSAME	DV= 1 if the respondent thinks her financial situation will be about the same in a year from now	53.67%	(0.50)
FEXPWORSE	DV= 1 if the respondent says he/she thinks he/she will be worse off financially in a year from now	8.59%	(0.28)
FEXPDK/DA	DV= 1 if the respondent says he/she doesn't know what his financial situation will be in a year ahead, compared to the present, 0 otherwise	3.04%	(0.17)
MALE	DV=1 if respondent is male, 0 if female	48.70%	(0.50)
FULLTIME	DV= 1 if the respondent is employed full time (30 hours+), 0 if not	80.83%	(0.39)
AGE	Age of the respondent at 1st December of the previous year	38.03	(10.90)
YOUNG	DV= 1 if the respondent is less than 35 years of age	40.61%	(0.49)
AGE2029	DV= 1 if the respondent is between 20 and 29 years of age	23.65%	(0.42)
AGE3039	DV= 1 if the respondent is between 30 and 39 years of age	29.41%	(0.46)
AGE4049	DV= 1 if the respondent is between 40 and 49 years of age	26.33%	(0.44)
AGE5060	DV= 1 if the respondent is between 50 and 60 years of age	18.17%	(0.39)
NEWJOB	DV=1 if the respondent started current post after 1-9-(Year-1) and has had at least one different employer since last year	12.47%	(0.33)
NEWPOSITION	DV=1 if the respondent started current post after 1-9-(Year-1) and has not changed employer	16.70%	(0.37)
SAMEJOB	DV=1 if the respondent started current job before 1-9-(Year-1)	70.83%	(0.45)
WHITE	DV= 1 if the respondent belongs to a white ethnic group, 0 if else	91.40%	(0.28)
CMARRIED	DV= 1 if resp. is cohabiting or married at present, 0 if single, divorced or separated	73.82%	(0.44)
TRUNION	DV=1 if there is a union or staff association at the workplace, 0 if not	51.48%	(0.50)
PRIVATE	DV= 1 if respondent is employed by private firm/company, 0 otherwise	67.47%	(0.47)
JBTIME	DV= 1 if respondent is working during daytime, 0 otherwise	75.58%	(0.43)
PENSIONMEMB	DV1 if the respondent is a member of an employer's pension scheme	55.00%	(0.50)
PERMJOB	DV=1 if the respondent's current job is permanent, 0 if seasonal or temporary	94.71%	(0.22)
MANAGER	DV=1 if the respondent has managerial or supervisory duties in current job	37.76%	(0.48)
BONUS	DV=1 if pay in the last 12 months includes bonuses or profit shares, 0 if not	30.52%	(0.46)
HIGHDEGR	DV=1 if highest educational qualification obtained is: "Higher Degree"	3.10%	(0.17)
UNIVDEGREE	DV=1 if highest educational qualification obtained is: "First Degree"	13.30%	(0.34)
HNDHNCTEACH	DV=1 if highest educational qualification obtained is: "HND, HNC, Teaching"	8.35%	(0.28)
ALEVEL	DV=1 if highest educational qualification obtained is: "A-Level"	21.31%	(0.41)
OLEVEL	DV=1 if highest educational qualification obtained is: "O-Level"	29.39%	(0.46)
CSE	DV=1 if highest educational qualification obtained is: "CSE"	6.29%	(0.24)
NOEDUC	DV=1 if highest educational qualification obtained is: "None of these"	18.26%	(0.39)
EXCHEALTH	DV=1 if individual assesses health over the last 12 months as "Excellent"	28.18%	(0.45)
GOODHEALTH	DV=1 if individual assesses health over the last 12 months as "Good"	50.92%	(0.50)
FAIRHEALTH	DV=1 if individual assesses health over the last 12 months as "Fair"	16.57%	(0.37)
POORHEALTH	DV=1 if individual assesses health over the last 12 months as "Poor"	3.77%	(0.19)
VPOORHEALTH	DV=1 if individual assesses health over the last 12 months as "Very Poor"	0.57%	(0.07)
FSIZE1_25	DV=1 if no. of employees at the workplace is less than 25	33.48%	(0.47)
FSIZE25_200	DV=1 if no. of employees at the workplace is between 25 and 200	36.79%	(0.48)
FSIZE200_1000	DV=1 if no. of employees at the workplace is between 200 and 1,000	19.29%	(0.39)

FSIZE_MT1000	DV=1 if no. of employees at the workplace is more than 1,000	10.32%	(0.30)
SKILMAN	DV=1 if resp. occupation is: “associate professionals & technical occupations”	11.80%	(0.32)
SKILNONMAN	DV=1 if main occupation is: “managers & administrators”, “professionals”, “craft & related occ.”	34.98%	(0.48)
UNSKNONMAN	DV=1 if main occupation is: “clerical & secretarial”, “personal & protective service”, “sales”, 0 else	36.94%	(0.48)
UNSKMAN	DV=1 if main occupation is: “plant & machine operatives”, “other occupations”	16.28%	(0.37)
AGRIFISH	DV=1 if SIC92 industry code of main job is A or B: “Agriculture, Hunting and Forestry” or “Fishing”	2.22%	(0.15)
MINEQUARRY	DV=1 if SIC92 industry code of main job is C: “Mining and Quarrying”	0.71%	(0.08)
MANUFACTURING	DV=1 if SIC92 industry code of main job is D: “Manufacturing”	25.31%	(0.43)
UTILITIES	DV=1 if SIC92 industry code of main job is E: “Electricity, Gas and Water Supply”	1.05%	(0.10)
CONSTRUCTION	DV=1 if SIC92 industry code of main job is F: “Construction”	3.83%	(0.19)
TRADE	DV=1 if SIC92 industry code of main job is G: “Wholesale and Retail Trade”	14.03%	(0.35)
HOTELS	DV=1 if SIC92 industry code of main job is H: “Hotels and Restaurants”	3.93%	(0.19)
TRANSCOM	DV=1 if SIC92 code of main job is I: “Transport, Storage and Communication”	5.02%	(0.22)
FINANCE	DV=1 if SIC92 industry code of main job is J: “Financial Intermediation”	5.54%	(0.23)
BUSINESS	DV=1 if SIC92 industry code of main job is K: “Real Estate, Renting and Business”	9.05%	(0.29)
PUBLIC	DV=1 if SIC92 industry code of main job is L: “Public Administration and Defense”	7.85%	(0.27)
EDUCATION	DV=1 if SIC92 industry code of main job is M: “Education”	8.01%	(0.27)
HEALTH	DV=1 if SIC92 industry code of main job is N: “Health and Social Work”	9.56%	(0.29)
OTHERIND	DV=1 if SIC92 code of main job is O: “Other Community, Social & Personal Service Activities”	3.27%	(0.18)
PRIVATE	DV=1 if SIC92 industry code of main job is P: “Private Households with Employees”	0.28%	(0.05)
EXTRATERR	DV=1 if SIC92 industry code of main job is Q: “Extra-territorial Organizations and Bodies”	0.32%	(0.06)
GLONDON	DV=1 if region of inhabitancy is: “Inner London”, “Outer London”, 0 if else	7.87%	(0.27)
RSEAST	DV=1 if region of inhabitancy is: “R. of South East”, 0 if else	16.73%	(0.37)
EASTANGLIA	DV=1 if region of inhabitancy is: “East Anglia”, 0 if else	3.28%	(0.18)
SWEST	DV=1 if region of inhabitancy is: “South West”, 0 if else	7.69%	(0.27)
WMIDLANDS	DV=1 if region of inhabitancy is: “West Midlands”, “R. of West Midlands”	7.29%	(0.26)
EMIDLANDS	DV=1 if region of inhabitancy is: “East Midlands”, 0 if else	7.17%	(0.26)
YORK&HUMBER	DV=1 if region of inhabitancy is: “South Yorkshire”, “West Yorkshire”, “R. of Yorks & Humber”	7.85%	(0.27)
NWEST	DV=1 if region of inhabitancy is: “Greater Manchester”, “Merseyside”, “R. of North West”, 0 if else	9.03%	(0.29)
NORTH	DV=1 if region of inhabitancy is: “Tyne & Wear”, “R. of North”, 0 if else	5.28%	(0.22)
WALES	DV=1 if region of inhabitancy is: “Wales”, 0 if else	11.68%	(0.32)
SCOTLAND	DV=1 if region of inhabitancy is: “Scotland”, 0 if else	16.13%	(0.37)
WAVE1	DV(1/0) equal to 1 in Wave 1 of BHPS, 0 in other waves	4.82%	(0.21)
WAVE2	DV(1/0) equal to 1 in Wave 2 of BHPS, 0 in other waves	5.43%	(0.23)
WAVE3	DV(1/0) equal to 1 in Wave 3 of BHPS, 0 in other waves	5.24%	(0.22)
WAVE4	DV(1/0) equal to 1 in Wave 4 of BHPS, 0 in other waves	5.31%	(0.22)
WAVE5	DV(1/0) equal to 1 in Wave 5 of BHPS, 0 in other waves	5.34%	(0.22)
WAVE6	DV(1/0) equal to 1 in Wave 6 of BHPS, 0 in other waves	5.59%	(0.23)
WAVE7	DV(1/0) equal to 1 in Wave 7 of BHPS, 0 in other waves	6.26%	(0.24)
WAVE8	DV(1/0) equal to 1 in Wave 8 of BHPS, 0 in other waves	6.39%	(0.24)
WAVE9	DV(1/0) equal to 1 in Wave 9 of BHPS, 0 in other waves	8.49%	(0.28)
WAVE10	DV(1/0) equal to 1 in Wave 10 of BHPS, 0 in other waves	8.93%	(0.29)
WAVE11	DV(1/0) equal to 1 in Wave 11 of BHPS, 0 in other waves	8.73%	(0.28)
WAVE12	DV(1/0) equal to 1 in Wave 12 of BHPS, 0 in other waves	7.87%	(0.27)
WAVE13	DV(1/0) equal to 1 in Wave 13 of BHPS, 0 in other waves	7.65%	(0.27)
WAVE14	DV(1/0) equal to 1 in Wave 14 of BHPS, 0 in other waves	7.46%	(0.26)
WAVE15	DV(1/0) equal to 1 in Wave 15 of BHPS, 0 in other waves	6.47%	(0.25)

APPENDIX 2: Construction of Reference Earnings Measures

This appendix provides a detailed description of both reference earnings measures used in this study. The first and main measure consists of predictions from cross-sectional BHPS monthly earnings estimates for the years 1991-2005. The second measure is derived from cross-sectional ASHE weekly earnings estimates for the years 1997-2005, and its main purpose is to ensure the robustness of the findings.

Measure 1: ***BHPS Reference Earnings***

For reasons of comparability with the previous literature, the main measure of reference earnings in this paper is derived by obtaining the predicted values from cross-sectional earnings estimations. Thus, a standard earnings equation of the following form is estimated:

$$\ln(W_i) = \sum_k \theta_k x_{ik} + + u_i$$

for each of the 15 available waves of the British Household Panel Survey, where W_i indicates usual gross monthly earnings in 1991 values, deflated by using the Office of National Statistics GDP deflator released by the Treasury. x_k indicates k individual and job related characteristics and u is the error term. The specification used is similar to Clark and Oswald (1996). Following Layard, (2003) who proposes that individuals compare their earnings and not their hours of work, usual weekly work hours are not included in the x_k vector. This exclusion also mitigates the multicollinearity in the subsequent job satisfaction estimation. The specification includes: MALE, CMARRIED, LKIDS, FULLTIME, JBTIME, PERMANENT, BONUS, INCREMENTS, UNION, MANAGER, PENSION, as well as dummy variables for: age group (4), education (7), health status (5), firm size (4), occupation (76; 2-digit 2000 SOC codes), industry (60; 2-digit 1992 SIC codes), and geographical regions (11). Results are standard and estimates for random years are presented below, for illustration purposes and space considerations.

Table A2.1
Cross-Sectional Earnings Estimates for BHPS Earnings (Waves 1-15)

Dependent Variables: LEARNINGS

	1991		1992-1995	**1996**		1997-1999	**2000**		2001-2004	**2005**	
	Coef.	***S.E.***		***Coef.***	***S.E.***		***Coef.***	***S.E.***		***Coef.***	***S.E.***
CONSTANT	5.814***	[0.090]	…	5.845***	[0.078]	…	6.165***	[0.093]	…	6.287***	[0.093]
AGE3039	0.119***	[0.019]	…	0.152***	[0.018]	…	0.106***	[0.014]	…	0.122***	[0.017]
AGE4049	0.113***	[0.020]	…	0.165***	[0.019]	…	0.140***	[0.015]	…	0.151***	[0.017]
AGE5060	0.088***	[0.026]	…	0.151***	[0.024]	…	0.087***	[0.019]	…	0.156***	[0.020]
MALE	0.266***	[0.020]	…	0.232***	[0.016]	…	0.203***	[0.013]	…	0.153***	[0.015]
CMARRIED	0.100***	[0.017]	…	0.070***	[0.016]	…	0.032***	[0.012]	…	0.041***	[0.015]
LKIDS	-0.014***	[0.006]	…	-0.010*	[0.005]	…	0.004	[0.004]	…	-0.001	[0.005]
FULLTIME	0.747***	[0.028]	…	0.749***	[0.025]	…	0.676***	[0.019]	…	0.665***	[0.022]
JBTIME	-0.021	[0.019]	…	-0.044**	[0.018]	…	-0.064***	[0.014]	…	-0.031	[0.019]
PERMANENT	0.148***	[0.042]	…	0.130***	[0.036]	…	0.142***	[0.033]	…	0.061	[0.053]
BONUS	0.061***	[0.016]	…	0.044***	[0.014]	…	0.060***	[0.011]	…	0.058***	[0.014]
INCREMENTS	0.046***	[0.014]	…	0.025*	[0.014]	…	0.021*	[0.012]	…	0.034**	[0.013]
UNION	0.049***	[0.018]	…	0.074***	[0.017]	…	0.034***	[0.013]	…	0.022	[0.016]
MANAGER	0.162***	[0.016]	…	0.144***	[0.015]	…	0.145***	[0.012]	…	0.159***	[0.014]
PENSION	0.134***	[0.017]	…	0.155***	[0.016]	…	0.171***	[0.012]	…	0.150***	[0.016]
HIGHDEGR	0.124**	[0.051]	…	0.083*	[0.046]	…	0.076***	[0.029]	…	0.072**	[0.035]
HNDHNCTEACH	-0.043	[0.031]	…	-0.042	[0.026]	…	-0.084***	[0.020]	…	-0.080***	[0.026]
ALEVEL	-0.145***	[0.029]	…	-0.123***	[0.026]	…	-0.158***	[0.018]	…	-0.130***	[0.021]
OLEVEL	-0.196***	[0.030]	…	-0.130***	[0.025]	…	-0.197***	[0.019]	…	-0.197***	[0.022]
CSE	-0.168***	[0.040]	…	-0.187***	[0.035]	…	-0.217***	[0.026]	…	-0.231***	[0.029]
NOEDUC	-0.236***	[0.033]	…	-0.236***	[0.030]	…	-0.286***	[0.022]	…	-0.271***	[0.027]
GOODHEALTH	-0.022	[0.015]	…	-0.024*	[0.015]	…	-0.004	[0.012]	…	-0.022	[0.015]
FAIRHEALTH	-0.026	[0.021]	…	-0.012	[0.020]	…	-0.046***	[0.015]	…	-0.055***	[0.018]
POORHEALTH	-0.001	[0.038]	…	-0.079**	[0.035]	…	-0.050*	[0.027]	…	-0.058*	[0.031]
VPOORHEALTH	-0.109	[0.097]	…	-0.071	[0.097]	…	-0.122**	[0.061]	…	-0.217***	[0.077]
FSIZE25_200	0.114***	[0.018]	…	0.095***	[0.017]	…	0.078***	[0.013]	…	0.069***	[0.016]
FSIZE200_1000	0.133***	[0.021]	…	0.102***	[0.019]	…	0.117***	[0.015]	…	0.105***	[0.019]
FSIZE_MT1000	0.134***	[0.025]	…	0.135***	[0.024]	…	0.160***	[0.018]	…	0.131***	[0.023]
OCCUPATION DUMMIES[75]	(+)		…	(+)		…	(+)		…	(+)	
INDUSTRY DUMMIES [59]	(+)		…	(+)		…	(+)		…	(+)	
REGION DUMMIES[10]	(+)		…	(+)		…	(+)		…	(+)	
No. of Individuals	3,454			4,018			6,378			4,289	
R-squared	0.751			0.736			0.695			0.698	
F-statistic	83.5***			73.2***			90.4***			68.0***	

Notes:
- * p<0.10, ** p<0.05, *** p<0.01. Standard Errors are robust.
- Earnings are deflated by the ONS GDP Deflator, released by the Department of Treasury (Base Year: 1991)
http://www.hm-treasury.gov.uk./Economic_Data_and_Tools/GDP_Deflators/data_gdp_index.cfm
- Reference groups are: AGE2029, UNIVDEGR, EXCHEALTH, FSIZE1_25, GLONDON

Measure 2: ***ASHE Reference Earnings***

The construction of this measure required the merging of the BHPS data to another database, the Annual Survey of Hours and Earnings (ASHE). The Annual Survey of Hours and Earnings (ASHE) is a new survey developed to replace the New Earnings Survey (NES) from 2004, including improvements to the coverage of employees, imputation for item non-response and the weighting of earnings estimates. Data from 1997 to 2003 have been transformed to a common format as the 2004 and 2005 data. Data prior to 1997 and after 2005 are discontinuous with the 2004 results. ASHE provides information about the levels, distribution and make-up of earnings and hours worked for employees in all industries and occupations. The data is available from the Office of National Statistics. The measure of reference earnings obtained comprises of average weekly earnings cells, created in 3 steps:

Step 1: Appending yearly data of average gross weekly earnings by government office region (11 geographical areas, similar to our areas from the BHPS), gender, full-time/part-time status and 2-digit SIC codes. The years available in a standardized format are 1997 to 2005. Merging data to BHPS by region, gender, full-time/part-time status and 2-digit SIC codes.

Step 2: Appending yearly data of average gross weekly earnings by government office region, gender, full-time/part-time status and 2-digit SOC codes. Merging data to BHPS by region, gender, full-time/part-time status and 2-digit SOC codes.

Step 3: Computation of the mean weekly earnings by 2-digit industry and 2-digit occupation for each observation in the BHPS dataset, and the years 1997 to 2005. This merging exercise provides with 31,422 observations of average weekly earnings, out of the 51,075 observations for these years in the BHPS. To impute the missing values, 8 cross-sectional regressions were estimated for the logarithm of 1991 real weekly earnings. The set of controls includes: MALE, FULLTIME, and dummies for region (11), occupation (76; 2-digit SOC), and industry (59; 2-digit SIC). Predicted values were obtained, rendering 50,635 observations. These regressions are presented below.

Table A2.2
Cross-Sectional Earnings Estimates for ASHE Earnings (1997-2005)

Dependent Variables: LASHERNINGS

	1997	***1998***	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***	***2005***
MALE	0.295***	0.296***	0.285***	0.284***	0.281***	0.247***	0.226***	0.195***	0.207***
	[0.004]	[0.004]	[0.003]	[0.004]	[0.003]	[0.006]	[0.006]	[0.005]	[0.005]
FULLTIME	0.854***	0.850***	0.838***	0.829***	0.833***	0.868***	0.857***	0.888***	0.877***
	[0.006]	[0.007]	[0.006]	[0.007]	[0.007]	[0.009]	[0.008]	[0.007]	[0.007]
RSEAST	-0.172***	-0.166***	-0.158***	-0.166***	-0.167***	-0.161***	-0.170***	-0.129***	-0.069***
	[0.006]	[0.007]	[0.007]	[0.008]	[0.007]	[0.013]	[0.013]	[0.010]	[0.009]
EASTANGLIA	-0.210***	-0.200***	-0.189***	-0.208***	-0.226***	-0.215***	-0.212***	-0.012	0.204***
	[0.008]	[0.009]	[0.008]	[0.010]	[0.009]	[0.015]	[0.015]	[0.015]	[0.018]
SWEST	-0.260***	-0.257***	-0.262***	-0.266***	-0.265***	-0.279***	-0.264***	-0.149***	-0.012
	[0.007]	[0.007]	[0.007]	[0.009]	[0.008]	[0.013]	[0.013]	[0.011]	[0.011]
WMIDLANDS	-0.254***	-0.244***	-0.238***	-0.260***	-0.255***	-0.286***	-0.287***	-0.187***	-0.066***
	[0.006]	[0.007]	[0.007]	[0.008]	[0.008]	[0.014]	[0.014]	[0.012]	[0.012]
EMIDLANDS	-0.262***	-0.263***	-0.257***	-0.275***	-0.290***	-0.289***	-0.285***	-0.184***	-0.065***
	[0.007]	[0.007]	[0.007]	[0.008]	[0.008]	[0.014]	[0.014]	[0.011]	[0.010]
YORK&HUMBER	-0.263***	-0.257***	-0.260***	-0.281***	-0.280***	-0.290***	-0.263***	-0.179***	-0.064***
	[0.007]	[0.007]	[0.007]	[0.009]	[0.008]	[0.013]	[0.013]	[0.011]	[0.010]
NWEST	-0.232***	-0.233***	-0.239***	-0.256***	-0.266***	-0.241***	-0.251***	-0.155***	-0.038***
	[0.006]	[0.007]	[0.007]	[0.008]	[0.007]	[0.013]	[0.013]	[0.010]	[0.010]
NORTH	-0.283***	-0.294***	-0.288***	-0.303***	-0.322***	-0.297***	-0.294***	-0.213***	-0.078***
	[0.008]	[0.008]	[0.008]	[0.010]	[0.009]	[0.015]	[0.016]	[0.012]	[0.012]
WALES	-0.268***	-0.277***	-0.285***	-0.291***	-0.326***	-0.306***	-0.307***	-0.211***	-0.090***
	[0.008]	[0.009]	[0.007]	[0.008]	[0.008]	[0.013]	[0.013]	[0.011]	[0.010]
SCOTLAND	-0.255***	-0.241***	-0.238***	-0.257***	-0.268***	-0.255***	-0.253***	-0.158***	-0.037***
	[0.006]	[0.007]	[0.007]	[0.008]	[0.007]	[0.013]	[0.013]	[0.010]	[0.009]
CONSTANT	4.852***	4.918***	4.819***	5.078***	4.914***	4.866***	4.805***	4.884***	4.659***
	[0.020]	[0.014]	[0.017]	[0.032]	[0.017]	[0.022]	[0.037]	[0.038]	[0.024]
OCCUPATION DUMMIES [75]	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
INDUSTRY DUMMIES [58]	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
No. of Individuals	3,993	3,876	4,846	5,233	4,891	2,185	2,193	2,295	1,910
R-squared	0.979	0.976	0.976	0.975	0.973	0.975	0.977	0.980	0.983

Notes:
* p<0.10, ** p<0.05, *** p<0.01