

## **A Dynamic Model of the Relationship Between Income and Financial Satisfaction: Evidence from Ireland**

CAROL NEWMAN\*  
*Trinity College Dublin*

LIAM DELANEY\*\*  
BRIAN NOLAN\*\*\*  
*University College Dublin*

---

*Abstract:* The link between income and subjective satisfaction with one's financial situation is explored in this paper using a panel analysis of 1,998 individuals tracked through the course of the boom period in Ireland, 1994-2001. A dynamic ordered probit model which incorporates state dependence and controls for correlated individual effects and the initial conditions problem is applied. The impact of the level of household income, the time-path of income and deviations of individual income from reference group income and household income are all considered. To the extent that income influences financial satisfaction, there is strong evidence from this paper that the level of household income has the most important effect but this effect is lessened once persistence in the data is controlled for and is diminishing at higher income levels. Controlling for income and socio-economic characteristics, the positive deviations of household income from reference group income are found to have a positive effect on financial satisfaction as are positive deviations of individual income from household income.

### I INTRODUCTION

Studies modelling subjective well-being have become common in the Economics literature (Ferrer-i-Carbonell, 2005; Senik, 2004; Van Praag *et al.*, 2003; McBride, 2001). Few studies, however, have explicitly modelled the

\*Carol Newman is a Lecturer in Economics at Trinity College Dublin. Contact details: cnewman@tcd.ie

\*\*Corresponding Author: Liam Delaney is a Lecturer in Economics, UCD School of Economics and UCD School of Public Health and Population Science. Research Fellow UCD Geary Institute. Contact details: Liam.Delaney@ucd.ie Phone: +353-1-7164631.

\*\*\*Brian Nolan is a Professor in the School of Applied Social Science in University College Dublin. The Living in Ireland Survey was conducted by The Economic and Social Research Institute Survey Unit.

relationship between income and individuals' subjective well-being as measured by their *financial satisfaction* with Van Praag *et al.* (2003) being the only example to the authors' knowledge.<sup>1</sup> Understanding this link is important for economists and economic theory particularly given the emphasis placed on income as a measure of welfare and the general well-being of nations. Ireland represents an ideal natural experiment for analysing the link between income and financial satisfaction given its unprecedented rate of economic growth from the mid-nineties to the turn of the 21st century. While, the causes of this economic boom have been debated at length, the consequences have received less attention. In particular, the effect of the growth in incomes on the subjective well-being of the population as a whole over the course of this period has not been systematically analysed. This paper presents evidence from the Living in Ireland Panel dataset (Economic and Social Research Institute, 1994-2001) on 1,998 individuals tracked in Ireland for the period from 1994 to 2001.

The key contribution of this paper is that four different aspects of the relationship between income and *financial satisfaction* are simultaneously explored. In the vein of McBride (2001), we hypothesise that an individual's self appraisal of their financial situation will depend on four income comparison norms. First, the level of household income is considered. We hypothesise that higher levels of income will lead to higher levels of financial satisfaction. Second, the effect of reference group income on reported levels of financial satisfaction is explored by considering the relationship between the proportion of household income in household reference group income (measured as the average household income of individuals of the same age, gender, education level and marital status) and an individual's reported level of financial satisfaction. Third, we extend the notion of reference dependency by analysing the impact of intra-household reference group income, captured by the proportion of individual income in total household income. Finally, the transitory component of income is explored by considering how the time path of income, that is the change in an individual's income level from one period to another, affects the reported level of financial satisfaction.

An additional contribution of this paper is that we allow for persistence or state dependence in our ordered measure of financial satisfaction. Pudney (2006) criticised the previous applied literature on subjective well-being for not incorporating the dynamics of individual perceptions of well-being into the modelling process.<sup>2</sup> In this paper we apply a model developed by Wooldridge

<sup>1</sup> Ferrer-i-Carbonell (2005), Senik (2004) and McBride (2001) analyse the relationship between income and general life satisfaction measures.

<sup>2</sup> Pudney (2006) suggests an alternative approach to that considered in this paper. He develops a latent autoregression model to capture the dynamic behaviour of life satisfaction over time.

(2005) for estimating dynamic panel ordered models which allows for unobserved heterogeneity, correlated individual effects and controls for initial conditions.<sup>3</sup>

The paper is structured in the following way. Section II of the paper examines existing evidence on the relationship between income and financial satisfaction while Section III presents the economic model underlying the issues of interest in this paper. Also presented in Section III is the empirical model and an outline of the econometric approach. Section IV presents the data. The results of a number of panel econometric estimations of the effect of the level of income, changes in income and relative income position on subjective financial satisfaction are presented in Section V. Some findings on the independent effect of demographic and socio-economic factors are also discussed. Section VI concludes the paper.

## II BACKGROUND

Most measures of well-being rely on individuals' subjective self-rating of how satisfied they are with their life situation.<sup>4</sup> Satisfaction with life, however, crosses different domains such as satisfaction with work, housing, leisure time or financial satisfaction, each of which may be affected differently by changes in income or personal circumstances (Van Praag *et al.*, 2003). In this paper, we are concerned with financial satisfaction, and specifically its relation with income. In line with the previous literature, financial satisfaction is defined as a function of income and a set of observable characteristics. In the standard model, financial satisfaction is seen as a function of achieved income levels. A simple model of the relationship between financial satisfaction and income posits that income is largely an exogenous determinant of financial satisfaction and that higher levels of income will be associated with higher levels of financial satisfaction. Indeed, most of the literature to date finds such a relationship although with a low order of magnitude in many applications.

There are a number of reasons for placing further structure on the relationship between financial satisfaction and income. In assessing the relationship between income and financial satisfaction, a number of regularities are apparent. First, the literature on subjective financial satisfaction points to a high degree of inter-temporal persistency in the path of financial satisfaction with variations being caused in general only by critical

<sup>3</sup> Contoyannis *et al.* (2004) apply this approach to a study of the dynamic behaviour of self-assessed health in the UK.

<sup>4</sup> The most commonly used measure of well-being is a composite measure of disutility or mental distress derived from scores recorded in the General Health Questionnaire.

events. (Fujita and Diener, 2005; Lucas *et al.*, 2004; Lucas *et al.*, 2003). Second, it has long been noted in the literature that people have a tendency to evaluate their financial satisfaction relative to a given reference group (Blanchflower and Oswald, 2004; Easterlin, 2001; Frank, 1997; Rabin, 1998; Clark, 2003; Sweeney and McFarlin, 2004). Closest to the spirit of this paper, Ferrer-i-Carbonell (2005) finds that reference-group income is approximately as important as personal income in explaining individual well-being. Similarly, McBride (2001) finds that happiness is negatively predicted by peer-group income and by the income level of parents. An exception is Senik (2004) who finds that reference group income increases well-being, an effect which is attributed to the reference group providing information on future income changes that are subsequently anticipated by the rest of the group.

Third, reference-dependency over time and preferences over sequences are also widely noted phenomena in the literature. One manifestation of this is habituation to higher levels of income. For example, Brickman *et al.* (1978) compared the happiness levels of lottery winners with those of a control group finding few differences in rates of subjective happiness between the two groups. Furthermore, an extensive literature on time preferences has demonstrated that people have preferences for improving as opposed to declining sequences even to the extent of being willing to trade off the total level of benefit to generate an improving sequence (Chapman, 2000; Lowenstein and Prelec, 1991).<sup>5</sup> Burchardt (2004) examines the subjective assessments of financial well-being at a specific point in time for individuals tracked across 10 years of the British Household Panel Survey. In terms of evaluating time dependent preferences, she finds that those who have experienced falling incomes are less satisfied than those who have had constant income levels, while those who have experienced rising incomes are no more satisfied than those whose income remained constant.

Thus, the literature points to a number of *a priori* hypotheses about the relationship between financial satisfaction and time and reference group dependency. First, we expect a high degree of persistency in the level of financial satisfaction. However, this persistency may be dislodged by severe shocks such as a separation, becoming disabled or becoming involuntarily unemployed. Second, the importance of absolute income levels is explored by considering the impact that household income has on an individual's level of

<sup>5</sup> Lowenstein and Prelec (1991) illustrate the point with an aptly chosen quote from the *Theory of Moral Sentiments*: *The man who lives within his income is naturally contented with his situation, which, by continual, though small accumulations is growing better every day. He is enabled gradually to relax, both in the rigour of his parsimony and in the severity of his application; and he feels with double satisfaction this gradual increase of ease and enjoyment, from having felt before the hardship, which attended the want of them.*

financial satisfaction. Third, we would expect financial satisfaction to be related to deviations from expected or reference group income. Here we extend the concept of reference dependency to include intra-household reference group effects by considering the extent to which an individual's relative contribution to household income might influence their personal level of satisfaction with their financial situation. Finally, to the extent that income does have an effect on financial satisfaction we would expect that this is due to both the level of income and its trajectory. In this paper we also take the notion of the trajectory of income being important a step further and consider the extent to which individuals are forward looking in appraising their financial situation by considering how future income changes impact on financial satisfaction.

### III METHODOLOGY

#### 3.1 *The Economic Model*

The literature exploring the theoretical link between utility in the economic sense and happiness in the psychological sense is limited.<sup>6</sup> Furthermore, the link between standard utility theory and a testable empirical model of happiness has not yet been established. In this paper, as with most of the other literature in this field, we do not attempt to establish a quantifiable link between happiness and utility but rather assume that a positive relationship exists between the two, that is

$$U_{it} = U(X_{it}, Z_i, GS_{it}) \quad (1)$$

where  $U_{it}$  is individual  $i$ 's utility in time period  $t$ ,  $X_{it}$  are a set of observable exogenous variables such as income, employment status, marital status etc. that affect an individual's level of utility,  $Z_i$ , are a set of individual specific unobservable personality traits and  $GS_{it}$  is an individual's general level of satisfaction with life.  $GS_{it}$  will depend on an individual's satisfaction with different domains of life. Van Praag *et al.* (2003) present a two-layer model where  $GS_{it}$  is assumed to be a function of the individual's reported level of satisfaction with  $j$  different domains (such as work, leisure, housing and finances and given by  $DS_{itj}$ ) and  $Z_i$ .

$$GS_{it} = GS(DS_{it1}, DS_{it2}, \dots, DS_{itj}, Z_i) \quad (2)$$

<sup>6</sup> Kimball and Willis (2005) propose a lifetime utility model which includes happiness as one component of flow utility.

Each domain satisfaction measure is in turn determined by the set of exogenous variables ( $X_{itj}$ ) which may vary across domains, and  $Z_i$ .

$$DS_{itj} = DS(X_{itj}, Z_i) \quad (3)$$

In this paper, we are interested in understanding the dynamic relationship between income and satisfaction in the financial domain and as such we do not focus on the relationship between the various domains of satisfaction and general satisfaction. A number of testable hypotheses on the relationship between income and financial satisfaction emerge from the literature (as discussed in Section II). First, we would like to test the extent to which financial satisfaction is state dependent. As such we are interested in testing hypothesis *H1*:

*H1*: Individual financial satisfaction is a persistent series.

We are also interested in the extent to which the persistence in this series can be dislodged by life changing shocks such as unemployment and ill health and as such a number of demographic and socio-economic characteristics are included to test for this.

Secondly, we would expect that income levels have an important role to play in determining financial satisfaction. We, therefore, wish to test hypothesis *H2*:

*H2*: Controlling for persistence and other socio-economic variables, individual financial satisfaction depends positively on the level of household income.

In line with most of the literature empirically examining the relationship between income and well-being (for example, Ferrer-i-Carbonell (2005), McBride (2001), Senik (2004) and Vendrik and Woltjer (2006)) the extent to which reference group effects can be separated from absolute income levels is of key interest given the general consensus in the literature indicating that such reference group effects are at least as important as (and in some cases more important than) the absolute income effect. An extension to the notion of reference group dependency is the extent to which intra-household reference group effects may exist. As such we consider in hypothesis *H3* how the relationship between individual and household income affects financial satisfaction.

*H3*: Controlling for persistence, socio-economic variables and the absolute level of household income, individual financial satisfaction will be

positively related to the proportion of household income relative to the income of the household's social reference group and to the proportion of individual income in total household income.

Finally, as discussed in detail in Section II, we might also expect the time path of income to be of importance in determining financial satisfaction. The following hypothesis encompasses both backward and forward looking income trajectories:

*H4:* Controlling for persistence, socio-economic variables, household income and reference group effects, individual financial satisfaction is positively related to past and future income changes.

### 3.2 The Empirical Specification

The basic model we are interested in estimating is given by Equation (4)

$$s_{it} = \alpha_0 + \alpha_1 s_{it-1} + \beta x_{it} + v_{it}; \quad i = 1, 2, \dots, n \quad t = 1, 2, \dots, T \quad (4)$$

where  $s_{it}$  is an ordinal measure of an individual's level of financial satisfaction;  $s_{it-1}$  is a vector of indicators for an individual's level of financial satisfaction in the previous period;  $x_{it}$  are income and other control variables; and  $v_{it}$  are random error terms. In this model persistence is controlled for by including lagged categories of financial satisfaction allowing us to directly test *H1*. If after including appropriate controls, the parameters included in  $\alpha_1$  in Equation (4) are significant and positive we can conclude that the series is indeed persistent.

For the purpose of illustration, we separate out the non-income related controls from the vector of exogenous variables given by  $x_{it}$  into a separate vector  $w_{it}$  and explore a number of different income specifications given by the hypotheses presented in the previous section. First, we include household income in levels thus allowing us to test *H2*. This specification is given by Equation (5).

$$s_{it} = \alpha_0 + \alpha_1 s_{it-1} + \gamma_1 Y_{ht} + \gamma_2 Y_{ht}^2 + \beta w_{it} + v_{it} \quad (5)$$

where  $Y_h$  is household income. It is expected that  $\gamma_1$  will be positive indicating that higher levels of household income will be associated with higher levels of financial satisfaction. The square of income is also included to capture any non-linearities.

To test for the impact of reference group effects (that is, hypothesis *H3*), we include the proportion of household income relative to social reference

group income in the model in the standard way (see for example, Ferrer-i-Carbonell (2005) or Vendrik and Woltjer (2006)).<sup>7</sup> Hypothesis *H3* also proposes that individuals' gain satisfaction from contributing more to household income, that is, there may be intra-household reference group effects. To test for this, we also include in our specification the proportion of individual income in total household income. This model is described by Equation (6).

$$s_{it} = \alpha_0 + \alpha_1 s_{it-1} + \gamma_1 Y_{ht} + \gamma_2 Y_{ht}^2 + \gamma_3 (Y_{ht}/Y_{Rt}) + \gamma_4 \left( Y_{it} / \sum_{i=1}^M Y_{it} \right) + \beta w_{it} + v_{it} \quad (6)$$

where  $Y_{Rt}$  is the average income of the household's social reference group,  $Y_i$  is individual income and  $M$  is the number of individuals in the household. For *H3* to hold, we would expect  $\gamma_3$  to be significant and positive indicating that the higher the level of household income relative to that of the social reference group, the higher the level of satisfaction with one's financial situation. If  $\gamma_4$  is found to be significant the results will suggest evidence of an intra-household reference group effect that individuals use to appraise their own personal financial situation. Here we hypothesise that the sign on  $\gamma_4$  will be positive, thus indicating that individuals' financial satisfaction is positively influenced by their income relative to the average of the household. If negative, however, it may suggest that being the main income earner places a burden on individuals and this burden is directly reflected in their self appraisal of their financial situation.

To test for the impact that the time path of income has on personal financial satisfaction we include the proportional change in household income from period  $t-1$  to period  $t$  and from period  $t$  to period  $t+1$  in the model.

$$s_{it} = \alpha_0 + \alpha_1 s_{it-1} + \gamma_1 Y_{ht} + \gamma_2 Y_{ht}^2 + \gamma_3 (Y_{ht}/Y_{Rt}) + \gamma_4 \left( Y_{it} / \sum_{i=1}^M Y_{it} \right) + \gamma_5 ((Y_{ht} - Y_{ht-1})/Y_{ht-1}) + \gamma_6 ((Y_{ht+1} - Y_{ht})/Y_{ht}) + \beta w_{it} + v_{it} \quad (7)$$

Equation (7) allows us to test hypothesis *H4*. It is expected that  $\gamma_5$  will be positive indicating that positive income sequences lead to a higher level of financial satisfaction. In relation to  $\gamma_6$ , if found to be statistically significant it

<sup>7</sup> The construction of this variable is discussed in Section IV.



will indicate that individuals are forward looking and if positive, base their current level of satisfaction on anticipated future income rises.<sup>8</sup>

### 3.3 *The Empirical Approach*

In addition to the basic income specification, required in a model of this kind is the inclusion of a number of controls. There are a number of factors other than income that could potentially influence financial satisfaction in that they could influence the need for resources or the extent to which a person can produce a level of financial satisfaction for a given level of income. For example, factors such as poor health, marital status and ageing as well as being associated with lower income levels may also be associated with a greater need for resources such as health-care (Ingelhart, 2002; Stack and Eshelman, 1998; Mookherjee, 1997). Personality variables and cognitive and non-cognitive skills may also influence the extent to which people can utilise a given level of income while at the same time influencing individuals' utility functions with respect to material goods. While the data available do not allow us to specify such variables in detail we can control for at least part of this latent heterogeneity through the inclusion of education and religiosity variables. The remainder can be controlled for through exploiting the panel structure of the data by allowing time invariant individual effects to be included. Additionally, a fixed time effect is incorporated into the model through the inclusion of a year dummy allowing us to control for exogenous factors that may influence the trend in financial satisfaction over time.<sup>9</sup>

The full empirical model of financial satisfaction can be estimated using Equation (8).

$$s_{it} = \alpha_0 + \alpha_1 s_{it-1} + \beta x_{it} + \eta_i + v_{it}; \quad i = 1, 2, \dots, n \quad t = 1, 2, \dots, T \quad (8)$$

where as before  $s_{it}$  is a measure of an individual's level of financial satisfaction and  $x_{it}$  are income in its various forms and the other control variables. Here, we also include  $\eta_i$  which are unobserved individual specific time invariant effects which allow for heterogeneity and we assume that  $v_{it}$ , the random error terms, are independent across individuals and are serially uncorrelated.

As discussed in the previous section, the lag of the dependent variable is included to allow for persistence or state dependence. Here, state dependence

<sup>8</sup> Identifying a causal relationship between future income and current satisfaction is problematic. If the result is found to be positive it may be that current levels of financial satisfaction lead to optimism about the future which in turn lead to greater work effort resulting in better outcomes. If negative, dissatisfaction with one's financial situation could lead to individuals working harder to achieve better outcomes in the future. Caution should, therefore, be exercised in interpreting the results of this parameter.

<sup>9</sup> Ferrer-i-Carbonell (2005) use a similar justification for their approach.

refers to a situation where in period  $t$  an individual's reported level of satisfaction will depend on what their reported level of satisfaction was in period  $t - 1$ . Incorporating the dynamics of this underlying process is important in order to consistently estimate the other parameters of interest given in  $\beta$ . However, the inclusion of the lag of the dependent variable creates a number of other problems hindering the consistent estimation of  $\beta$ . Dynamic models which include unobserved effects will not be consistently estimated using standard methods since  $s_{it-1}$  will be correlated with the unobserved time invariant effects  $\eta_i$ . This implies that the model will be unable to distinguish between state dependence and unobserved heterogeneity. An important consideration in dynamic models of this kind with unobserved effects is, therefore how the initial observations are treated. In the context of this study, the "initial conditions" problem refers to the fact that with panel data, observations on individuals are at a point in time which occurs after the process which led them to report the level of satisfaction observed in the first or initial period. Where the number of time periods is short (as is the case with most longitudinal data) assumptions about the properties of the initial conditions must also be considered.

Dynamic panel data models which address these issues are well developed for the linear case, however, the estimation procedure is further complicated by the fact that  $s_{it}$  is ordinal in nature.<sup>10</sup> The true underlying latent model can be written as:

$$s_{it}^* = \alpha_0 + \alpha_1 s_{it-1} + \beta x_{it} + \eta_i + v_{it}; \quad i = 1, 2, \dots, n \quad t = 1, 2, \dots, T \quad (9)$$

where  $s_{it}^*$  represents the underlying unobserved cardinal measure of financial satisfaction. We do observe:

$$\begin{aligned} s_{it} = 1 & & \text{if } s_{it}^* \leq \mu_1 \\ s_{it} = 2 & & \text{if } \mu_1 < s_{it}^* \leq \mu_2 \\ & \dots & \\ s_{it} = 6 & & \text{if } \mu_5 < s_{it}^* \end{aligned} \quad (10)$$

where the  $\mu$ s are unknown parameters to be estimated. In other words, the probability that a specific alternative is chosen is the probability that the latent variable is between two boundaries.

<sup>10</sup> Van Praag and Ferrer-i-Carbonell (2004), among others, use a cardinal approach by assuming that the observed ordinal variable represents an underlying cardinal measure of an individuals' true well-being. They approximate this cardinal measure by a standard normal distribution function. This approach is not considered here.

Controlling for unobserved heterogeneity in this type of model is complicated by the incidental parameters problem and the initial conditions problem. The ordinal nature of the dependent variable leads to the incidental parameters problem which prevents the unobserved heterogeneity from being treated as a fixed effect (Neyman and Scott, 1948). As an alternative,  $\eta_i$  can be treated as a random effect, however, this requires the assumption that  $e_{it} = \eta_i + v_{it}$  is independent of  $x_{it}$  for consistent estimation by maximum likelihood. In applications of the kind considered in this paper, this is unlikely to be the case.<sup>11</sup> To control for possible correlations between the regressors and the random effects, following Wooldridge (2005), we parameterise the distribution of  $\eta_i$  by including the means of the time varying independent variables.<sup>12</sup> This implies that in the above model the unobserved heterogeneity will be given by:

$$\eta_i = \alpha_0 + \alpha_1 \bar{x}_i + a_i \quad (11)$$

where  $\bar{x}_i$  is the average over the sample period of each time varying exogenous variable and  $\alpha_i$  are random effects assumed to be distributed as  $N(0, \sigma_a^2)$  and independent of the exogenous variables.

Solving the initial conditions problem in nonlinear models is more difficult. Henley (2000) and Denny and Doyle (2005) estimate a reduced form equation for the initial conditions and use a two-step estimation procedure to control for the initial conditions in the dynamic model. Required for identification of the reduced form equation, however, are a range of instrumental variables which include variables relevant to the first period and pre-sample information. It is rare that such data are available as is the case in this study. Instead we adopt an approach proposed by Wooldridge (2005) and applied by Contoyannis *et al.* (2004) which is computationally simpler and achieves the same aims. The approach involves modelling the distribution of the unobserved effects conditional on the initial value of the dependent variable and any exogenous explanatory variables. Implementation of this approach requires further parameterisation of the unobserved heterogeneity:

<sup>11</sup> For example, it would be unreasonable to assume that factors such as an individual's employment status or income level are uncorrelated with certain personality traits captured by the unobserved heterogeneity term. In particular, it is unlikely that the lag on financial satisfaction is uncorrelated with the unobserved individual effects.

<sup>12</sup> The interpretation of the coefficient on these estimates is complicated by the fact that it is difficult to distinguish between what might be interpreted as "permanent" or long-term effects captured by including means over time and correlations between the regressor and the unobserved heterogeneity. Contoyannis *et al.* (2004) and Frijters *et al.* (2003) interpret these coefficients as long term or permanent effects and the coefficients on their time varying counterparts as "transitory" effects. This is particularly relevant for the income variable where mean income could be interpreted as a proxy for permanent income.

$$\eta_i = \alpha_0 + \alpha_1 \bar{x}_i + \alpha_2 s_{i0} + \alpha_i \quad (12)$$

where  $s_{i0}$  is a vector of indicators of the individual's initial level of financial satisfaction. The coefficients in  $\alpha_2$  will provide information on the relationship between the initial level of financial satisfaction and the unobserved effects. An important issue that arises with the specification of the unobserved effects in this manner is that the separate effects of time-invariant explanatory variables on financial satisfaction and  $\eta_i$  will not be identified. Furthermore, the coefficients on the mean of the time variant exogenous variables will include both the correlation between these variables and the unobserved effect and the long-term causal effects of these variables on financial satisfaction and as such should be interpreted with caution.

#### IV DATA

The data used in this paper are taken from the Living in Ireland Survey. The Living in Ireland Survey forms the Irish component of the European Community Household Panel (ECHP): an EU-wide project, co-ordinated by Eurostat, to conduct harmonised longitudinal surveys dealing with the social situation, financial circumstances and living standards of European individuals and households. The first wave of the ECHP was conducted in 1994, and the same individuals and households were followed each year. The survey ran for eight waves, until 2001.<sup>13</sup> A total of 8,865 adults (aged 16 or over) were surveyed in the first year on the key variables, only 1,998 of which remained in the sample for the entire eight waves. The sample was supplemented with an additional 1,515 households in 2000. However, only the balanced panel of the 1,998 original adults included in the survey are considered here.

Individuals' subjective appraisal of their personal satisfaction with each domain is measured on a scale of 1 to 6 ranging from very dissatisfied to very satisfied. Table 1 presents average levels of satisfaction across four domains, work, housing, leisure time and financial situation for 1994 to 2001.<sup>14</sup> On

<sup>13</sup> The questionnaires were administered in a face-to-face interview by the ESRI's team of interviewers. On average, the household questionnaire took 12 minutes to complete, while the individual questionnaire took 30-35 minutes to complete. The average number of individual interviews per household in 1994 was 2.4. Further information about sampling is available in Watson (2004).

<sup>14</sup> As for other life satisfaction studies standard assumptions are required in order to analyse these data: first, that individuals are capable and willing to answer questions relating to domains of life satisfaction; second, that such responses are directly linked to individual welfare; and third, that individuals who report the same level of financial satisfaction are directly comparable in terms of the actual level of financial satisfaction that they enjoy (Van Praag *et al.*, 2003).

average, individuals are more satisfied with work, housing and leisure time than with their financial situation. However, over the course of the Irish economic boom average levels of financial satisfaction increased by 17 per cent compared with 1 per cent for satisfaction with work and housing and 3 per cent for satisfaction with leisure time. These findings would suggest that the increased levels of affluence experienced in Ireland during this boom period had the greatest impact on personal financial satisfaction with small positive effects evident in the other domains. Table 2 presents Spearman Rank Correlations between net household income and domain specific life satisfaction. While net household income is positively correlated with satisfaction with work, housing and financial situation the magnitude of the correlation is greatest for the latter.<sup>15</sup>

Table 1: *Domain Specific Life Satisfaction Over the Course of the Irish Economic Boom*

<i>Year</i>		<i>1994-2001 (Balanced Panel)</i>			
		<i>Work</i>	<i>Financial Situation</i>	<i>Housing</i>	<i>Leisure Time</i>
1994	Mean	4.55	3.50	4.95	4.50
	Std. Deviation	1.41	1.59	1.38	1.50
1995	Mean	4.59	3.59	4.96	4.66
	Std. Deviation	1.31	1.53	1.25	1.34
1996	Mean	4.59	3.53	4.98	4.64
	Std. Deviation	1.29	1.53	1.22	1.38
1997	Mean	4.63	3.77	5.03	4.68
	Std. Deviation	1.28	1.49	1.19	1.38
1998	Mean	4.64	3.77	5.05	4.66
	Std. Deviation	1.20	1.47	1.14	1.38
1999	Mean	4.58	3.80	5.03	4.63
	Std. Deviation	1.22	1.46	1.14	1.33
2000	Mean	4.58	3.91	4.98	4.65
	Std. Deviation	1.24	1.44	1.15	1.30
2001	Mean	4.61	4.08	4.98	4.62
	Std. Deviation	1.23	1.41	1.15	1.31
Total	Mean	4.60	3.75	5.00	4.63
	Std. Deviation	1.27	1.50	1.20	1.37

In addition to the various income specifications outlined in Section III, a number of demographic and socio-economic variables are also considered. Details of these variables are provided in Table 3.

<sup>15</sup> As might be expected a negative correlation is found between net household income and satisfaction with leisure time, suggestive of a labour-leisure trade-off. This issue is not explored in this paper.

Table 2: *Spearman Rank Correlations Between Net Household Income and Domain Specific Life Satisfaction (Balanced Panel)*

	<i>Net Household Income</i>	<i>Satisfied With Work</i>	<i>Satisfied With Financial Situation</i>	<i>Satisfied With Housing</i>	<i>Satisfied With Leisure Time</i>
Net Household Income	1.000				
Satisfied with work	0.041***	1.00			
Satisfied with financial situation	0.221***	0.525***	1.00		
Satisfied with housing	0.077***	0.445***	0.429***	1.00	
Satisfied with leisure time	-0.141***	0.432***	0.348***	0.461***	1.00

\*\*\* indicates significance at the 1 per cent level.

Table 3: *Description of Socio-Economic and Demographic Variables*

<i>Variable Name</i>	<i>Description</i>
Number of adults	The number of adults in the household.
Number of children	The number of children in the household.
Age	Age of the individual.
Female	Dummy variable taking a value of 1 if the individual is female and 0 otherwise.
Married	Dummy variable taking a value of 1 if the individual is married and 0 otherwise.
Junior Certificate Education	Dummy variable taking a value of 1 if the individual's maximum level of education is to Junior Certificate level and 0 otherwise.
Leaving Certificate Education	Dummy variable taking a value of 1 if the individual's maximum level of education is to Leaving Certificate level and 0 otherwise.
Third Level Education	Dummy variable taking a value of 1 if the individual's maximum level of education is at third level and 0 otherwise.
Health1	Dummy variable taking a value of 1 if the individual claims to be in good or very good health.
Health2	Dummy variable taking a value of 1 if the individual claims to be in fair health.
Religiosity	Dummy variable taking a value of 1 if the individual attends religious services at least once a week.
Unemployed	Dummy variable taking a value of 1 if the individual is unemployed and 0 otherwise.
Retired	Dummy variable taking a value of 1 if the individual is retired and 0 otherwise.

An important consideration when using panel survey data of the kind applied in this paper is the pattern of attrition. A difficult type of attrition to deal with in panel data models is where individuals leave the panel and then re-enter at a later stage. In addition, samples that are supplemented with additional households in later waves can also be troublesome.<sup>16</sup> In this paper, we only include households that appeared in all waves. Attrition is a problem if the decision to leave is not random and as such using a balanced sample may inflict a bias on the results of the model. Following the approach taken by Jones *et al.* (2006) we apply variable addition tests to the unbalanced panel such as those proposed by Verbeek and Nijman (1992) to test for an attrition bias in the estimation of the random effects ordered probit model. Two types of attrition variables are considered: first, a variable indicating the number of years an individual remains in the sample; and second, a dummy variable taking a value of one for individuals that remain in the sample for the entire period. In both cases the tests for attrition suggest that the decision to leave the sample is not related to financial satisfaction. In addition, the results are broadly the same for the balanced and unbalanced panel. As a result, we proceed with the balanced panel dataset.<sup>17</sup>

## V RESULTS

### 5.1 *Specification Issues*

Table 4 presents results for a range of specifications of the random effects ordinal model of financial satisfaction.<sup>18</sup> An important objective of this paper is to illustrate the importance of modelling well-being as a dynamic process while at the same time controlling for correlated individual effects and the initial conditions problem. Column (1) of Table 4 presents the results for a random effects ordered probit model without persistence while column (2) presents the results of a model that includes a vector of indicators of the lagged category of financial satisfaction, our control for state dependence, thus allowing us to test hypothesis *H1*. In Section 3.1 we hypothesised that individual satisfaction is a persistent series. As revealed in column (2), the

<sup>16</sup> In 2000, the Irish sample of individuals and households followed from Wave 1 was supplemented by the addition of 1,500 new households to the total. The rationale behind this measure was to increase the overall sample size, which had declined due to attrition since 1994 (Watson, 2004).

<sup>17</sup> Results for these tests are available by request from the authors.

<sup>18</sup> For specification testing purposes a basic income specification is used with the inclusion of only the level of household income. The more involved income specifications are discussed in Section 5.2.

Table 4: Specification of the Ordered Probit Model of Financial Satisfaction (Balanced Panel)

	(1)	(2)	(3)	(4)
Financial Sat. Cat 2 ( <i>t-1</i> )	....	0.261*** (0.043)	0.249*** (0.043)	0.224*** (0.043)
Financial Sat. Cat 3 ( <i>t-1</i> )	....	0.480*** (0.042)	0.454*** (0.042)	0.398*** (0.042)
Financial Sat. Cat 4 ( <i>t-1</i> )	....	0.710*** (0.044)	0.670*** (0.044)	0.589*** (0.044)
Financial Sat. Cat 5 ( <i>t-1</i> )	....	0.986*** (0.050)	0.927*** (0.050)	0.813*** (0.049)
Financial Sat. Cat 6 ( <i>t-1</i> )	....	1.345*** (0.058)	1.273*** (0.058)	1.146*** (0.056)
Household Income	0.144*** (0.008)	0.125*** (0.008)	0.106*** (0.009)	0.108*** (0.009)
Household Income squared	-0.002*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)
Investment Income	0.049 (0.043)	0.066 (0.042)	-0.029 (0.043)	-0.033 (0.042)
Number of adults	-0.133*** (0.014)	-0.123*** (0.012)	-0.072*** (0.017)	-0.075*** (0.017)
Number of children	-0.062*** (0.019)	-0.055*** (0.016)	-0.029 (0.024)	-0.035 (0.024)
Age	0.023*** (0.002)	0.015*** (0.001)	0.014*** (0.002)	0.012*** (0.002)
Health1	0.654*** (0.075)	0.619*** (0.072)	0.471*** (0.079)	0.488*** (0.079)
Health2	0.434*** (0.074)	0.413*** (0.071)	0.356*** (0.077)	0.367*** (0.077)
Religiosity	0.070** (0.035)	0.054* (0.031)	0.027 (0.042)	0.028 (0.042)
Unemployed	-0.855*** (0.070)	-0.773*** (0.067)	-0.657*** (0.073)	-0.679*** (0.073)
Retired	0.194*** (0.061)	0.181*** (0.053)	0.110 (0.078)	0.114 (0.078)
Female	0.048 (0.049)	0.048 (0.037)	0.052 (0.038)	0.050 (0.037)
Married	0.028 (0.044)	0.035 (0.037)	0.011 (0.037)	-0.005 (0.036)
Primary Level Ed.	0.271*** (0.050)	0.184*** (0.043)	0.120*** (0.043)	0.093** (0.042)
Secondary Level Ed.	0.350*** (0.057)	0.225*** (0.046)	0.102** (0.047)	0.043 (0.046)
Third Level Ed.	0.502*** (0.068)	0.335*** (0.055)	0.122** (0.059)	0.074 (0.057)
Time Dummies	Yes	Yes	Yes	Yes
Mean Household Income	....	....	0.051*** (0.012)	0.018 (0.012)
Mean Investment Income	....	....	0.564*** (0.116)	0.475*** (0.112)
Mean No. of Adults	....	....	-0.114*** (0.024)	-0.060** (0.024)
Mean No. of Children	....	....	-0.044 (0.031)	-0.016 (0.030)
Mean Health1	....	....	0.579*** (0.192)	0.273 (0.187)
Mean Health2	....	....	0.176 (0.212)	0.000 (0.206)
Mean Religiosity	....	....	0.039 (0.065)	-0.087 (0.065)



Table 4: Specification of the Ordered Probit Model of Financial Satisfaction (Balanced Panel) (cont'd)

	(1)	(2)	(3)	(4)
Mean Unemployment	....	....	-0.669*** (0.166)	-0.396** (0.163)
Mean Retirement	....	....	0.147	0.090 (0.106)
Financial Sat. Cat 2 ( $t_0$ )	....	....	...	0.233*** (0.063)
Financial Sat. Cat 3 ( $t_0$ )	....	....	...	0.464*** (0.062)
Financial Sat. Cat 4 ( $t_0$ )	....	....	...	0.568*** (0.062)
Financial Sat. Cat 5 ( $t_0$ )	....	....	...	0.847*** (0.067)
Financial Sat. Cat 6 ( $t_0$ )	....	....	...	1.049*** (0.075)
Intercept 1	0.196*** (0.144)	0.342*** (0.123)	0.507** (0.201)	0.474** (0.196)
Intercept 2	0.966*** (0.144)	1.093*** (0.123)	1.261*** (0.202)	1.233*** (0.197)
Intercept 3	1.841*** (0.144)	1.946*** (0.123)	2.119*** (0.202)	2.097*** (0.197)
Intercept 4	2.858*** (0.145)	2.942*** (0.124)	3.120*** (0.203)	3.105*** (0.198)
Intercept 5	3.863*** (0.147)	3.928*** (0.126)	4.111*** (0.204)	4.100*** (0.199)
Log Likelihood	-20,617	-20,287	-20,217	-20,081
N	13,916	13,916	13,916	13,916

Standard errors are given in parenthesis

\*\*\* indicates significance at the 1 per cent level, \*\* indicates significance at the 5 per cent level, \* indicates significance at the 10 per cent level

coefficients on the lagged categories of the dependent variable are all positive and significant and their inclusion significantly increases the log-likelihood value. This indicates that there is state dependence in individuals' subjective appraisal of their level of financial satisfaction. Of particular note is the effect that the inclusion of these controls has on the other regressors. In all cases the magnitude of the effects of the statistically significant explanatory factors falls, highlighting the importance of controlling for state dependence in models of subjective well-being, which many past studies have failed to do.

In column (3) the model is extended to control for correlated individual effects with the inclusion of the mean of time varying variables as specified in Equation (11).<sup>19</sup> The significance of the mean of most of the time-varying variables indicates that there is a correlation between these explanatory variables and the unobserved factors that affect financial satisfaction (for example individual personality traits or an individual's general level of happiness or outlook on life). Contoyannis *et al.* (2004) and Frijters *et al.* (2003) interpret these coefficients as long term or permanent effects and the coefficients on their time varying counterparts as "transitory" effects. It is difficult, however, to distinguish between what might be interpreted as "permanent" or long-term effects captured by including means over time and correlations between the regressors and the unobserved heterogeneity. As a result of this complication, here we only attempt to interpret the coefficients on the time varying variables as all time invariant variables (including the means of the time varying variables) capture both long-term effects and correlations with the unobserved heterogeneity.<sup>20</sup> The importance of including these controls is evident in the impact that their inclusion has on the direct effects of the time varying variables. For example, the coefficient on current income falls from 0.125 to 0.106 once the correlation between income and the unobserved effects is controlled for. Similarly, the magnitudes of the direct effects of the number of adults in the household, health and unemployment on financial satisfaction fall with the inclusion of the means over time, while the direct effect of the number of children, religiosity and retirement become insignificant suggesting that the unobserved effects and long-term effects that determine financial satisfaction are more important for these latter variables.

<sup>19</sup> Due to the fact that education varies very little over time including its mean over time would prevent the parameters on the transitory component of the variable from being identified. As such we do not include it as a control for correlated individual effects.

<sup>20</sup> It should be noted that in many applications the mean of income is often included as a proxy for permanent income which may also be an appropriate way of thinking about the relationship between the time path of income and financial satisfaction. However, due to the fact that the mean of income also serves as a control for unobserved heterogeneity we avoid this interpretation here.

Column (4) extends the parameterisation of the distribution of the unobserved effects to include the vector of initial values as described by equation (12). The initial value parameters are positive and significant indicating that high initial values are positively correlated with the unobserved determinants of financial satisfaction. Its inclusion affects the magnitude and statistical significance of the coefficients on the time-invariant components of the model. Overall, our results indicate that even with the inclusion of controls for state dependence, correlated effects and initial values, income and a number of demographic variables are found to have significant effects on individual financial satisfaction. In addition, we find that the magnitudes of these effects are overstated in models that do not incorporate controls of this kind.<sup>21</sup>

### 5.2 *Income and Financial Satisfaction*

Table 5 presents the results of the various income specifications of the random effects ordered probit model including controls: for unobserved heterogeneity and the incidental parameters problem by incorporating the mean of the time varying independent variables; the initial conditions problem by including the initial value of the dependent variable for each individual; and other socio-economic effects. The first column allows us to test hypothesis *H2* proposed in Section 3.1. The first key question of interest in relation to the relationship between income and financial satisfaction is: how and to what extent do absolute income levels affect the level of financial satisfaction of Irish households in the 1994-2001 period? Hypothesis *H2* proposed that individual financial satisfaction depends positively on the level of household income. As revealed by the positive and significant coefficient on the household income variable we can conclude that as expected this hypothesis holds true. The negative and significant coefficient on income squared suggests that the relationship is non-linear. As expected, richer people are more satisfied with their financial situation but the effect on financial satisfaction diminishes for extra units of income at higher income levels. This result is common across many other studies in the literature which also find a strong positive relationship between household income and satisfaction (Ferrer-i-Carbonell, 2005; Senik, 2004; Van Praag *et al.*, 2003).

The second column of Table 5 extends the model to include reference group income allowing us to test hypothesis *H3*. The social reference group of an individual is assumed to consist of individuals of a similar age, of the same

<sup>21</sup> It should be noted that in controlling for unobserved heterogeneity our approach fails to identify effects of variables that vary very little over time. This might explain the insignificance of gender, marital status and education in the model that includes these controls.

Table 5: *Income and Financial Satisfaction*†

	(1) <i>Equation (5)</i>	(2) <i>Equation (6)</i>	(3) <i>Equation (7)</i>
Financial Sat.Cat 2 ( <i>t-1</i> )	0.201*** (0.046)	0.200*** (0.046)	0.199*** (0.046)
Financial Sat.Cat 3 ( <i>t-1</i> )	0.365*** (0.046)	0.364*** (0.046)	0.365*** (0.046)
Financial Sat.Cat 4 ( <i>t-1</i> )	0.539*** (0.048)	0.535*** (0.048)	0.536*** (0.048)
Financial Sat.Cat 5 ( <i>t-1</i> )	0.739*** (0.054)	0.736*** (0.054)	0.739*** (0.054)
Financial Sat.Cat 6 ( <i>t-1</i> )	1.049*** (0.062)	1.049*** (0.062)	1.055*** (0.062)
Household Income	0.106*** (0.011)	0.085*** (0.015)	0.079*** (0.015)
Household Income Squared	-0.002*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)
Prop of HH Income in Ref Income	...	0.110** (0.046)	0.107** (0.045)
Prop of Ind. Income in HH Income	...	0.103* (0.058)	0.107* (0.058)
Change in Household Income	...	...	0.006 (0.005)
Future Change in Household Income	...	...	-0.008 (0.005)
Mean of Household Income	0.032** (0.013)	0.032** (0.013)	0.036*** (0.013)
Intercept 1	0.362* (0.203)	0.475** (0.210)	0.476** (0.210)
Intercept 2	1.121*** (0.203)	1.236*** (0.210)	1.236*** (0.210)
Intercept 3	1.983*** (0.203)	2.099*** (0.211)	2.099*** (0.211)
Intercept 4	2.977*** (0.204)	3.093*** (0.212)	3.094*** (0.212)
Intercept 5	3.956*** (0.205)	4.074*** (0.213)	4.075*** (0.213)
Log Likelihood	-17,410	-17,397	-17,389
n	11,928	11,923	11,920

† Random effects ordered probit model incorporating controls for demographic and socio-economic variables, correlated individual effects, initial values and time dummies. Standard errors are given in parenthesis. \*\*\* indicates significance at the 1 per cent level, \*\* indicates significance at the 5 per cent level, \* indicates significance at the 10 per cent level.

sex, marital status (married vs. unmarried) and education level.<sup>22</sup> Six age categories (under 25, 25-35, 35-45, 45-55, 55-65 and over 65) and four categories of education (less than Junior Certificate, Junior Certificate, Leaving Certificate and Higher education) are used. This approach is similar to

<sup>22</sup> While a narrower definition may more accurately identify households' actual social reference group, it may also lead to Manski's (1993) reflection problem. With no exogenous information on peer groups this could not be overcome using these data. As a check on our approach reference group income was also measured as the predicted values from a model of individual income levels estimated annually yielding a similar result. This technique was deployed by Clark and Oswald (1996) and Hamermesh (1977) in the job satisfaction literature and Senik (2004) in the life satisfaction literature.

that used by Ferrer-i-Carbonell (2005), McBride (2001) and Vendrik and Woltjer (2006). As hypothesised, the higher the level of household income relative to reference group income the higher the individual's level of financial satisfaction. This finding is also supported by other well-being studies who find a negative effect of reference group income on general life satisfaction.

Intra-household effects are also found. As anticipated, the larger an individual's income relative to household income the more satisfied they are with their financial situation. This effect, however, is only significant at the 10 per cent level. Few previous studies have considered the separate effect of individual income over household income on financial satisfaction. Consistent with our finding, McBride (2001) includes individual income finding a significant and positive effect but of a small magnitude. Van Praag *et al.* (2003) find that controlling for the level of household income, the existence of a second earner in the household has a significant and negative effect on individuals' levels of financial satisfaction – a result also supported by our findings.

The third column of Table 5 extends the model to consider the transitional effects of income on individual financial satisfaction. Hypothesis *H4* posits that positive sequences of household income will have a positive effect on financial satisfaction even when absolute income levels are controlled for. We attempt to capture this transitional effect by including the proportional change in household income. We find, however, that neither the retrospective measure or the forward looking measure add any explanatory power to the model. This result is contrary to what was expected and is contrary to much of the evidence in the literature which suggests that the level of income is not what is important to individuals in their own subjective appraisal of their financial situation but whether the income sequence is improving (for example, Burchardt (2004)).

### 5.3 *Socio-economic Factors and Financial Satisfaction*

While this paper is primarily concerned with the impact of income in its various forms on individual levels of financial satisfaction, a number of additional factors that influence financial satisfaction in different ways are also controlled for. We explore these variables here by considering to what extent the time varying socio-economic factors have an independent effect on financial satisfaction levels once correlations with the unobserved components of the model are controlled for.<sup>23</sup> Table 6 presents the results

<sup>23</sup> As previously noted, however, the coefficients on the time invariant factors cannot be directly interpreted as the causal effect of these variables on financial satisfaction cannot be separated from their correlation with the unobserved effects.

for all control variables (both time varying and time invariant) as they appear in the final specification of the income model presented in Column (3) of Table 5.

Table 6: *Socio-Economic and Demographic Effects*<sup>†</sup>

	$\beta$ Parameters		Unobserved Heterogeneity
Investment income	0.019	(0.059)	0.405*** (0.116)
Number of adults	-0.043**	(0.021)	-0.090*** (0.027)
Number of children	-0.005	(0.029)	-0.066* (0.036)
Health1	0.484***	(0.086)	0.235 (0.196)
Health2	0.357***	(0.084)	-0.026 (0.215)
Religiosity	0.046	(0.046)	-0.072 (0.069)
Unemployed	-0.670***	(0.079)	-0.398** (0.171)
Retired	0.007	(0.094)	0.228* (0.120)
Age		0.008*** (0.002)	
Female		0.086** (0.042)	
Married		0.068 (0.043)	
Primary Level Ed.		0.081* (0.046)	
Secondary Level Ed.		0.030 (0.051)	
Third Level Ed.		0.066 (0.067)	
Financial Sat.Cat 2 ( $t_{\theta}$ )	...		0.250*** (0.065)
Financial Sat.Cat 3 ( $t_{\theta}$ )	...		0.487*** (0.064)
Financial Sat.Cat 4 ( $t_{\theta}$ )	...		0.596*** (0.064)
Financial Sat.Cat 5 ( $t_{\theta}$ )	...		0.895*** (0.070)
Financial Sat.Cat 6 ( $t_{\theta}$ )	...		1.133*** (0.078)

<sup>†</sup>Random effects ordered probit model incorporating controls for demographic and socio-economic variables, correlated individual effects, initial values and time dummies. Results for demographic and socio-economic effects included in Column (3) of Table 5.

Standard errors are given in parenthesis. \*\*\* indicates significance at the 1 per cent level, \*\* indicates significance at the 5 per cent level, \* indicates significance at the 10 per cent level

As hypothesised by Lucas *et al.* (2003; 2004), in Section 3.1 we considered the possibility that life changing events such as unemployment or ill health may dislodge the persistence evident in the financial satisfaction series. As revealed in Table 6, unemployment has a significant negative effect on financial satisfaction of a very large magnitude, even when the correlation between unemployment and the unobserved effects are controlled for. This result has also been found in other studies of well-being (See for example, Winkelmann and Winkelmann (1998) and Vendrik and Woltjer (2006)). Individual's perceived health status is also a significant explanatory factor of a relatively high magnitude even after the inclusion of the mean of the health

index for each individual. The magnitude of these results suggests that while income is an important determinant of financial satisfaction, state variables such as health and unemployment have dramatic independent effects.

## VI CONCLUSION

The Irish economy grew rapidly over the period 1994-2001 and this paper provides important evidence on the effect of this on financial well-being. Perhaps unsurprisingly, the protracted economic gains over this period raised financial satisfaction among the population though not satisfaction in many other domains of life. Our results point to a number of important features explaining differences in financial satisfaction among individuals. In general, income is an important factor driving financial satisfaction but state variables such as health and unemployment also have dramatic independent effects. To the extent that income influences financial satisfaction, there is strong evidence from this paper that the level of household income remains the dominating influence. We also find strong evidence of diminishing returns to income in terms of its effect on financial satisfaction.

Much of the research on well-being finds that income levels relative to average income in a social reference group are important for life satisfaction. In addition to confirming this, our paper also finds evidence that the greater the deviation in individual income from household income, the greater the level of individual financial satisfaction. As such, this is the first paper to consider the effect of intra-household differences in income on subjective well-being measures and is suggestive of the existence of a benchmark level of intra-household income (here assumed to be total household income) that individuals use to appraise their own financial situation.

The above conclusions are far stronger than conclusions reached from models that do not correct for state dependence, unobserved heterogeneity and the initial conditions and therefore the paper provides a strong contribution to enhancing the robustness of findings in this literature. However, there are clearly a number of limitations with using this type of data and model to estimate reference effects. In particular, the data available do not allow us to pinpoint the actual reference groups that individuals utilise when forming their expectations, nor does it allow us to account for endogeneity in this selection process. Future research that examines the causal effects of peer group conditions on life satisfaction would be a strong development of this work.

## REFERENCES

- BLANCHFLOWER, D. and A. OSWALD, 2004. "Well-being Over Time in Britain and the USA", *Journal of Public Economics*, Vol. 88, Nos. 7-8, pp. 1359-86.
- BRICKMAN, P., D. COATES and R. JANOFF-BULMAN, 1978. "Lottery Winners and Accident Victims: Is Happiness Relative?", *Journal of Personality and Social Psychology*, Vol. 36, pp. 917-27.
- BURCHARDT, T., 2004. "One Man's Rags are Another Man's Riches: Identifying Adaptive Preferences Using Panel Data", *CASE 086*.
- CHAPMAN, G. B., 2000. "Preferences for Improving and Declining Sequences of Health Outcomes", *Journal of Behavioural Decision Making*, Vol. 13, pp. 203-18.
- CLARK, A., 2003. "Unemployment as a Social Norm: Psychological Evidence from Panel Data", *Journal of Labor Economics*, Vol. 21, No. 2, pp. 323-51.
- CLARK, A. and A. OSWALD, 1996. "Satisfaction and Comparison Income", *Journal of Public Economics*, Vol. 61, pp. 359-81.
- CONTOYANNIS, P., A. M. JONES and N. RICE, 2004. "The Dynamics of Health in the British Household Panel Survey", *Journal of Applied Econometrics*, Vol. 19, pp. 473-503.
- DENNY, K. and O. DOYLE, 2005. "Does Voting History Matter: Analysing Persistence in Turnout". UCD Geary Discussion Paper 2005/13; Centre for Economic Research, Working Paper Series WP06/07, University College Dublin.
- EASTERLIN, R., 2001. "Income and Happiness: Toward a Unified Theory", *The Economic Journal*, Vol. 111, No. 473, pp. 465-84.
- ECONOMIC AND SOCIAL RESEARCH INSTITUTE (1994-2001). *Living in Ireland Surveys*, Dublin: The Economic and Social Research Institute.
- FERRER-I-CARBONELL, A., 2005. "Income and Well-Being: an Empirical Analysis of the Comparison Income Effect", *Journal of Public Economics*, Vol. 89, pp. 997-1019.
- FERRER-I-CARBONELL, A. and P. FRIJTERS, 2004. "How Important is Methodology for the Estimates of the Determinants of Happiness?", *Economic Journal*, Vol. 114, No. 497, pp. 641-59.
- FRANK, R., 1997. "The Frame of Reference as a Public Good", *The Economic Journal*, Vol. 107 (Nov.), pp. 1832-47.
- FRIJTERS, P., J. HAIKEN-DENEW and M. SHIELDS, 2003. "Estimating the Causal Effect of Income on Health: Evidence from Post Reunification East Germany." Centre for Economic Policy Discussion Paper No. 465, Australian National University.
- FUJITA, F. and E. DIENER, 2005. "Life Satisfaction Set Point: Stability and Change", *Journal of Personality and Social Psychology*, Vol. 88, No. 1, pp. 158-64.
- HAMERMESH, D. S., 1977. "Economic Aspects of Job Satisfaction" in O. C. Ashenfelter and W. E. Oates (eds.), *Essays in Labour Market Analysis*, New York: John Wiley.
- HENLEY, A., 2000. "Self-Employment Choice: State Dependence, Initial Conditions and Unobserved Heterogeneity". School of Management and Business Research Paper 2000-7, University of Wales, Aberystwyth.
- INGELHART, R., 2002. "Gender, Ageing and Subjective Well-Being", *International Journal of Comparative Sociology*, Vol. 43, Nos. 3-5, pp. 391-408.



- JONES, A., X. KOOLMAN and N. RICE, 2006. "Health Related Non-Response in the British Household Panel Survey and European Community Household Panel: Using Inverse-Probability-Weighted Estimators in Non-Linear Models", *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, Vol. 169, No. 3, pp. 543-69.
- KIMBALL, M. and R. WILLIS, 2005. "Utility and Happiness", University of Michigan, mimeo.
- LOWENSTEIN, G. and D. PRELEC, 1991. "Negative Time Preference", *American Economic Review*, Vol. 81, No. 2, pp. 347-52.
- LUCAS, R., A. CLARK, Y. GEORGELLIS and E. DIENER, 2003. "Re-examining Adaptation and the Set Point Model of Happiness: Reactions to Changes in Marital Status", *Journal of Personality and Social Psychology*, Vol. 84, pp. 527-39.
- LUCAS, R., A. CLARK, Y. GEORGELLIS and E. DIENER, 2004. "Unemployment Alters the Set-Point for Life Satisfaction", *Psychological Science*, Vol. 15, pp. 8-13.
- MANSKI, C., 1993. "Identification of Endogenous Social Effects: The Reflection Problem", *The Review of Economic Studies*, Vol. 60, No. 3, pp. 531-542.
- MCBRIDE, M., 2001. "Relative-Income Effects on Subjective Well-Being in the Cross-Section", *Journal of Economic Behavior and Organization*, Vol. 45, pp. 251-78.
- MOOKHERJEE, H. N., 1997. "Marital Status, Gender and Perception of Well-Being", *Journal of Social Psychology*, Vol. 137, No. 1, pp. 85-105.
- NEYMAN, J. and E. SCOTT, 1948. "Consistent Estimates Based on Partially Consistent Observations", *Econometrica*, Vol. 16, pp. 1-32.
- PUDNEY, S., 2006. "The Dynamics of Perception: Modelling Subjective Well-Being in a Short Panel", ISER Working Paper 2006-27.
- RABIN, M., 1998. "Psychology and Economics", *Journal of Economic Literature*, Vol. 36, No. 1, pp. 11-46.
- SENIK, C., 2004. "When Information Dominates Comparison. Learning from Russian Subjective Panel Data", *Journal of Public Economics*, Vol. 88, pp. 2099-123.
- STACK, S. and J. R. ESHLEMAN, 1998. "Marital Status and Happiness: A 17-Nation Study", *Journal of Marriage and the Family*, Vol. 60, No. 2, pp. 527-36.
- SWEENEY, P. and D. MCFARLIN, 2004. "Social Comparisons and Income Satisfaction: A Cross-National Examination", *Journal of Occupational and Organizational Psychology*, Vol. 77, pp. 149-54.
- VAN PRAAG, B. and A. FERRER-I-CARBONELL, 2004. *Happiness Quantified: A Satisfaction Calculus Approach*, Oxford: Oxford University Press.
- VAN PRAAG, B., P. FRIJTERS and A. FERRER-I-CARBONELL, 2003. "The Anatomy of Subjective Well-Being", *Journal of Economic Behavior and Organisation*, Vol. 51, pp. 29-49.
- VENDRIK, M and G. WOLTJER, 2006. "Happiness and Loss Aversion: When Social Participation Dominates Comparison", IZA Discussion Paper No. 2218, Available at SSRN: <http://ssrn.com/abstract=921067>
- VERBEEK, M. and T. NIJMAN, 1992. "Testing for Selectivity Bias in Panel Data Models", *International Economic Review*, Vol. 33, pp. 681-703.
- WATSON, D., 2004. "Living in Ireland Survey – Technical Overview", Accessed on 19/8/05 at <http://issda.ucd.ie/documentation/esri/lii-overview.pdf>
- WINKELMANN, L. and R. WINKELMANN, 1998. "Why are the Unemployed so Unhappy? Evidence from Panel Data", *Economica*, Vol. 65, pp. 1-15.

WOOLDRIDGE, J., 2005. "Simple Solutions to the Initial Conditions Problem in Dynamic, Nonlinear Panel Data Models with Unobserved Heterogeneity", *Journal of Applied Econometrics*, Vol. 20, pp. 39-54.