WELL-BEING IN PANELS

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ABSTRACT

This paper uses panel data to study human wellbeing. It finds that fixed-effects equations have a similar structure to cross-section equations. This is potentially important, because nearly all work in the field has been forced to rely on cross-section information, and critics have argued that the omission of controls for person-effects makes the literature's conclusions open to doubt. Our paper follows a random sample of 7000 British individuals through each year of the 1990s. The paper calculates the relative importance of economic and non-economic events to psychological health. It puts dollar values -- positive or negative -- on the 'happiness' value of health, marriage, unemployment, children, and education. Widowhood is the worst life event. The paper also makes a first stab at identifying what lies behind the large fixed-effects in people's subjective well-being.

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Andrew E. Clark and Andrew J. Oswald*

1. Introduction

Economists have recently become interested in the patterns in subjective wellbeing data. Despite Easterlin's (1974, 1995) work, and a large empirical literature in applied psychology, the discipline of economics has traditionally resisted the use of survey data on mental wellbeing. In doing so, it has cut itself off, quite consciously, from attempts, for instance, to study utility theory by using proxy or quasi measures for utility. There appear to be three main reasons why economics researchers have been sceptical of happiness and mental health surveys. They might be termed the ordinality problem, the scaling problem, and the omitted-dispositions problem.

The first two difficulties are well-known. Answers to questions like 'how happy do you feel on the following scale…?' are subject to the scaling criticism that different human beings may use different mental scales (so that your 5 is my 4) and to the issue that wellbeing, at least in traditional economics, is intrinsically ordinal and not cardinal. Recent research has tried to overcome these two concerns. It has treated people's different ways of answering questionnaires as being captured by an error term in a regression equation. This can be viewed as an assumption of the existence of a kind of measurement error in individuals' answers. Such errors do no harm if they both enter the dependent regression variable alone (rather than the independent variables) and satisfy the well-behavedness properties that are typically assumed throughout applied work in economics. Research has also used ordered logit and probit methods, rather than Ordinary Least Squares equations, which in principle can circumvent the dilemma that measured wellbeing must not be treated as cardinal.

Less attention, however, has been paid to the omitted-dispositions problem. There appears to be a feeling among economists -- this emerges very commonly and spontaneously from seminar audiences -- that people's subjective feelings are unreliable because they are likely to be dominated by individuals' innate personalities. What this comes down to, if it is

to be a coherent criticism, is the idea that investigators who work with subjective data will tend to obtain biased estimates in a 'happiness' equation if they fail to control for in-born dispositions. To put it differently, cross-section equations will be unreliable whenever unobservable characteristics (like a person's natural cheerfulness) are correlated with observable variables (like education).

The aim of this paper is to try to address the third of these difficulties -- that of omitted dispositions. By using longitudinal data, the paper estimates panel equations (or so-called fixed-effect equations, where 'fixed-effect' means the unchanging characteristics of a person). Such methods have the advantage over cross-section work that they effectively allow a separate regression dummy-variable to be entered for each person in a survey. That dummy variable acts as a control for the fact that some human beings may be born with sunny dispositions while others are born cranky and, crucially, the possibility that genetic effects of this sort are correlated with variables the econometrician does observe.

To anticipate the paper's results, we find evidence that seems encouraging. Cross-section wellbeing equation structures are similar to those found with panel estimation. This is potentially important. It suggests that, in happiness research, the biases in cross-section patterns may be less dramatic than has sometimes been supposed.

2. Data and Cross-Section Results

The current paper uses data from the first nine waves of the British Household Panel Study, BHPS, a general survey covering a random sample of approximately 10,000 individuals in 5,500 British households. This data set includes a range of information about individual and household demographics, health, employment, values, and finances. The wave 1 data were collected between late 1991 and early 1992. The wave 2 data were collected between late 1992 and early 1993, and so on[1].

The analysis in the current paper refers to individuals of working age (16 to 65). That produces 74,835 observations in total, covering 17,809 different individuals[2]. Of those, 3,989 people are interviewed in all nine waves of the data set.

For this analysis, a proxy for 'utility' or mental wellbeing is required. In this paper it is the so-called GHQ-12 measure of psychological health (see Goldberg, 1972). This measure

is constructed from the responses to twelve questions (administered via a self-completion questionnaire) that cover feelings of happiness, strain, depression and ability to cope, anxiety-based insomnia, and lack of confidence, amongst others. The relevant part of the questionnaire is reproduced in the Annex. Responses are made on a four-point scale of frequency of a feeling in relation to a person's usual state: "Not at all", "No more than usual", "Rather more than usual", and "Much more than usual". The two highest response values are taken to indicate potential psychological ill-health. Darity and Goldsmith (1996), Konow and Earley (1999) and Oswald (1997) discuss some of the validation work that has been carried out with such psychological scales.

We use the responses to the GHQ-12 questions to construct what is known as a Likert measure of psychological health. This is a wellbeing score from zero to 36. It is the simple sum of the responses to the twelve questions, coded so that the response with the lowest well-being value scores 3 and that with the highest well-being value scores 0. For simplicity, this count is reversed here, so that higher scores indicate higher levels of well-being.

The paper's wellbeing measure thus runs from 0 (all twelve responses indicating the worst psychological health) up to 36 (no responses indicating poor psychological health)[3]. The inter-item correlation within the GHQ-12 is high in this paper's BHPS sample, with a Cronbach's alpha score of 0.89. The distribution of the reversed Likert well-being measure in this paper's sample of the BHPS is shown below.

Well-being Score	*Number of Observations*	*Cumulative Percentage*
0	88	0.12
1	63	0.2
2	74	0.3
3	89	0.42
4	122	0.58
5	118	0.74
6	146	0.94
7	189	1.19
8	223	1.49
9	230	1.79
10	319	2.22
11	391	2.74
12	593	3.53

13	678	4.44
14	769	5.47
15	855	6.61
16	1055	8.02
17	1250	9.69
18	1446	11.62
19	1788	14.01
20	1953	16.62
21	2534	20.01
22	3103	24.15
23	3675	29.07
24	6545	37.81
25	6417	46.39
26	6763	55.42
27	6962	64.73
28	6979	74.05
29	6858	83.22
30	6472	91.86
31	2644	95.4
32	1565	97.49
33	873	98.66
34	460	99.27
35	308	99.68
36	238	100
Total	**74,835**	

The mean, median and mode of this distribution are 25, 26 and 28 respectively. There is a long tail in these kinds of GHQ scores. Relatively large numbers of individuals have well-being scores down to 15.

Table 1 summarises the basic patterns in the data. It presents the relationships between our measure of psychological well-being and a number of standard economic and demographic variables. Both the mean level of well-being and, taking account of the fact that this is an ordinal rather than a cardinal measure, the percentage with "high" well-being (defined as a well-being score of greater than the mean level, 25) are shown.

These cross tabulations reveal that men report higher average well-being scores than women. The young have higher well-being scores than do middle-aged or older individuals, and the single have the highest well-being, while the separated or widowed have the lowest. With respect to labour force status, women on maternity leave have the lowest score, followed by the unemployed and students; the highest levels of well-being are found amongst

retirees and those on government training courses. The relationship between well-being, employment and unemployment has been one of the central questions in the literature.

Table 1 also shows that well-being is strongly positively correlated with health, more weakly correlated with education, and shows some tendency to fall with the number of children. This latter relationship may be confounded with other variables, such as age and marital status, as will be the case for many of Table 1's categories. Individuals who own their own houses report higher well-being than those who rent or those buying a house. For economists, a key relationship is that between well-being and income, measured here by real household monthly income, converted to equivalent units using the ratios 1:0.5:0.3. This relationship is positive and monotonic. We return below to the question of income and well-being in a multivariate analysis.

The differences depicted in Table 1 are statistically significant. All of the tests of the hypothesis that the mean GHQ scores are identical across categories are rejected at reasonable significance levels.

Empirical research has highlighted the characteristics that are correlated with, and are potentially causally related to, subjective well-being (see Clark, 1996, Clark and Oswald, 1994, and Veenhoven, 1999). It is clear, however, that a multivariate approach is needed.

Table 2 reports the results of such regressions on data from the first nine waves of the BHPS. For simplicity, given that the wellbeing scores run up to 36, OLS equations are presented. The same broad results can be reproduced using ordered probits. Table 2 has two columns. The first refers to households with equivalent income under £30,000 per annum (in 1992 terms), and the second to households with equivalent income under £20,000. These restrictions are designed to allow for a small number of income outliers[4].

Table 2's results again demonstrate that males have higher well-being levels than do females[5], and that, in both regressions, there is a U-shaped relationship with age (as in Clark, Oswald and Warr, 1996), minimising around age 43 in both of Table 2's estimated equations. The omitted labour force category, to which all of the estimated labour market coefficients are relative, is "not in the labour force". The dummy variables for employment, self-employment and retirement are all positive and significant, while that for unemployment

is negative and significant.

Yearly household equivalent income is in real terms, having been adjusted by the private consumption deflator. This income variable in Table 2's equations has a positive and significant coefficient. To an economist, this is an important finding, because it is consistent with the idea of a utility function that is monotonically increasing in income. There is also some evidence from Table 2 that those with higher education have lower levels of GHQ well-being. The correlations with health status are particularly strong: they attract the most significant coefficients of all the explanatory variables and "excellent health" has a t-statistic of over 70 in each of Table 2's equations. Married people have the highest level of mental well-being, while the separated and widowed have the lowest. Well-being is significantly lower for individuals with three or more children. Last, home owners have significantly higher psychological well-being scores than those in other types of housing.

Compensating Differentials

As the regression equations make clear, human welfare is affected by a mixture of economic and non-economic forces. A natural idea is to try to calculate the value to human beings of different sorts of life events and influences. In principle, this can be done in the following way.

The estimated well-being equation is of the form

$$WB = A + \exists_1 S_1 + \exists_2 S_2 + ... + (\ln(Y) + \underline{2}'\underline{X} + , \qquad (1)$$

where WB is a measure of individual well-being, A is a constant, Y is some measure of income, the S_i are dummy variables for various kinds of labour market and life events (such as labour force status or marital status), and $\underline{X}$ is a vector of other control variables. The estimated coefficients from equation (1) can be used to calculate the 'compensating differentials' for the S_i events, namely, the alterations in income that would be required to exactly off-set a particular life occurrence.

Consider a bad life event. Imagine that an individual switches from employment to unemployment (respectively states S_E and S_U, say). The compensating differential for this movement can be calculated by setting the utilities in the two different states equal, so that:

$$\exists_E + (\ln(Y_0) = \exists_U + (\ln(Y_1)$$

which yields

$$Y_1 = \exp[((\exists_E - \exists_U)/() + \ln(Y_0)] \quad (2)$$

This method has been used by, for instance, Clark (1996) to calculate the shadow wage using BHPS data; by Clark and Daniel (1999) to calculate compensating differentials for six broad measures of job characteristics; by Blanchflower and Oswald (2003) for marriage and racial differences; by Clark and Maurel (2001) for the shadow price of wage arrears in Russia; by Di Tella, MacCulloch and Oswald (2003) for macroeconomic movements in the economy; and by van Praag and Baarsma (2000) to calculate the shadow price of aircraft noise.

Using the above formula, and the estimated parameters in Table 2, the differentials for various events can be calculated: see the foot of Table 2. These are mostly large compared to average yearly household equivalent income in the sample. For example, the transition from employment to unemployment requires a rise in yearly household equivalent income of £56,000 in column 2. This is, of course, an enormous amount. It suggests that there are very large psychic costs from joblessness. In an important early paper, Winkelmann and Winkelmann (1998) use German Socio-Economic Panel data to estimate that the associated drop in income only accounts for 14 per cent of the total psychological cost of unemployment. The same calculation here (using the income sample means of £13,294 and £7,315 for the employed and unemployed, respectively) produces figures of seven per cent and ten per cent in columns one and two respectively. Hence German and British results are somewhat similar in size.

Interactions

Table 2's Ordered Probit wellbeing equations were re-run on various sub-groups of the sample, to see if the effect of labour force status on well-being differed across demographic groups. The results showed that income has a larger estimated effect on women's well-being than on men's, while employment, compared to unemployment, is more important for men. As a consequence, the estimated compensating differential for unemployment (compared to employment) is higher for men than for women. The

compensating differential for unemployment is also higher for those aged over 35 than for younger individuals.

3. Panel Data: Transitions and Fixed Effect Regressions

We turn now to the panel aspect of our data. Here, in Table 3, it is possible to chart how human beings are affected in the actual year of a life event.

A number of transition dummy variables were created to reflect developments in the individual's job and home. In Table 3, cross-tabulations are presented of these dummy variables with changes in the levels of both well-being and happiness[6]. This is a simple way to get a feel for how people are affected -- in longitudinal data -- by life's occurrences.

The first two rows in Table 2 refer to transitions in labour force status: from work to unemployment, and from unemployment to work. For example the number -1.65 means in the top left-hand corner of Table 3 that a typical individual who loses his or her job suffers a large fall in wellbeing of 1.65 points (on the 36-point scale). Finding work, by contrast, raises mental wellbeing by 2.64 points. It is possible that this gap of approximately one wellbeing point is because those who become unemployed are initially confident -- perhaps even over-confident -- of finding work quickly.

The numbers show that such transitions can have large effects on psychological wellbeing. It is worth emphasising that, since we are using data from the same individuals to make these Table 3 calculations, there is no immediate issue of inter-personal comparisons of subjective measures. Interestingly, those who transit between work and unemployment report a change in well-being that is similar to the difference in simple well-being scores in Table 1. In other words, cross-tabulations on levels give the correct general answers. This fact goes some way to assuage fears of reverse causality, whereby those with low well-being would have more trouble in finding and keeping a job. The t-statistics from the test that the changes in well-being or 'happiness' in Table 3 are independent of these transitions are large.

The third line refers to income changes. There are obviously any number of ways to cut the sample up here. We calculate the change in well-being according to whether the change in household equivalent income was in the top 25% or not. The difference is

significantly significant

The next set of four transition dummies in Table 3 refer to marital status. Marriage over the past year leads to a significant rise in well-being (there is actually some evidence that this rise is larger for remarriages than for first marriages). By contrast, the transition from marriage to separation is associated with large and statistically significant falls in well-being. Changes in numbers of children and alterations in educational levels are not correlated with changes in well-being. Health changes in Table 3 bring about alterations in psychological well-being in a way consistent with the elementary correlations in levels that are reported in Table 1.

One of the most striking findings in Table 3 is the effect of widowhood. Here, rather sadly but plausibly, we find an extreme fall in psychological wellbeing of 5.74 points. This illustrates the mental-health benefits from marriage, because widowhood is a kind of unfortunate natural experiment in which there is a kind of exogenous marital dissolution.

Repeated observations on the same individual allow controls for unobserved individual heterogeneity to be used. Following from our decision to use OLS in Table 2, we can control for unobserved fixed effects in a simple way by estimating well-being equations using deviations from the mean as the dependent variable. This requires that the individual be observed more than once, and that their well-being score change at least once. Table 4 reports the results of such OLS "within" regressions[7].

These Table 4 panel-equation results are consistent in structure with those from Table 2's pooled cross-section regressions. Unemployment continues to have a strong negative effect on well-being in these equations, while work and retirement are both positively correlated with well-being. Income is significantly correlated with well-being in column 2, but not in column 1. Health continues to have a strong positive effect. Separation and widowhood are associated with sharp drops in well-being. The pattern of the children and household size dummies is similar to that in Table 2. Last, renters are the worst off of all housing groups, *ceteris paribus*.

Table 4B presents alternative equations, both in levels and within groups, for lower income people. It also experiments with a longer difference in marriage, that is, up to a two-

year lag. We find a much larger wellbeing coefficient than on marriage in the current year. For example, in the panel estimates of Table 4B, 'married' enters with a coefficient of 0.109, while 'married within the previous two years' enters with a coefficient of 0.343. A possible interpretation of this is that happiness flows from meeting the person one is going to marry, so that wellbeing jumps up some time before the official marriage takes place.

4. Behind the Fixed Effects

The panel regressions in Table 4 allow the individual fixed effects to be estimated. These -- one for each person -- can be retrieved and used as data for a dependent variable.

In a second-stage equation, therefore, we can relate these estimated person-effect wellbeing values to a number of explanatory variables. Heuristically, the idea here is to try to decompose the fixed effect. An illustration is given in Figure 1. The first panel shows the average estimated fixed effect by five-year birth cohorts. This shows that, *ceteris paribus*, those who are born earlier tend to report higher GHQ scores than do those who were born recently. The effect is striking. A regression line is superimposed on the columns of the graph; amongst other things the regression line in Figure 1 shows that the effect is close to linear (the difference between older neighbouring cohorts is greater than the difference between more recent neighbouring cohorts). The second panel of Figure 1 shows that there is a substantial sex difference in the fixed effect, with men reporting scores that are *ceteris paribus* one point higher on the 0-36 scale than women.

Table 5 contains the results from second-stage regressions of the fixed effect. The explanatory variables include sex, year of birth, ethnicity, school type[8], and a host of variables referring to parents' labour force status when the respondent was aged 14. The first column includes all of the explanatory variables, while the second, the preferred specification, keeps only those which are significant at the ten per cent level.

These regression results suggest, as in Figure 1, that males and those born earlier report significantly higher GHQ scores. Other results make it clear that school type plays a role. In particular, those whose last school attended was a 6th form college or public/private school report higher mental wellbeing, whereas those whose last school was a 'secondary modern' report lower scores. Last, having a professional father is associated with a

significantly lower wellbeing score.

Conclusion

This paper studies wellbeing in panels. It uses nine waves of British longitudinal data. A principal finding -- though we have not attempted to calculate a test statistic for this -- is that cross-section and panel equations seem to have similar general structures. If correct, this is potentially important, because most of the published literature on wellbeing equations has been estimated on cross-sections and has thus been unable to adjust for person-effects.

Both OLS and panel regressions reveal that labour force variables and marital status variables have strong effects on well-being. By comparing their estimated coefficients to those on income in well-being regressions, it is possible to calculate the value of different kinds of life events. Widowhood has the largest effect that we detect. It induces nearly a 5 point reduction in mental wellbeing (on a 0 to 36 scale). We show that income matters to people. We also calculate that at most ten per cent of the psychological impact of unemployment is financial.

Panel estimation allows the estimated individual fixed-effects to be regressed on individuals' characteristics. This is done here using a two-step procedure. We demonstrate that these fixed effects are correlated with age, ethnicity and year of birth. The latter effect is particularly strong. The paper also finds that, other things held constant, having a professional father reduces individual well-being.

Footnotes

* We would like to thank Arthur van Soest for useful discussions. The BHPS data were made available through the ESRC Data Archive. The data were originally collected by the ESRC Research Centre on Micro-social Change at the University of Essex. Neither the original collectors of the data nor the Archive bear any responsibility for the analyses or interpretations presented here.

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Appendix

The twelve questions used to create the GHQ-12 wellbeing measure in the BHPS survey:

1. Here are some questions regarding the way you have been feeling over the last few weeks. For each question please ring the number next to the answer that best suits the way you have felt.

Have you recently....

a) been able to concentrate on whatever you're doing ?

Better than usual	*1*
Same as usual	*2*
Less than usual	*3*
Much less than usual	*4*

then

b) lost much sleep over worry ?
e) felt constantly under strain ?
f) felt you couldn't overcome your difficulties ?
i) been feeling unhappy or depressed ?
j) been losing confidence in yourself ?
k) been thinking of yourself as a worthless person ?

with the responses:

Not at all	*1*
No more than usual	*2*
Rather more than usual	*3*
Much more than usual	*4*

then

c) felt that you were playing a useful part in things ?
d) felt capable of making decisions about things ?
g) been able to enjoy your normal day-to-day activities ?
h) been able to face up to problems ?
l) been feeling reasonably happy, all things considered ?

with the responses:

More so than usual	*1*
About same as usual	*2*
Less so than usual	*3*
Much less than usual	*4*

TABLE 1. Cross-tabulations of Wellbeing Measured on a 0 to 36 Scale:

BHPS Waves 1 to 9

	Average well-being	*% with high well-being*	*Number of Observations*
Female	24.3	47.8	39708
Male	25.6	60.2	35127
16 to 29	25.6	58.7	23028
30 to 44	24.6	51.1	26134
45 to 65	24.6	51.6	25673
Married	24.9	53.3	42391
Separated	22.8	42.0	1613
Divorced	23.7	45.5	6122
Widowed	23.3	42.4	1530
Never married	25.5	58.0	23128
Self employment	25.5	57.9	6017
In paid employment	25.3	56.4	44559
Unemployed	23.5	44.7	4073
Retired	25.3	57.9	4014
Family carer	24.1	47.5	1137
FT student	23.7	43.2	6630
Long term sick	25.6	59.1	5079
On maternity leave	20.1	24.0	2825
Govt training	26.0	62.6	286
Something else	24.6	50.0	180
Children: 0	25.1	55.4	48980
Children: 1	24.5	50.4	10776
Children: 2	24.8	51.7	10428
Children: 3+	24.1	46.7	4661
Household Size: 1	24.2	50.3	6604
Household Size: 2	25.1	54.8	22822
Household Size: 3	24.8	52.8	17219
Household Size: 4	25.1	54.5	17781
Household Size: 5	24.9	53.8	7563
Household Size: 6+	24.7	50.7	2846
Health excellent	26.7	68.6	18691
Health good	25.4	55.7	37797
Health fair to very poor	22.1	34.1	18320
Education: other	24.3	49.7	22957
Education: medium	25.1	55.3	28398
Education: high	25.2	55.3	22995
Owned Outright	25.2	56.3	11893
Owned with mortgage	25.1	55.0	41724
Renter	24.3	49.8	20933
Income quartile: lowest	24.0	47.2	18992
Income quartile: 2	24.9	52.2	18288
Income quartile: 3	25.4	56.9	18731
Income quartile: highest	25.5	58.3	18793

Note: For each demographic variable, an F-statistic of the test that the average GHQ wellbeing scores are equal across the different values of the demographic variable can be constructed. This F-statistic is significant at better than the one per cent level for each pair of well-being measure and demographic variable presented above.

TABLE 2. Wellbeing Equations with Demographic and Job Variables:
OLS on Pooled Years of Data

	Wellbeing Cross-Section Equations BHPS Waves One to Nine	
	Households with yearly equivalent income < £30 000	*Households with yearly equivalent income < £20 000*
Log of Household Equivalent Income	0.206	0.294
	(.039)	(.053)
Male	1.067	1.070
	(.039)	(.041)
Age	-0.265	-0.266
	(.012)	(.012)
Age-squared/1000	3.058	3.085
	(.149)	(.155)
Employed	1.032	1.045
	(.053)	(.055)
Self-employed	0.950	0.973
	(.084)	(.088)
Unemployed	-0.652	-0.602
	(.091)	(.093)
Retired	1.178	1.118
	(.106)	(.109)
Education: High	-0.182	-0.151
	(.053)	(.055)
Education: A/O/Nursing	-0.055	-0.043
	(.049)	(.05)
Health: Excellent	4.175	4.191
	(.055)	(.058)
Health: Good	2.927	2.953
	(.048)	(.049)
Married	0.109	0.115
	(.066)	(.07)
Separated	-1.483	-1.482
	(.138)	(.144)
Divorced	-0.480	-0.499
	(.087)	(.091)
Widowed	-1.023	-0.980
	(.148)	(.153)
One Child	-0.100	-0.108
	(.065)	(.068)
Two Children	0.024	0.060
	(.077)	(.08)
Three+ Children	-0.323	-0.295
	(.108)	(.111)
Household size: 2	0.266	0.277

	(.08)	(.084)
Household size: 3	0.174	0.135
	(.085)	(.09)
Household size: 4	0.276	0.251
	(.091)	(.096)
Household size: 5	0.392	0.358
	(.106)	(.11)
Household size: 6+	0.395	0.403
	(.13)	(.134)
Housing: Owned Outright	0.258	0.267
	(.059)	(.063)
Housing: Rented	-0.079	-0.046
	(.049)	(.051)
Region dummies	Yes	Yes
Wave dummies	Yes	Yes
Constant	25.968	25.879
	(.237)	(.246)
N	*71957*	*65865*
Adjusted R-squared	0.1364	0.1392

COMPENSATING DIFFERENTIALS (£)

Work-unemployment	82000	56000
Married-separated	77500	54500
Married-divorced	28500	21000
Married-widowed	55500	37500
Health excellent-good	61000	42000
Well-Being effect of a 50% rise in income	0.083	0.119

Note. Average yearly household equivalent income (in 1992 Pounds) is £10 850 and £9 665 in Column1 and Column 2's samples respectively. Standard errors are in parentheses.

TABLE 3. People's Changes in Wellbeing: Cross-tabulations

	Change in GHQ (0-36)	***N***
Now unemployed, was in work		
Yes	-1.65*	890
No	-0.04	54242
Now in work, was unemployed		
Yes	2.64*	1046
No	-0.12	54086
Household equivalent income rose by more than 19%		
Yes	0.05*	13751
No	-0.11	41381
Now married, was not married		
Yes	0.26*	1238
No	-0.07	53852
Now separated, was married		
Yes	-0.83*	401
No	-0.06	54731
Now divorced, was married		
Yes	-0.63	146
No	-0.07	54986
Now widowed, was married		
Yes	-5.74*	97
No	-0.06	55035
Number of children greater than at last wave		
Yes	-0.04	2203
No	-0.07	52929
Health worse		
Yes	-1.03*	10591
No	0.16	44503
Health better		
Yes	0.89*	9883
No	-0.28	45211
Education up		
Yes	0.08	1619
No	-0.07	53146
Bought House		
Yes	0.17	1142
No	-0.07	53706

* = difference significant at the five per cent level.

TABLE 4. Wellbeing Equations with Demographic and Job Variables:
Panel Estimates: 'Within' Regression Equations

Wellbeing Panel Equations
BHPS Waves One to Nine

	Households with yearly equivalent income < £30 000	*Households with yearly equivalent income < £20 000*
Log of Household Equivalent Income	0.035	0.136
	(.054)	(.069)
Age	-0.418	-0.404
	(.06)	(.063)
Age-squared/1000	2.230	2.449
	(.332)	(.349)
Employed	0.922	0.967
	(.071)	(.074)
Self-employed	0.998	0.992
	(.124)	(.131)
Unemployed	-0.975	-0.911
	(.104)	(.107)
Retired	0.786	0.679
	(.131)	(.137)
Education: High	-0.158	-0.146
	(.168)	(.173)
Education: A/O/Nursing	-0.067	-0.023
	(.166)	(.171)
Health: Excellent	2.199	2.232
	(.069)	(.072)
Health: Good	1.630	1.632
	(.054)	(.057)
Married	0.150	0.206
	(.128)	(.139)
Separated	-0.982	-0.863
	(.2)	(.212)
Divorced	0.284	0.427
	(.183)	(.195)
Widowed	-1.845	-1.752
	(.31)	(.326)
One Child	0.087	0.043
	(.089)	(.094)
Two Children	0.334	0.324
	(.117)	(.123)
Three+ Children	0.080	0.061
	(.17)	(.176)
Household size: 2	0.250	0.325
	(.115)	(.124)
Household size: 3	0.102	0.132

	(.123)	(.132)
Household size: 4	0.083	0.103
	(.133)	(.142)
Household size: 5	0.273	0.315
	(.155)	(.163)
Household size: 6+	0.139	0.185
	(.2)	(.207)
Owned Outright	0.144	0.099
	(.098)	(.105)
Renter	-0.166	-0.128
	(.089)	(.094)
Region dummies	Yes	Yes
Wave dummies	Yes	Yes
Constant	33.835	32.682
	(1.915)	(2.014)
N	*71957*	*65872*

COMPENSATING DIFFERENTIALS (£)

Work-unemployment	n.s.	137500
Married-separated	n.s.	78500
Married-divorced	n.s.	-16000
Married-widowed	n.s.	143500
Health excellent-good	n.s.	44000
Well-Being effect of a 50% rise in income	n.s.	0.055

Note: Standard errors are in parentheses.

TABLE 4B. Wellbeing Equations, Lower Income, and the Timing of Marriages: Level and Panel Regressions

Wellbeing Equations
BHPS Waves One to Nine

Households with yearly equivalent income < £17 000

	OLS		***Panel***	
Log of Household Equivalent Income	0.312	0.341	0.193	0.188
	(.082)	(.074)	(.105)	(.093)
Male	1.058	1.064		
	(.057)	(.051)		
Age	-0.240	-0.254	-0.293	-0.313
	(.018)	(.016)	(.124)	(.109)
Age-squared/1000	2.766	2.951	2.427	2.125
	(.22)	(.192)	(.563)	(.454)
Employed	0.925	0.999	0.925	0.991
	(.076)	(.067)	(.106)	(.09)
Self-employed	0.936	0.958	0.943	0.996
	(.118)	(.106)	(.184)	(.162)
Unemployed	-0.348	-0.378	-0.724	-0.789
	(.134)	(.117)	(.152)	(.13)
Retired	1.024	1.043	0.559	0.618
	(.143)	(.13)	(.183)	(.161)
Education: High	-0.085	-0.127	-0.061	-0.060
	(.074)	(.066)	(.279)	(.232)
Education: A/O/Nursing	0.046	-0.034	0.226	0.171
	(.069)	(.062)	(.288)	(.237)
Health: Excellent	4.446	4.318	2.458	2.343
	(.08)	(.071)	(.1)	(.088)
Health: Good	3.126	3.022	1.731	1.651
	(.067)	(.06)	(.076)	(.067)
Married within past 2 years	0.335		0.343	
	(.152)		(.168)	
Married within past year		0.518		0.613
		(.175)		(.171)
Married	0.022	0.019	0.109	0.085
	(.099)	(.087)	(.249)	(.197)
Separated	-1.606	-1.645	-0.734	-0.890
	(.2)	(.18)	(.318)	(.271)
Divorced	-0.592	-0.639	0.475	0.467
	(.125)	(.112)	(.3)	(.253)
Widowed	-1.034	-0.878	-1.995	-1.962
	(.202)	(.183)	(.46)	(.399)
One Child	-0.044	-0.033	0.097	-0.014
	(.091)	(.082)	(.133)	(.115)

Two Children	0.167	0.180	0.341	0.307
	(.106)	(.096)	(.178)	(.152)
Three+ Children	-0.334	-0.317	-0.008	-0.077
	(.151)	(.134)	(.248)	(.212)
Household size: 2	0.320	0.290	0.263	0.233
	(.112)	(.102)	(.171)	(.15)
Household size: 3	0.170	0.090	0.076	-0.005
	(.121)	(.109)	(.183)	(.16)
Household size: 4	0.223	0.155	-0.032	-0.047
	(.13)	(.117)	(.201)	(.174)
Household size: 5	0.398	0.323	0.203	0.243
	(.153)	(.136)	(.233)	(.201)
Household size: 6+	0.107	0.228	0.113	0.067
	(.194)	(.168)	(.299)	(.255)
Housing: Owned Outright	0.288	0.272	0.165	0.106
	(.084)	(.076)	(.146)	(.128)
Housing: Rented	0.043	0.031	0.081	-0.046
	(.071)	(.062)	(.138)	(.118)
Region dummies	Yes	Yes	Yes	Yes
Wave dummies	Yes	Yes	Yes	Yes
Constant	24.993	25.265	29.249	29.839
	(.362)	(.312)	(5.019)	(3.744)
N	36205	44969	36205	44969
Adjusted R-squared	0.1420	0.1408	0.0646	0.0468
COMPENSATING DIFFERENTIALS (£)				
Work-unemployment	40500	40500	85500	94500
Single-recently married	-10500	-15000	-17500	-32500
Married-separated	52000	49000	43500	52500
Married-divorced	19500	19500	-19000	-20500
Married-widowed	34000	26500	109000	109000
Health excellent-good	42500	38000	37500	37000
Well-Being effect of a 50% rise in income	0.127	0.138	0.078	0.076

Note: Standard errors are in parentheses.

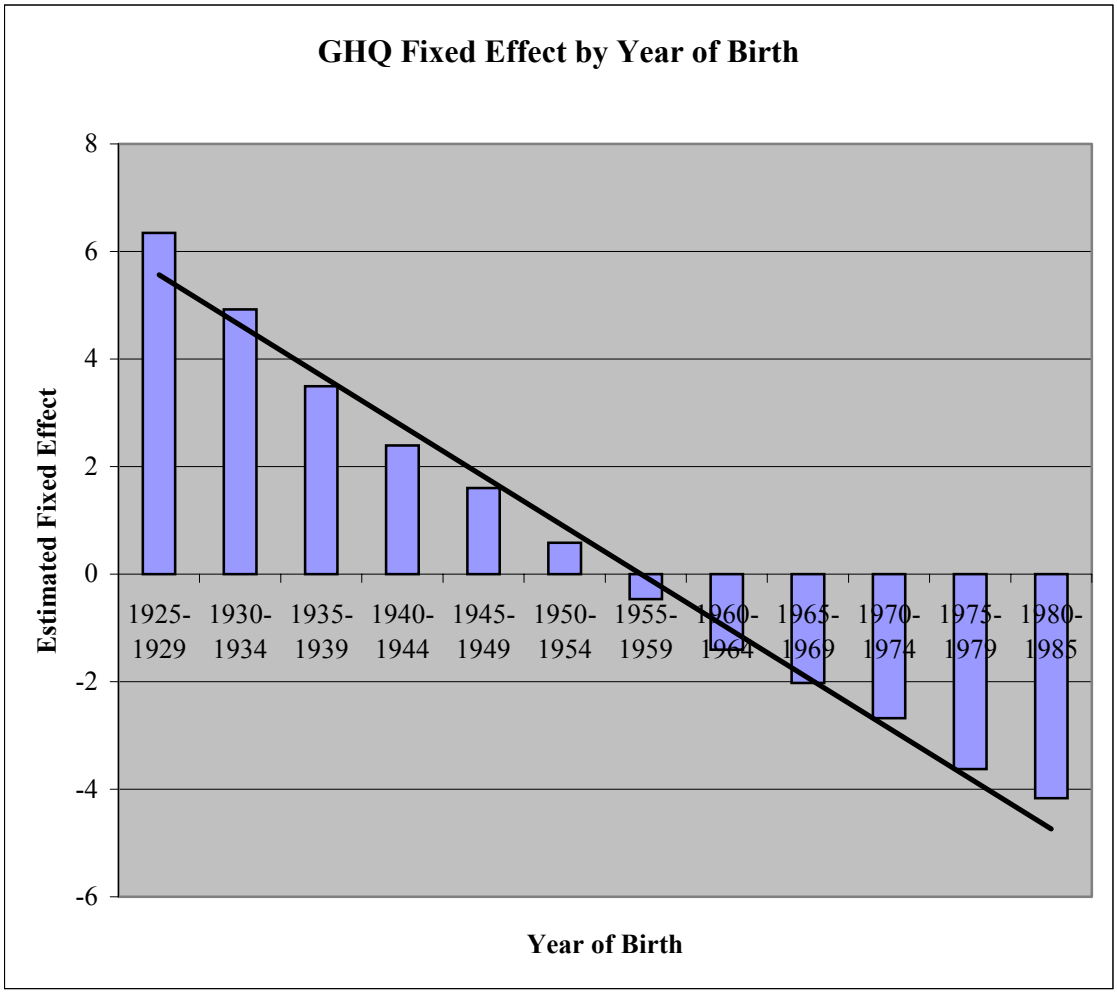
TABLE 5. Second-Stage Regressions with Fixed Effects as the Dependent Variable

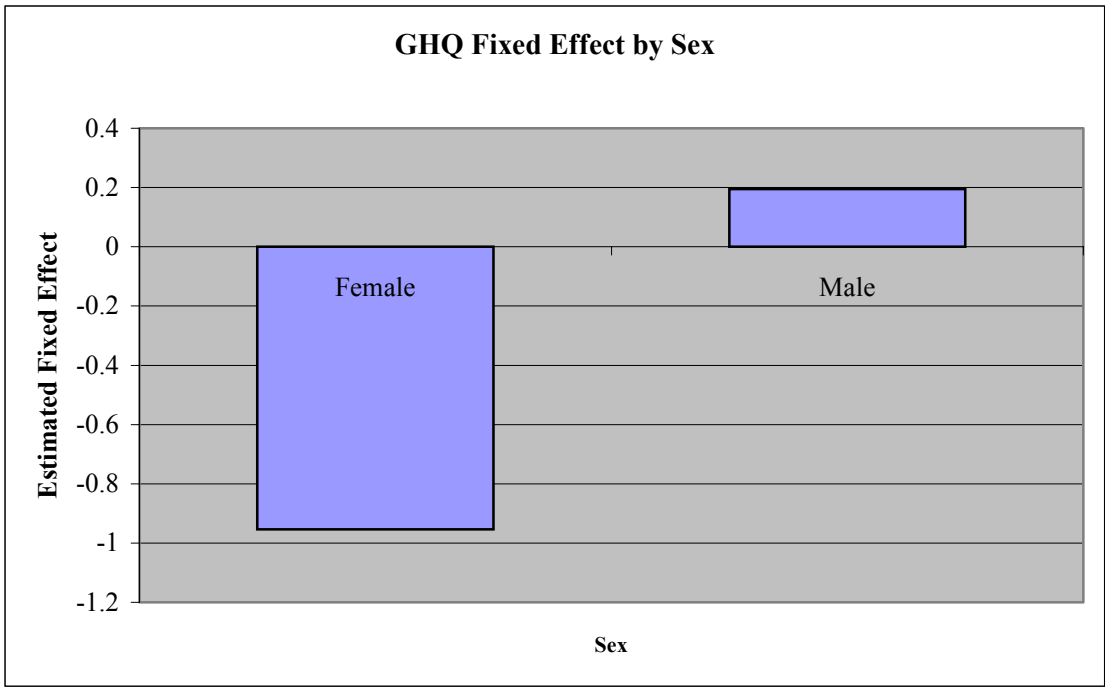
	Robust Regressions of the Estimated Fixed Effect in Wellbeing Equations. BHPS Waves One to Nine	
Male	1.109	1.113
	(.059)	(.059)
Ethnicity: Black	-0.086	
	(.268)	
Ethnicity: Asian Subcontinent	-0.477	-0.420
	(.246)	(.231)
Year of Birth	-0.188	-0.189
	(.002)	(.002)
Father: professional	-0.365	-0.366
	(.175)	(.156)
Father: managerial & technical	0.050	
	(.117)	
Father: skilled non-manual	-0.011	
	(.139)	
Father: skilled manual	-0.090	
	(.088)	
Father: partly skilled	-0.102	
	(.111)	
Father: unskilled	-0.219	
	(.164)	
Father: Armed Forces	0.256	
	(.274)	
Mother: professional	0.134	
	(.563)	
Mother: managerial & technical	-0.159	
	(.121)	
Mother: skilled non-manual	-0.227	-0.165
	(.100)	(.092)
Mother: skilled manual	-0.294	
	(.146)	
Mother: partly skilled	-0.141	
	(.106)	
Mother: unskilled	-0.188	
	(.127)	
Father had Employees	-0.133	
	(.133)	
Mother had Employees	0.051	
	(.252)	
Father: Manager	-0.111	
	(.087)	
Mother: Manager	0.188	
	(.138)	

Born outside of the UK	0.026	
	(.142)	
School: Grammar, not fee-paying	0.131	
	(.107)	
School: Grammar, fee-paying	0.086	
	(.247)	
School: Sixth form college	0.372	0.381
	(.144)	(.142)
School: Public & other private	0.251	0.268
	(.149)	(.142)
School: Elementary	0.518	0.487
	(.219)	(.212)
School: Secondary modern	-0.117	-0.175
	(.075)	(.066)
School: Technical	0.296	
	(.229)	
School: Other specific school	-0.007	
	(.168)	
Constant	368.492	368.950
	(4.782)	(4.246)
N	16354	16354

Note: Standard errors are in parentheses.

FIGURE 1. ESTIMATED FIXED EFFECTS IN A GHQ REGRESSION





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[1] For more information, see the BHPS web site: http://www.iser.essex.ac.uk/bhps.

[2] The number of individuals in the BHPS database increases over time, due to the inclusion of children in the original household sample who turn 16, and of the new members of

households formed by original panel members.

[3] An alternative is the Caseness score, which counts the number of times, out of twelve, that an individual answers in one of the two negative response categories.

[4] Although standard techniques exist to control for outliers in OLS regressions, these are not applicable to panel analysis. For consistency between the pooled and panel regressions, we therefore adopt a cruder control for outliers.

[5] Clark (1997) discusses the general finding that, on the other hand, women report higher levels of job satisfaction than do men.

[6] The changes in happiness often look small, but it should be borne in mind that the distribution of this variable is quite tight, so that small differences in means can be significant, owing to the very small standard errors.

[7] All of the analysis in this paper was carried out using Stata. This package adds the grand mean back in to both sides of the within estimator, which explains the presence of a constant term in Table 4's within regression results.

[8] The school type variable is constructed from the answer to the question "Could you look at this card and tell me what type school (you are attending/ you attended **last**)?". Around two per cent of individuals in the BHPS chose the response "Elementary School" to this question.