

**HOW WELL DO INDIVIDUALS PREDICT THEIR FUTURE LIFE SATISFACTION?
EVIDENCE FROM PANEL DATA FOLLOWING A NATIONWIDE EXOGENOUS SHOCK**

Paul Frijters

Economics Program, RSSS, Australian National University, Australia

John P. Haisken-DeNew

RWI, Essen, Germany

Michael A. Shields

Department of Economics, University of Melbourne, Australia

Corresponding author: Michael A. Shields, Department of Economics, University of Melbourne, Parkville, Melbourne, Australia 3010. E-mail: mshields@unimelb.edu.au; Fax: +61 0(3) 83446899. The author would like to thank Jeff Borland, Lisa Farrell, Bill Griffiths, Kevin Lee, Chris Skeels, Stephen Wheatley Price and Mark Wooden for useful comments.

HOW WELL DO INDIVIDUALS PREDICT THEIR FUTURE LIFE SATISFACTION? EVIDENCE FROM PANEL DATA FOLLOWING A NATIONWIDE EXOGENOUS SHOCK

Abstract

In this paper we provide a novel contribution to the growing economics-based literature on life satisfaction by investigating the ability of individuals to correctly predict their own future life satisfaction using high-quality longitudinal data for East Germans. The environment in which this analysis is based is the decade following reunification in Germany, and it is generally accepted that reunification was completely unexpected and delivered a particularly large shock to the future prospects of the inhabitants of the former East Germany. We therefore take it as a 'natural' experiment through which to study the rationality of expectations and the adjustment of expectations over a period of substantial transition. Our results show that the majority of East Germans significantly overestimated the gains from reunification. As with the recent literature on income expectations, we also find strong evidence of micro-heterogeneity with the largest prediction errors being for the young, the poorly educated and those with children. An important result, however, is that expectations and realisations of life satisfaction in East Germany had essentially converged only five years after reunification, at a level considerably below that of West Germans. The implication for other economic enquiries is that the assumption of rationality does not appear too bad in 'normal' times, but that it appears inappropriate in times of great transition.

JEL Classifications: C23, C25, I31, Z1

Keywords: Life Satisfaction, Prediction Error, Rationality, Learning

I. Introduction

The last decade has seen a small explosion of interest by economists into the economic and social determinants of life satisfaction or happiness, which builds upon a long tradition of exploring self-reported measures of individual well-being by psychologists (see Kahneman et al., 1999). Whilst economic theory is based on utility maximising behaviour, empirical economics typically has relied on revealed preferences to test the validity of competing theories. The strong appeal of life satisfaction data is that it can provide a direct proxy for utility, and recent studies have used this to establish, for example, the trade-off between unemployment and inflation (Di Tella et al., 2001), the degree to which unemployment is involuntary in nature (e.g. Clark and Oswald, 1994, Winkelmann and Winkelmann, 1998; Clark et al., 2001; Frijters et al., 2004a), the role of social norms in generating unemployment hysteresis (Clark, 2003; Lalive and Stutzer, 2004), the level of inequality-aversion across the population (e.g. Schwarze and Härpfer, 2003) and monetary equivalents for different types of health conditions (Ferrer and Van Praag, 2002).

In terms of the determinants of life satisfaction, the main focus of economists has been on the costs of unemployment and the relationship between income and life satisfaction. While there is already a clear consensus that unemployment has a large detrimental impact on life satisfaction (even after controlling for income), the relationship between income changes and satisfaction is much more contentious (see, for example, Frey and Stutzer, 2002a, 2000b; Helliwell, 2002; Frijters et al., 2004b). Probably the most popular view is that higher income does significantly improve life satisfaction, but that the gradient of this relationship is very small. This is supported by time-series data on a number of countries showing that average satisfaction or happiness levels have remained fairly constant over the last 50 years despite considerable increases in real incomes (e.g. Easterlin, 1974, 1995; Lane, 2000). This weak correlation between income and life satisfaction has been termed the ‘Easterlin paradox’, and has led to interest in the degree to which individuals adapt to income changes and the role of material expectations in this process (e.g. Easterlin, 2001; Stutzer, 2004).¹

In this paper we aim to provide a new angle to this literature by examining how well individuals predict their future life satisfaction, and their ability to improve their forecast over time. What we therefore ask is whether individuals are rational in their life satisfaction forecasts. We do this by using high quality longitudinal survey data that uniquely asks respondents to predict their future life satisfaction and also allows us to track the same individuals over time to see how well they did. We are then able to establish the size of any forecast error and the characteristics of individuals who are most likely to accurately predict their future. This is undertaken over a five-year time horizon.

Additionally, we undertake this study in the novel context of a real-world nationwide exogenous shock. To some extent, this research builds upon related work that looks at how individuals recall their past utility (see, for example, Kahneman et al., 1997, and the review by Hagerty, 2003). These studies have found that most individual recall their past life satisfaction or happiness to be lower than their current level.

Given our data, we are also able to directly inform on a key assumption of Easterlin's (2001) theory of the relationship between income and happiness, where individuals are assumed to always predict their future life satisfaction or happiness to be better than at present. This is because individuals are assumed to form their expectations based on perceived higher future income, but that their material aspirations remain at their current levels. Our data clearly suggest that this is not the case, with 56% of East Germans reporting their expected future life satisfaction to be no higher than today's. This is strong evidence given the general optimism that East Germans felt towards reunification.²

In designing our empirical strategy, we have also drawn on the recent literature that has used individual and household level survey data to test whether individuals form rational expectations with respect to income forecasted over the next 12 months (See Keane and Runkle, 1990; Dominitz and Manski, 1997; Das and van Soest, 1999; Das et al., 1999; Bonham and Cohen, 2001; Souleles, 2001; Carroll, 2003). These studies have clearly rejected rationality, and also found that forecasts errors can be attributed to individual characteristics such as age and employment status. Importantly, Keane and Runkle (1990) and Bonham and Cohen (2001) also argue that unbiased tests for rational expectations can only be undertaken using such survey data due to the existence of 'microheterogeneity'. This occurs when individuals use different information sets when making their forecasts, leading to rejection of the rational expectations hypothesis with aggregate data even if expectations were rational on the individual level. Individual and household longitudinal data, where a great deal of information is known about respondents, allows the direct identification of the types of individuals whose expectations are structurally incorrect.

¹ A recent exception in this literature is Frijters et al. (2004b), who found that the substantial increase in real household income in East Germany following reunification explained about 40% of the large rise in life satisfaction.

² One practical advantage of our data is that virtually the whole sample reports life satisfaction expectations and outcomes. This is not always the case with income expectations (see, for example, Das et al. 1999), where sizeable fractions report 'no answer' to either the income expectation question or the actual income question. If this non-response is a-selective, then some caution should be given to the robustness of findings using income expectations. Another advantage is that our welfare question is bounded on a (0,10) scale. This means that outliers will not have large effects, which may not be the case with income questions where income outliers have been shown to have large consequences for the results. For example, Das et al. (1999) discuss the biases on actual means of incomes and therefore on the question of whether expected and realised means coincide. Furthermore, the expectation question we use is based on a five-year time horizon, which implies that expectations require much more thought from the respondents than the one-year time horizon typically used in income questions (Easterlin, 2001).

The context for our analysis of how well individuals predict their own life satisfaction is East Germans over the decade immediately following reunification. It is widely accepted that reunification of East and West Germany is as close to a 'natural' experiment as is experienced in economics: few people anticipated the 'falling of the wall', nor the resulting rapid endowment of a former communist country with a set of market institutions (Bach and Trabold, 2000). It can therefore be viewed as a large nationwide exogenous shock, whose aftermath should be informative about rationality and the speed with which individuals adjust their expectations. Furthermore it is the case that the expectations of the East Germans had little impact on the transition policies that the West-German government devised for the East. This lack of policy endogeneity makes German reunification a useful setting for a study of the reactions of individuals to unexpected large changes in their economic and political environment. Specifically, the immediate years following reunification were a time of great optimism for both East and West Germans, even though there was considerable concern about the economic impact of reunification on the West. For East Germans this optimism was reflected in popular slogans such as 'Helmut (Kohl), take us by the hand, lead us to the economic wonderland' (Bach and Trabold, 2000).

The paper is presented as follows. Section II introduces our data, defines the measures of life satisfaction and illustrates the levels of current and expected life satisfaction for East and West Germans in the post-reunification period. The empirical methods by which we examine how well individuals' predict their future welfare and their ability to improve their forecast over time are discussed in Section III. The results are presented in Section IV. Conclusions are drawn in Section V.

II. Data and Life Satisfaction Profiles in Germany following Reunification

A. Data

To investigate the ability of East Germans to correctly predict their future life satisfaction following reunification, we use data from the German Socio-Economic Panel (GSOEP). The GSOEP is a nationally representative panel that has closely followed around 13,500 individuals (living in some 7,000 households) each year since 1984. Following reunification, the panel was extended to include residents of former East Germany.³ In this paper we focus on men and women, aged 21-64, who resided in East Germany, which we follow from 1991 up to 1999. Since our analysis requires individual-specific observations of both expectations (of $t+5$, at t) and realisations (at $t+5$) of life satisfaction we can only use the information on individuals who are observed in the panel for at least a

³ In this paper we use the German version of the GSOEP data (see Haisken-DeNew and Frick, 2000 for details), although the same analysis can be conducted with the international 'scientific use' version, albeit with around 5% fewer observations.

5-year period. Consequently, there are four possible combinations of expectations and realisations that we observe between 1991 and 1999: 1991-1996; 1992-1997; 1993-1998; and 1994-1999. Out of the 4,100 East German's appearing in the GSOEP between 1991 and 1999, we observe 2725 individuals over the required duration of 5-years (note that the average duration of respondents in the panel between 1991 and 1999 was 6.4 years). The cases excluded from our empirical analysis are a combination of those who remained in the panel for less than 5 years (due to attrition) plus those who entered the panel for the first time post-1994. We have checked in detail whether there was any selection on either initial satisfaction levels or expected satisfaction levels, but neither turned out to be the case. Finally, as the data span almost a decade, we have deflated all income information by the OECD main economic indicators consumer price index (base year 1995).

B. Measuring Current and Expected Life Satisfaction

The dependent variables we use in this analysis are based on two questions asked to each respondent in the GSOEP. These are:

'How happy are you are present with your life as a whole?'

This is immediately followed in the survey by:

'How happy do you think you will be five years from now?'

The responses to both questions are based on the same ordinal scale: running from 0 (very unsatisfied) to 10 (very satisfied). Whilst the determinants of the responses to the first question have been widely examined by economists (see, for example, Clark et al., 2001; Frijters et al., 2004; Gerlach and Stephan, 1996; and Winkelmann and Winkelmann, 1998), we are unaware of any studies that have investigated between expectations and realisations of life satisfaction for either East or West Germans.

C. Current and Expected Life Satisfaction Profiles

Figures 1 and 2 show the time profiles for current and expected life satisfaction. For comparison, we have also included separate profiles for West Germans (just over 11,000 individuals) over the same period.⁴ A number of interesting patterns emerge. Firstly, current levels of life satisfaction in the East

⁴ Figures 1 and 2: The averaged data points for each year use the full sample of East and West Germans, respectively, observed in the panel between 1991 and 1999 (i.e. 25,903 person-year observations for East Germans and 63,868 person-year observations for West Germans).

were significantly lower than in the West in every year. Secondly, whilst West Germans experienced a small gradual reduction in their life satisfaction following reunification, East Germans experienced a larger improvement. Consequently, the life satisfaction differential between East and West declined following reunification, but nearly a decade later, a significant differential still remained. Thirdly, expectations of life satisfaction at $t+5$ were far higher than current levels (at t) for East Germans in the first few years following reunification. East Germans appeared therefore to have been very optimistic about the benefits from reunification. Fourthly, the divergence between actual and expected life satisfaction was not evident for West Germans, suggesting that West Germans, on average, were fairly neutral with respect to the anticipated benefits or costs of reunification. Fifthly, actual and expected life satisfaction had converged by 1996 for East Germans, demonstrating that East Germans quickly corrected their over-optimism about the benefits to them from reunification

Table 1 illustrates the relationship between expected and realisations of life satisfaction in more detail. In particular, it is clear that East Germans over-estimated the benefits to them from reunification. For example, in 1991 the expectation of life satisfaction by East Germans for 1996 was 7.31, whilst the mean realization in 1996 was 6.38. This gives a mean forecast error of 0.93 (about 13%). In the following years the size of the forecast error declined sharply (almost linearly), and by 1994 East Germans were accurately forecasting life satisfaction. In contrast, the forecast error made by West Germans was smaller at about 4% in 1991, and had disappeared by 1993.

TABLE 1
Expectations, Realisations and the Mean Forecast Error for East and West Germans

| | East | | | West | | |
|---------|---------------------|-------------------------|---|---------------------|-------------------------|---|
| | $E_t\{LS_{i,t+5}\}$ | $\overline{LS}_{i,t+5}$ | $E_t\{LS_{i,t+5}\} - \overline{LS}_{i,t+5}$ | $E_t\{LS_{i,t+5}\}$ | $\overline{LS}_{i,t+5}$ | $E_t\{LS_{i,t+5}\} - \overline{LS}_{i,t+5}$ |
| 1991-96 | 7.31 | 6.38 | 0.93 | 7.36 | 7.07 | 0.29 |
| 1992-97 | 6.97 | 6.33 | 0.64 | 7.21 | 6.94 | 0.27 |
| 1993-98 | 6.74 | 6.41 | 0.33 | 7.01 | 6.94 | -0.08 |
| 1994-99 | 6.58 | 6.55 | 0.03 | 7.17 | 7.09 | -0.07 |

Note: $E_t\{LS_{i,t+5}\}$ is the expected level of life satisfaction at t for $t+5$. $\overline{LS}_{i,t+5}$ is the realised level of life satisfaction at $t+5$. $E_t\{LS_{i,t+5}\} - \overline{LS}_{i,t+5}$ is the mean forecast error.

FIGURE 1:
Average Current (t) and Expected ($t+5$) Life Satisfaction
for East Germans following Reunification

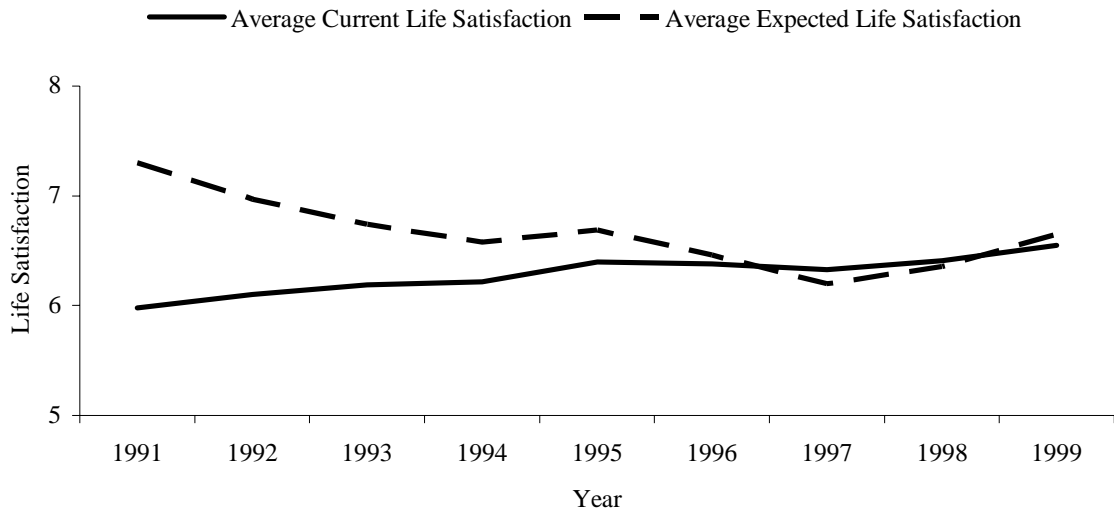
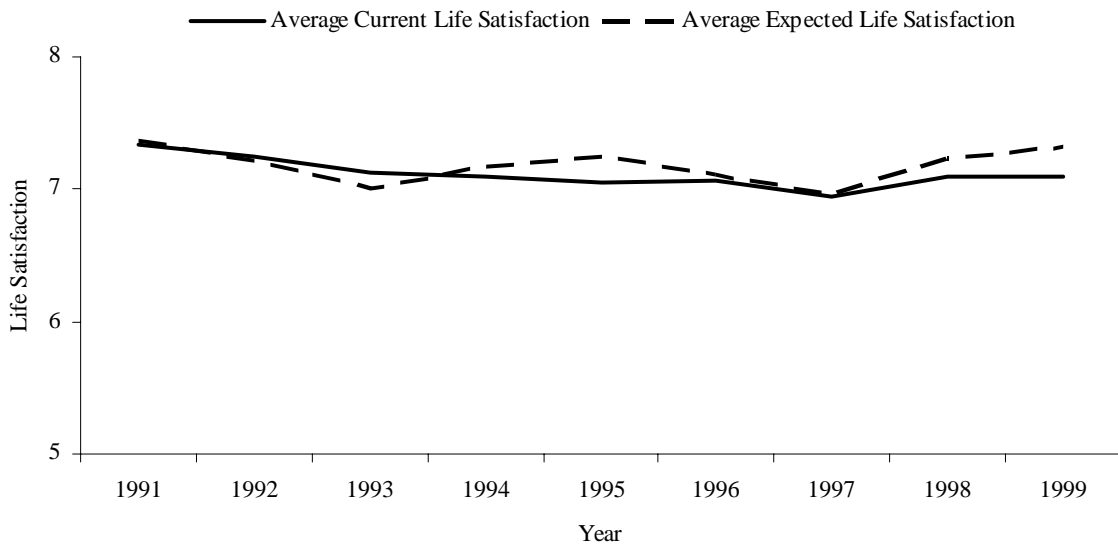


FIGURE 2:
Average Current (t) and Expected ($t+5$) Life Satisfaction
for West Germans following Reunification



D. Evidence on a Key Assumption of Easterlin's (2001) Theory of Income and Happiness

As already mentioned, the uniqueness of this data also allows us to shed some light on one of the main arguments used by Richard Easterlin (2001) in his elegant theory of the relationship between income and happiness. The theory is based on a strong version of the 'hedonic treadmill hypothesis' (Brickman and Campbell, 1971), where individuals are viewed as forever chasing goals that promise satisfaction during the chase, but that never satisfy once reached. In Easterlin's version, this hypothesis

is reflected in his quote of Samuel Johnson (1776) that ‘Life is a progress from want to want, not from enjoyment to enjoyment’

One of the main arguments used by Easterlin is that ‘people at any given point in the life cycle typically think that they will be better off in the future than at present... I am talking here of comparisons over periods of some length, say, five years or more, not very short intervals such as a year or less’ (p.471). This then clashes with the rather constant aggregate happiness levels found over time in the US, which is the paradox he aims to explain. To support this claim, he points to evidence from a 15-country study conducted by Cantril (1965), which finds, according to Easterlin, that in every country respondents ‘rated their prospective happiness higher, and their past happiness less, with only a few trivial exceptions’ (p.471). Some caution should be given to this interpretation though because the exact questions asked to respondents by Cantril (1965) did not explicitly refer to either ‘happiness’ or ‘life satisfaction’. The actual Cantril questions were:

‘Here is a ladder with ten steps which denotes the “ladder of life”. The bottom step stands for the worst possible life. If you climb up and arrive at the tenth step, you arrive at the best possible life. Can you indicate where you are at the moment? And where do you expect to be in 5 years time?’

We would hesitate to equate ‘the best possible life’ with ‘the happiest possible life’ because the two are only the same if respondents care only about happiness. As far as we know hence, there is no actual evidence of over-estimation of future life satisfaction based on life satisfaction questions.⁵

Our data on East Germans in the post-reunification years, given the five-year time horizon of the expectations question, therefore provides an interesting environment in which to examine new evidence about this proposed paradox. Overall, our findings are very different to that of Cantril’s and provide little evidence in support of Easterlin’s argument. For example, looking at the pooled sample over 1991-1999, we find that only 44.3% of respondents predicted their life satisfaction in five-years time to be higher than at present, whilst 34.6% thought it would stay the same and 21.1% thought it would be lower (not a trivial amount). Even in 1991, when there existed general euphoria in East Germany about the benefits of reunification, 19.9% of individuals predicted that their life satisfaction would remain unchanged in five-years time and 7.4% even expected it to be lower than today. Interesting, there also appears to be some life-cycle differences in expectations. Of those aged less than 30, pooling over the nine years, we find that 43.2% thought that their future life satisfaction would be better, whilst 29.6% thought it would be the same and 13.5% expected it to be worse. The

corresponding figures for respondents over the age of 60 are 24.9%, 37.6% and 37.5%, respectively. Clearly, the young are more optimistic, on average, than the old.

E. A Preliminary Investigation into the Sensibility of the Expectations question

As a simple decomposition exercise intended to provide an initial feel for the expectations data, and in particular to explore whether the expectation question has any informative content, we can write:

$$E\{E_t\{LS_{i,t+5}\} - LS_{i,t+5}\}^2 = E(\overline{E_t\{LS_{i,t+5}\}} - \overline{LS_{i,t+5}})^2 + E(E_t\{LS_{i,t+5}\} - \overline{E_t\{LS_{i,t+5}\}})^2 \\ + E(LS_{i,t+5} - \overline{LS_{i,t+5}})^2 - Cov(E_t\{LS_{i,t+5}\}, LS_{i,t+5})$$

This decomposes the square forecast error into the square average forecast error, the variance in forecast, the variance in realisations and the covariance. Each of these terms has a very intuitive interpretation:

- $E(\overline{E_t\{LS_{i,t+5}\}} - \overline{LS_{i,t+5}})^2$ is the square of the average forecast error and hence the structural degree to which ‘the average person got it wrong’.
- $E(E_t\{LS_{i,t+5}\} - \overline{E_t\{LS_{i,t+5}\}})^2$ and $E\{E_t\{LS_{i,t+5}\} - \overline{LS_{i,t+5}}\}^2$ denote the variance in the forecasts and the variance in the outcomes, respectively. They are a measure of the total amount of variation in the two different series.
- $Cov(E_t\{LS_{i,t+5}\}, LS_{i,t+5})$ is the covariance between the forecast and the actual outcome and is therefore a direct measure of the ‘fit’ of the forecast. This fit denotes the ability of individuals to predict how far their future satisfaction will deviate from the population average, which for instance may be due merely to knowledge about fixed personality traits and not about future events.
- To see whether individuals have any useful information about the future, we also look at $Cor\{E_t\{LS_{i,t+5}\} - LS_{i,t}, LS_{i,t+5} - LS_{i,t}\}$. This is the correlation between the predicted change in satisfaction and the actual change in satisfaction. This term will only be high if individuals have information over and above fixed individual traits (and above aggregate expected improvements). This term is therefore a measure of the degree to which individuals are aware of *individual level changes* affecting their satisfaction.

TABLE 2: Variance decomposition for expected and realised life satisfaction in East and West Germany

| | Total forecast error squared | Aggregate error squared | Forecast variance | Variance in realisations | Covariance of prediction and realisation | Fit of predicted to actualised changes |
|---------------------|---|--|--|--|--|--|
| | $E\{E_t\{LS_{i,t+5}\} - LS_{i,t+5}\}^2$ | $E\{E_t\{LS_{i,t+5}\} - \overline{LS_{i,t+5}}\}^2$ | $E(E_t\{LS_{i,t+5}\} - E_t\{LS_{i,t}\})$ | $E\{E_t\{LS_{i,t+5}\} - \overline{LS_{i,t+5}}\}^2$ | $-Cov(E_t\{LS_{i,t+5}\}, LS_{i,t+5})$ | $Cor\{E_t\{LS_{i,t+5}\} - LS_{i,t}, LS_{i,t+5} - LS_{i,t}\}$ |
| East Germany | | | | | | |
| 1991-1996 | 5.25 | 0.99 | 2.89 | 3.19 | -1.82 | 0.376 |
| 1992-1997 | 4.83 | 0.51 | 2.75 | 3.27 | -1.70 | 0.265 |
| 1993-1998 | 4.64 | 0.19 | 2.90 | 3.65 | -2.10 | 0.250 |
| 1994-1999 | 4.12 | 0.02 | 2.96 | 3.58 | -2.44 | 0.304 |
| West Germany | | | | | | |
| 1991-1996 | 3.94 | 0.18 | 2.86 | 2.82 | -1.92 | 0.267 |
| 1992-1997 | 4.04 | 0.18 | 3.02 | 3.18 | -2.34 | 0.249 |
| 1993-1998 | 4.18 | 0.02 | 2.91 | 3.48 | -2.23 | 0.241 |
| 1994-1999 | 3.96 | 0.05 | 2.98 | 3.15 | -2.22 | 0.288 |

Table 2 shows the results from this decomposition exercise, and to allow comparison we again provide the results also for West Germans. Three items of interest stand out. Firstly, we see that for both East and West Germans the initial average forecast error ($= E(\overline{E_t\{LS_{i,t+5}\}} - \overline{LS_{i,t+5}})^2$), which is larger in the East, disappears after 2 years. We also see that the contribution of the population forecast error to the total squared error in 1991 in East Germany is about 20%. Comparing this with the approximately 2% that all the individual characteristics combined contributed to the explanation of $E\{E_t\{LS_{i,t+5}\} - LS_{i,t+5}\}^2$ (see next Section), we can conclude that the importance of individual characteristics compared to population characteristics in the forecast error is almost negligible. This would indicate that expectations are indeed, on average, ‘roughly right’, apart from a bias shared by all individuals in the reunification period. For East Germany, we see an increasing $Cov(E_t\{LS_{i,t+5}\}, LS_{i,t+5})$ over the years following reunification. We interpret this as an indication that learning has taken place over this period. The fact that this term increased much less markedly in West Germany would support this notion, given the much more stable environment in the West throughout the post-reunification years.

The last column in this Table 2 ($= Cor\{E_t\{LS_{i,t+5}\} - LS_{i,t}, LS_{i,t+5} - LS_{i,t}\}$) shows that these correlations are in the order of 0.3 for both East and West Germany. These are all highly significant and are extremely high compared to the very low explanatory power usually found for observables with respect to satisfaction changes. This means that individuals do have useful private information as to their future satisfaction that goes beyond their current satisfaction level and an aggregate expected increase. The fact that these correlations are actually higher in East than West Germany means it is not the case that expectations are less meaningful in East Germany. Overall, we would therefore argue that life satisfaction expectations do have informational content about future individual level changes.

We now turn to an empirical investigation into the aptitude of individuals to correctly predict their future life satisfaction, the rationality of these predictions and the ability improve their forecast over time.

III. Empirical Framework

Our approach to empirical investigating the rationality of individuals’ life satisfaction predictions is to examine the determinants of the forecast error between the life satisfaction that individuals expect for time $t+5$ at time t and the actual satisfaction they report at time $t+5$.

A. The Continuous Case

Following Oswald (1997) and Di Tella et al. (2001), we initially assume that life satisfaction responses can be treated as a continuous variable. We relax this restriction in the next section. Assuming continuity makes the data informative about whether and how much expectations differ from outcomes because they are directly cardinally comparable. This has some advantages over previous studies of income and business cycle expectations, which are often based on questions asking individuals how likely they believe that future outcomes will be. These include questions of the form: ‘What do you think your income will be one year from now: lower/the same/higher?’ (see Keane and Runkle, 1990; Bonham and Cohen, 2001). In such cases it is difficult to imply from ex post knowledge of changes in observed income and actual business cycles whether expectations were correct or not. For instance, it is not clear what the category ‘the same income’ means to individuals: Das et al. (1999) found that ‘the same income’ corresponded to small income increases. They suggest that this means that individuals may have ‘the same real income’ in mind or ‘the same relative income’. Hence the income concept in expectations and realisations may differ in an unknown way. Similar reservations hold for expectations about inflation and business cycles: what an individual perceives as being inflation and a business cycle will for instance depend on her consumption package and her work situation. This perception is furthermore likely to change over time, which makes expectations asked in one period and outcomes in another period difficult to compare. Such comparability problems are not present with our life satisfaction measurements.

As in Table 1, we label the expected level of life satisfaction at t for $t+5$ as $E_t\{LS_{i,t+5}\}$ and the actual level of satisfaction at time t as $LS_{i,t}$. As a first approximation, we suppose the following relation to hold:

$$LS_{i,t+5} = f(x_{i,t}, x_{i,t+5}) + v_i + \varepsilon_{it+5} \quad (1)$$

where $x_{i,t}$ are observable individual characteristics including an intercept; v_i is an individual fixed characteristic that can be related to x ; and ε_{it} a time-varying error-term with unconditional expectation 0 that can be related to $x_{i,t}$ also. This general formulation means we put virtually no structure on the relation between $x_{i,t}$ and $LS_{i,t}$.

We now assume that $E_t\{LS_{i,t+5}\} = LS_{i,t+5}(x_{i,t+5}^e)$ where $x_{i,t+5}^e$ is the anticipated $x_{i,t+5}$ by the individual at time t . There then holds:

$$E_t\{LS_{i,t+5}\} - LS_{i,t+5} = (f(x_{i,t}, x_{i,t+5}^e) - f(x_{i,t}, x_{i,t+5})) + (\varepsilon_{i,t+5}^e - \varepsilon_{i,t+5}) \quad (2)$$

which implies that the estimation error has two parts. The part with $(f(x_{i,t}, x_{i,t+5}^e) - f(x_{i,t}, x_{i,t+5}))$ is the part due to anticipation error in observed characteristics $x_{i,t}$ and $(\varepsilon_{i,t+5}^e - \varepsilon_{i,t+5})$ is due to anticipation error in unobserved characteristics.

We interpret the Rationality such that there should be no fundamental predictors of the error in anticipation. Translated to this model, our null hypothesis is that:

$$Cov\{x_{i,t}, (f(x_{i,t}, x_{i,t+5}^e) - f(x_{i,t}, x_{i,t+5}))\} = Cov\{x_{i,t}, (\varepsilon_{i,t+5}^e - \varepsilon_{i,t+5})\} = 0 \quad (3)$$

Under this assumption, we can fit an OLS of $x_{i,t}$ on $E_t\{LS_{i,t+5}\} - LS_{i,t+5}$ where under our null hypothesis, the coefficients and the intercept should be equal to 0.

B. *The Categorical Case*

We want to check the robustness of these OLS results by relaxing the assumption of continuity of the dependent variables, because the dependent variables are in actuality categorical (ranging 0-10). However, by doing this we lose the rather convenient ability to simply look at the difference between expectations and outcomes as a cardinal measure of the forecast error. Consequently, we have to make more specific assumptions about the meaning of expectation answers and outcomes in order to be able to look at the rationality of forecasts.

Many papers using categorical expectations and outcomes have taken expectations to be probabilistic, that is they have assumed that individuals have a perceived outcome probability distribution (see, for example, Das et al., 1999). In that framework, answers to categorical questions have to be translated to probabilistic statements. One possible assumption is to assume that the stated expected category is the modal category, i.e. the category with the greatest expected probability mass of occurring. By examining whether the realisations are indeed concentrated in the expected category, this leads to a simple non-parametric test of rationality, though it does not lend itself easily to infer the individual determinants of forecast errors. Another assumption sometimes often made is that the stated expected category includes the median of the expected outcome distribution. Rationality can then be tested by noting that when the stated expected category contains the median, one should find less than half of the realisations either below or above the expected category. Again however, such a procedure does not lend itself easily for the identification of the structural determinants of forecast errors. The choice between possible probabilistic interpretations of the expectations questions is also somewhat ad hoc.

In our case, the probabilistic approach is not very useful: the forecast error is so large in our data that the irrationality of expectations shows up trivially under any of the probabilistic assumptions above. This means we, more ambitiously, try to look at the determinants of the forecast error. We therefore, as in the continuous case, assume that individuals' expectation is a point-estimate and that the stated expected category contains that point estimate. This approach makes it possible to look at the determinants of forecast-errors. There is a correspondence with the probabilistic assumptions made in much of the literature though: under the assumptions of our model, our approach can be interpreted as corresponding to the assumption that the reported category contains the mean and median of the expectation.

Specifically, assume we have:

$$\begin{aligned} LS_{i,t}^* &= x_{i,t-5}\beta_0 + x_{i,t}\beta_1 + \varepsilon_{it} \\ LS_{i,t} = k &\Leftrightarrow LS_{i,t}^* \in [\lambda_k, \lambda_{k+1}) \end{aligned} \quad (4)$$

where $LS_{i,t}^*$ is latent life satisfaction; $LS_{i,t}$ is observed satisfaction; and λ_k is the cut-off point (increasing in k) for the satisfaction answers. We do not interpret the coefficients causally, which allows the possibility that β_0 and β_1 include the effect of unobservables related to $x_{i,t-5}$ and $x_{i,t}$. We just assume the residual error term ε_{it} to be independent of $x_{i,t-5}$ and $x_{i,t}$ and normally distributed. As normalisations for this ordered-probit model, we set $\lambda_0 = -\infty$, $\lambda_1 = 0$, $\lambda_{11} = +\infty$, and $Var\{\varepsilon_{it}\} = 1$.

We now assume that:

$$E_{t-5}\{LS_{i,t}^*\} = LS_{i,t}^*(x_{i,t}^e) = x_{i,t-5}\beta_0 + x_{i,t}\beta_1 + (x_{i,t}^e - x_{i,t})\beta_1 + \varepsilon_{it}^e + (\varepsilon_{it} - \varepsilon_{it}^e) \quad (5)$$

We translate the RE hypothesis to the H0 that $x_{i,t-5} \perp (x_{i,t}^e - x_{i,t}), (\varepsilon_{it} - \varepsilon_{it}^e)$, i.e. that initial characteristics are orthogonal to forecast errors.

We can now use these assumptions as follows. First, we estimate β_0 and β_1 from an ordered probit on $LS_{i,t}$. By construction, $x_{i,t-5}$ is independent of $LS_{i,t}^* - x_{i,t-5}\hat{\beta}_0 - x_{i,t}\hat{\beta}_1$. In turn, this also means that $x_{i,t-5}$ under H0 is independent of $E_{t-5}\{LS_{i,t}^*\} - x_{i,t-5}\hat{\beta}_0 - x_{i,t}\hat{\beta}_1$. This means that if we fit an ordered probit of $x_{i,t-5}$ on $E_{t-5}\{LS_{i,t}^*\} - x_{i,t-5}\hat{\beta}_0 - x_{i,t}\hat{\beta}_1$, and set $\lambda_k = \hat{\lambda}_k$, that under H0, we should find that the coefficient $\hat{\gamma}_0^{PR}$ of $x_{i,t-5}$ is zero. If we get something different, this would be direct evidence of structural forecast error. Three methodological points are in order. The first is that the

expected estimate of β_0 for the expectation and the outcome is the same even if it only represents a spurious relation with unobservables. This is because the effect of the relation with unobservables is the same under H0 for both expected life satisfaction and actual life satisfaction. The second point is that the normalisations are different for the two analyses: the variance of $E_{t-5}\{LS_{i,t}^*\}$ will be higher than 1 because it includes the term $(x_{i,t}^e - x_{i,t})\hat{\beta}_1 + (\varepsilon_{it} - \varepsilon_{it}^e)$. Hence, assuming that this total error term is again normally distributed, we have to estimate this variance. Thirdly, we note that we would not get the same $\hat{\beta}_1$ if we included $x_{i,t}$ as a regressor in the ordered probit analysis of expected life satisfaction, because it will not be independent of $(x_{i,t}^e - x_{i,t})$, which is part of the error term.

C. Specification Testing: OLS vs. Categorical

In order to be able to judge the added value of the categorical framework, we here develop a test of the equality of the outcomes. We denote the estimated coefficients for $x_{i,t-5}$ of the OLS model of forecast errors by $\hat{\gamma}_0^{OLS}$. Our null-hypothesis is that the outcome of the categorical model is the same, i.e.:

$$H0: \quad \gamma_0^{PR} = \alpha \hat{\gamma}_0^{OLS} \quad (6)$$

where α is an unknown positive constant that arises because $\hat{\gamma}_0^{OLS}$ is estimated under a different normalization than the ordered probit coefficients $\hat{\gamma}_0^{PR}$.⁶

Under the null hypothesis, we can use the following likelihood ratio test:

$$2L(\hat{\gamma}_0^{PR}) - 2L(\alpha \hat{\gamma}_0^{OLS}) \sim \chi(k) \quad (7)$$

One practical problem is that α is unknown. To circumvent this, we can note that:

$$2L(\hat{\gamma}_0^{PR}) - 2L(\alpha \hat{\gamma}_0^{OLS}) \geq 2L(\hat{\gamma}_0^{PR}) - \max_{\alpha} \{2L(\hat{\alpha} \hat{\gamma}_0^{OLS})\} \quad (8)$$

⁶ $\hat{\gamma}_0^{PR}$ is estimated with $\text{var}(\varepsilon_{it})=1$. The OLS model estimates this variance and does not share the same normalisation.

Hence, by using the $\hat{\alpha}$ that maximizes $L(\hat{\alpha}\hat{\gamma}_0^{OLS})$, we get a lower bound for $2L(\hat{\gamma}_0^{PR})-2L(\hat{\alpha}\hat{\gamma}_0^{OLS})$. If we thus find that we can reject the null using $2L(\hat{\gamma}_0^{PR})-2L(\hat{\alpha}\hat{\gamma}_0^{OLS})$ as our test statistic, we know that the true statistic will reject the null also.

D. Explanatory Variables

The GSOEP contains a wide-range of information about respondents' economic, household and locational characteristics. In this paper one of our principal objectives is to establish if there is any evidence of microheterogeneity i.e. identify the types of individuals who make the largest forecast errors, and conversely to identify those individuals whose forecasts are the most accurate. We follow the recent economics literature that has investigated the economic factors that impact on life satisfaction in our choice of explanatory variables (e.g. Clark et al., 2001; Di Tella et al., 2001; Frey and Stutzer, 2000; Frijters et al., 2004; Winkelmann and Winkelmann, 1998). Consequently, in the above models we control for the following individual and household characteristics: age (and age-squared), gender, marital status, health status (in terms of disability), number of children, years of schooling, employment status and household income. A priori we might expect that the forecast error will be greatest for the young (with relatively less life experience) and the uneducated (with the lowest learning ability). However, these are conjectures rather than theory-based priors.

Given our focus on German reunification as a 'natural' experiment or exogenous shock, we also control for whether or not the individual lives on the border of the East and West, and whether or not she was a member of the Communist Party prior to reunification. In addition, due to the longitudinal nature of the data we also control for a number of recent 'life events'. In particular, an individual's ability to correctly forecast her future life satisfaction may depend (a) whether she has experienced a marital separation or divorce in the last year, (b) whether she has been fired for a job in the last year and (c) whether she moved from the East to the West following reunification.⁷

IV. Results

A. The Continuous Case

In Table 3 we present the OLS estimates for the four combinations of expectations and outcomes available, i.e. for $E_{1991}\{LS_{i,1996}\} - LS_{i,1996}$, through till $E_{1994}\{LS_{i,1999}\} - LS_{i,1999}$. For ease of interpreting

⁷ We observe 276 individuals who moved from East to West Germany following reunification. To allow for us to estimate the importance of this move in the ability of individuals to accurately forecast their life satisfaction, we have retained them in the East Germany sample.

the intercept, we take the deviations of $x_{i,t}$ from its cross-sectional mean. This allows us to interpret the intercept as the average forecast error.

We see that the average forecast error goes down from about 1 in 1991 to only 0.15 in 1994. Hence we see evidence of a clear convergence of average expectations to realisations. This is the part we can attribute to ‘population forecast error’ i.e. the degree to which everyone had wrong expectations. However, there are also clear individual differences in forecast error. The older and more highly educated individuals have a smaller difference between expectations and realisations, which in this case means less absolute forecast error also. What is also interesting is that those living on the border and those having moved to the West from the East following reunification had a much higher expected satisfaction than that which actually materialised. This effect decreased markedly over time however: the degree to which those on the border and those having moved to the West were wrong almost disappeared by 1994. It is also clear that individuals with many children were too optimistic in 1991 and beyond.

The coefficients for just being fired, separated, or divorced, are insignificant and change signs over time. Hence, there appears to be little predictive power in these adverse life events at the time of the prediction. Similarly, the coefficients of income, disability level, whether one was a member of the communist party, whether one was married, and gender, are not significant and also often change signs. Finally, the coefficients on employment are interesting, for employment starts off having no effect, but ends up having a large positive significant effect. By construction, this means that the unemployed in 1991 had no different forecast error from others in 1991, but had much lower expectations than outcomes in 1994. The expectations of the unemployed may well have been overly pessimistic in 1994 due to the fact that 1994 was a recession year and 1999 (which is the year the expectations were for) was a boom year in East Germany. Hence, this result may suggest that forecasts were not only wrong after the great transition in 1990, but that they are also wrong over the business cycle for selected groups of individuals as well.

As for the predictive power of individual characteristics, we can see by the declining R^2 statistics that individual characteristics explain little of the variance in the data in the later years following reunification.

Summarising, the results from our models clearly suggest that the majority of the forecast errors made by East Germans in the immediate years following reunification was general to the entire population. However, those with higher education, higher age and those not living on the border or having moved from the East to the West had the smallest forecast error. Many of the individual predictors of the forecast error in 1991 had become insignificant by 1994, as had the average

forecast error. Our East German sample also experienced a fairly rapid increase (within four years) in their ability to correctly predict their future life satisfaction.

TABLE 3
 OLS Estimates of the Forecast Error:
 Expected Life Satisfaction ($t+5$) minus Actual Life Satisfaction ($t+5$)
 Conditional on Individual Characteristic (t)

| Individual Characteristics | 1991-1996 | | 1992-1997 | | 1993-1998 | | 1994-1999 | |
|---|-----------|-------|-----------|-------|-----------|-------|-----------|-------|
| | γ | $ t $ | γ | $ t $ | γ | $ t $ | γ | $ t $ |
| Age | -0.010 | 1.90 | -0.021 | 3.62 | -0.020 | 3.34 | -0.029 | 5.29 |
| Female | -0.120 | 1.36 | -0.001 | 0.01 | 0.024 | 0.26 | -0.024 | 0.28 |
| Married | 0.074 | 0.45 | 0.016 | 0.10 | -0.174 | 1.04 | -0.146 | 0.97 |
| Separated or Divorced | 0.133 | 0.60 | -0.033 | 0.15 | 0.397 | 1.71 | -0.022 | 0.11 |
| Level of disability | -0.001 | 0.25 | -0.004 | 0.94 | -0.001 | 0.12 | 0.001 | 0.16 |
| Number of children | 0.083 | 1.51 | 0.141 | 2.54 | 0.097 | 1.69 | 0.112 | 2.09 |
| Years of schooling | -0.084 | 4.17 | -0.055 | 2.71 | -0.021 | 1.01 | -0.025 | 1.27 |
| Employed | 0.082 | 0.48 | 0.232 | 1.70 | 0.337 | 2.47 | 0.523 | 4.19 |
| Non-participant | 0.075 | 0.34 | 0.087 | 0.47 | -0.023 | 0.12 | 0.369 | 2.11 |
| Log household income (post tax) | 0.098 | 0.93 | -0.064 | 0.60 | 0.224 | 2.12 | 0.058 | 0.61 |
| Moved to West Germany after reunification | 1.353 | 3.11 | 0.941 | 3.33 | 0.537 | 2.10 | 0.342 | 1.68 |
| Live on the border of East and West Germany | 0.287 | 3.17 | 0.100 | 1.07 | 0.088 | 0.92 | 0.076 | 0.85 |
| Communist Party Member before reunification | 0.080 | 0.77 | -0.041 | 0.38 | -0.085 | 0.77 | 0.019 | 0.18 |
| Separated or Divorced in last 12 months | -0.848 | 1.79 | 0.332 | 0.57 | -0.478 | 0.74 | 0.441 | 1.33 |
| Fired in last 12 months | 0.272 | 1.40 | -0.027 | 0.01 | -0.246 | 1.38 | 0.244 | 1.22 |
| Intercept | 0.996 | 23.42 | 0.712 | 16.56 | 0.438 | 9.83 | 0.145 | 3.51 |
| * R^2 | 0.211 | | 0.140 | | 0.078 | | 0.055 | |
| Observations | 2303 | | 2261 | | 2157 | | 2275 | |

Note: * Because the intercepts equal 0 under H_0 , the R^2 is based on the explained proportion of $E\{E_t\{LS_{i,t+5}\} - LS_{i,t+5}\}^2$

B. The Categorical Case

The results of the estimation procedure for the pooled ordered probit specification are provided in Table 4. For direct comparison, we also include results for a pooled (1991-1999) OLS model (the continuous case). Importantly, the results are very similar to those presented in Table 3, even though we are now pooling over the four sets of years. From the ordered probit model we can see

that expectations in 1991 for life satisfaction in 1996 were, on average, wrong by about 0.75 points ($=0.44 + (1991 - \overline{year}) * -0.205$), and only by 0.15 in 1994.

The test statistic for equality of the OLS and the probit coefficients is 8.6, which is an underbound for the true test statistic. The 1% critical value of the corresponding Chi-square distribution for 17 degrees of freedom is 33.4. The 10% critical value of the Chi-square distribution for 17 degrees of freedom is 24.8. Hence, the null of equal coefficients cannot be rejected for any reasonable level of significance.

TABLE 4
Pooled OLS and Ordered Probit Estimates of the Forecast Error:
Expected Life Satisfaction ($t+5$) minus Actual Life Satisfaction ($t+5$)
Conditional on Individual Characteristic (t)

| Individual Characteristics | OLS | | Ordered Probit | |
|---|------------------------|-------|-----------------------|-------|
| | 1991-1999 | | 1991-1999 | |
| | $\hat{\gamma}_0^{OLS}$ | t | $\hat{\gamma}_0^{PR}$ | t |
| Age | -0.020 | 7.16 | -0.014 | 8.42 |
| Female | -0.031 | 0.69 | -0.015 | 0.54 |
| Married | -0.064 | 0.79 | -0.032 | 0.66 |
| Separated or Divorced | 0.094 | 0.86 | 0.070 | 1.06 |
| Level of disability | -0.001 | 0.44 | -0.001 | 0.82 |
| Number of children | 0.103 | 3.72 | 0.054 | 3.24 |
| Years of schooling | -0.047 | 4.62 | -0.033 | 5.37 |
| Employed | 0.311 | 4.47 | 0.205 | 4.94 |
| Non-participant | 0.144 | 1.53 | 0.116 | 2.06 |
| Log household income (post tax) | 0.083 | 1.62 | 0.073 | 2.35 |
| Moved to West Germany after reunification | 0.662 | 4.99 | 0.531 | 6.63 |
| Live on the border of East and West Germany | 0.139 | 3.01 | 0.095 | 3.44 |
| Communist Party Member before reunification | -0.015 | 0.28 | -0.045 | 1.42 |
| Separated or Divorced in last 12 months | 0.030 | 0.13 | -0.003 | 0.03 |
| Fired in last 12 months | 0.051 | 0.48 | 0.022 | 0.42 |
| Year | -0.283 | 14.30 | -0.205 | 17.34 |
| Intercept | 0.576 | 26.77 | 0.444 | 34.55 |
| R ² | 0.100 | | NA | |
| Mean log-likelihood | NA | | 1.924 | |
| χ^2 Test of parameter equality (d.f. 17) | NA | | 8.636 | |
| $\hat{\alpha}$ | NA | | 0.742 | |
| Observations | 8996 | | 8996 | |

This fits previous findings that a categorical analysis of life satisfaction leads to similar results as continuous analysis (e.g. Di Tella et al. 2001). It is also remarkable because the probit results required much stronger functional assumptions of error-terms. These apparently are not important for the issue at hand. Again we see that the older and more educated have lower prediction errors. The employed, those on the border and those having moved to the West have higher prediction errors. The estimated standard deviation of 1.195, corresponding to a variance of 1.43, suggests that compared to actual satisfaction error, the forecast error term $(x_{i,t}^e - x_{i,t})\hat{\beta}_1 + (\varepsilon_{it} - \varepsilon_{it}^e)$ adds another 43% variance, which does not seem implausible.

V. Conclusion

In this paper we have contributed to the recent literature that has used individual or household longitudinal data to investigate the economic determinants of life satisfaction. We believe that we have provided a novel test of individual rationality and learning by using longitudinal data on current (t) and expected ($t+5$) life satisfaction for East German's in the years following reunification. Life satisfaction is often taken as a direct measure of individual utility, so an assessment of how well individuals predict their own future utility is an interesting study. Moreover, our analysis is conducted in an economic and social environment of great change, namely, East Germany in the immediate years following reunification in Germany. The collapse of the Berlin Wall at the end of 1989 was completed unexpected, and consequently provides us with a large-scale exogenous shock with which to study the rationality and learning. To enable this we use longitudinal data drawn from nine-waves of the German Socio-Economic Panel (GSOEP). Our analysis clearly shows that whilst current levels of life satisfaction in East Germany immediately following reunification were considerably lower than the levels experienced by their West German counterparts, expectations of life satisfaction five-years hence were high. Interestingly, the average expected life satisfaction for East Germans in 1996, predicted in 1991, was at a level roughly equivalent to actual life satisfaction in West Germany in 1991. Clearly, expectations of the benefits from reunification were very high in the East, with East Germans having a 'reasonably' good idea of the level of life satisfaction experienced in the West.

We have also used the data to shed light on the validity of a key assumption in Easterlin's (2001) theory of the relationship between income and happiness: namely, that individuals always predict that their future life satisfaction will be higher than today's (supported by empirical evidence from Cantril (1965)). The reasoning behind this is that individuals are assumed to form their expectations based on perceived higher future income, but that their material aspirations

remain at their current levels. Our data clearly suggest that this is not the case, with 56% of East Germans reporting their expected future life satisfaction to be no higher than today's. Even in the euphoric period immediately following reunification (i.e. 1991) over a quarter of individuals did not expect the future to be any better.

Turning to the ability of individuals to correctly predict their life satisfaction, we find little evidence in support of rationality over the five-year time horizon using both continuous and categorical models. As with a number of other studies using individual level data on income expectations, we also find strong evidence of micro-heterogeneity in the sense of Bonham and Cohen (2001): the uneducated, the young and those with children had structurally higher forecast errors. However, these individual characteristics were found to explain only a small component of the total forecast error, with the vast part of the forecast errors made by East Germans in the immediate years following reunification being general to the entire population. Moreover, many of the individual predictors of the forecast error in 1991 had become insignificant by 1994, as had the average forecast error. It appears that virtually all East Germans experienced a fairly rapid increase (within four years) in their ability to correctly predict their future life satisfaction. The results therefore indicate that learning about the aggregate shocks took place over this period and that expectations were close to rational in the period 1994-1999. The broader (tentative) implications are that the assumption of rationality does not appear too bad in 'normal' times, but that it appears inappropriate in times of great transition.

References

- Bach, S. and Trabold, H. (2000). Ten years after German monetary, economic and social union: An introduction. *Quarterly Journal of Economic Research*, 2, 149-151.
- Bertrand, M. and Mullainathan, S. (2001). Do people mean what they say? Implications for subjective survey data. *American Economic Review*, Papers and Proceedings, 91, 67-72.
- Brickman, P. and Campbell, D. (1971). Hedonic relativism and planning the good society. In Apley, M. (ed.), *Adaptation-level Theory: A Symposium*. New York: Academic Press.
- Bonham, C. and Cohen, R. (2001). To aggregate, pool, or neither: Testing the Rational Expectations Hypothesis using survey data. *Journal of Business and Economic Statistics*, 19, 278-291.
- Clark, A., Georgellis, Y. and Sanfey, P. (2001). Scarring: the psychological impact of past unemployment. *Economica*, 68, 221-241.
- Clark, A. (2004). Unemployment as a social norm: Psychological evidence from panel data. *Journal of Labor Economics*, 21, pp. 323-351.

- Das, M. and van Soest, A. (1999). A panel data model for subjective information on household income growth. *Journal of Economic Behavior and Organization*, 40, 409-426.
- Das, M., Dominitz, J. and van Soest, A. (1999). Comparing predictions and outcomes: Theory and application to income changes. *Journal of the American Statistical Association*, 94, 75-90.
- Di Tella, R., MacCulloch, R. and Oswald, A. (2001). Preferences over inflation and unemployment: Evidence from surveys of happiness. *American Economic Review*, 91, 335-341.
- Dominitz, J. and Manski, C. (1997). Using expectations data to study subjective income expectations. *Journal of the American Statistical Association*, 92, 855-872.
- Easterlin, R. (1974). Does economic growth improve the human lot? Some empirical evidence. In David, Paul and Melvin Reder. (Eds.), *Nations and Households in Economic Growth*. Academic Press: New York and London.
- Easterlin, R. (1995). Will raising the incomes of all increase the happiness of all? *Journal of Economic Behaviour and Organisation*, 27, 35-48.
- Easterlin, R. (2001). Income and happiness: Towards a unified theory. *Economic Journal*, 111, 465-484.
- Frey, B. and Stutzer, A. (2000). Happiness, economy and institutions. *Economic Journal*, 110, 918-938.
- Frey, B. and Stutzer, A. (2002a). *Happiness and Economics*. Princeton University Press: Princeton.
- Frey, B. and Stutzer, A. (2002b). What can economists learn from happiness research? *Journal of Economic Literature*, 40, 402-435.
- Frijters, P., Haisken-DeNew, J. and Shields, M. (2004). Investigating the patterns and determinants of life satisfaction in Germany following reunification. *Journal of Human Resources*, forthcoming.
- Frijters, P., Haisken-DeNew, J. and Shields, M. (2004). Money does matter! Evidence from increasing real incomes and life satisfaction in East Germany following reunification. *American Economic Review*, forthcoming.
- Gerlach, K. and Stephan, G. (1996). A paper on unhappiness and unemployment in Germany. *Economics Letters*, 52, 325-330.
- Haisken-DeNew, J. and Frick, J. (2000). Desktop companion to the German Socio-Economic Panel Study (GSOEP). German Institute for Economic Research: Berlin.
- Hagerty, M. (2003). Was life better in the “good old days”? Intertemporal judgements of life satisfaction. *Journal of Happiness Studies*, 4, 115-139.

- Helliwell, J. (2002). How's life? Combining individual and national variables to explain subjective well-being. National Bureau of Economic Research Working Paper no. 9065.
- Kahneman, D. and Snell, J. (1990). Predicting utility. In R. M. Hogath (Ed.), *Insights in Decision Making*, University of Chicago Press.
- Kahneman, D., Walker, P. and Sarin, R. (1997). Back to Bentham? Explorations of experienced utility. *Quarterly Journal of Economics*, 112, 647-661.
- Kahneman, D., Diener, E. and Schwarz, N. (1999, Eds), *Foundations of Hedonic Psychology: Scientific Perspectives on Enjoyment and Suffering*. New York: Russell Sage Foundation.
- Keane, M. and Runkel, D. (1990). Testing for rationality of price forecasts: New evidence from panel data. *American Economic Review*, 80, 714-735.
- Lalive, R. and Stutzer, O. (2004). The role of social work norms in job searching and subjective well-being. *Journal of the European Economic Association*, forthcoming.
- Lane, R. (2000). *The Loss of Happiness in Market Democracies*. Yale University Press: New Haven.
- Lovell, M. (1986). Tests of the Rational Expectations Hypothesis. *American Economic Review*, 76, 110-124.
- Manski C. (1990), 'The use of intentions data to predict behavior: best-case analysis', *Journal of the American Statistical Association*, 85, 934-940.
- Oswald, A. (1997). Happiness and economic performance. *Economic Journal*, 107, 1815-1831.
- Pesaran, H. (1987). *The Limits of Rational Expectations*. Oxford: Basil Blackwell.
- Roberts, J. (1995). New Keynesian economics and the Phillips curve. *Journal of Money, Credit and Banking*, 27, 975-984.
- Schwarze, J. and Härpfer, M. (2003). Are people inequality averse, and do they prefer redistribution by the state? A revised version. IZA Discussion Paper no. 974: Bonn.
- Stutzer, A. (2004). The role of income aspirations in individual happiness. *Journal of Economic Behavior and Organization*, forthcoming.
- Souleles, N. (2001). Consumer sentiment: Its rationality and usefulness in forecasting expenditure - Evidence from the Michigan micro data. *Mimeo*, Finance Department, University of Pennsylvania.
- Ferrer-i-Carbonell, A. and van Praag, B. (2002). The subjective costs of health losses due to chronic diseases. An alternative model for monetary appraisal. *Health Economics*, 11, 709-722.
- Winkelmann, L. and Winkelmann, R. (1998). Why are the unemployed so unhappy? Evidence from panel data. *Economica*, 65, 1-17.