Optimism, pessimism and life satisfaction: an empirical investigation

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Abstract: This empirical investigation into life satisfaction, using nationally representative German panel data, finds a substantial association with an individual's thoughts about the future, whether they are optimistic or pessimistic about it. Furthermore, including individuals' optimism and pessimism about the future substantially increases the explanatory power of standard life satisfaction models. The thoughts that individuals have about the future contribute substantially to their current life satisfaction. In particular, the reduction in life satisfaction experienced by individuals who report being pessimistic is greater than that for well-understood negative events like unemployment. These effects are attenuated but remain substantial after controlling for individual fixed effects, statistically matching on observable variables between optimistic and pessimistic individuals, and addressing the potential endogeneity of optimism and pessimism to life satisfaction. Moreover, these effects are robust to controlling for future life events that may be anticipated.

Key Words: Life Satisfaction; Subjective Well-Being; Mental Health; Entropy Balancing; GMM; Dynamics; Endogeneity; SOEP

JEL codes: C23, D84, I31

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"Damn right, I like the life I live
Because I went from negative to positive
And it's all good."
The Notorious B.I.G., *Juicy*
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1. Introduction

Within the economics discipline, many investigations into well-being focus on objective factors (income, labour force status, marital status, education, health) and, in many cases, have convincingly demonstrated associations and, causal connections. Investigations considering subjective factors are rarer, although also important for individual well-being and life satisfaction. The well-known study of Winkelmann and Winkelmann (1998), for example, demonstrated that much of the loss of life satisfaction from entering unemployment was non-pecuniary, and some of these non-pecuniary factors were subjective (for example self-esteem, feelings of loneliness and a lack of purpose). For other studies of subjective factors and well-being see Baumeister et al. (2003) and Ho et al. (2010). The meaning of happiness itself may be subject to different subjective feelings. Over the lifecycle Mogliner et al. (2011) find differing meanings for happiness, notably excitement for young people, and a sense of peace for the not so young. The inclusion of, or controlling for, subjective states and factors may even enhance collective understanding of how objective factors are related to well-being.

The study is an investigation of a subjective factor: the association of what individuals think about the future – whether they are optimistic or pessimistic – and their life satisfaction now. Using nationally representative German panel data, evidence is presented that people

who are pessimistic about the future, compared with people who are quite optimistic, are much less satisfied with life. Conversely, there is a life satisfaction premium associated with feeling optimistic about the future compared to being merely quite optimistic. Clearly, the thoughts that an individual has about the future are important for current life satisfaction; moreover, including a measure of an individual's thoughts about the future substantially increases the explanatory power of well-being models.

This empirical investigation uses four methods to establish this result: ordinary least squares (OLS); fixed effects (FE); System General Method of Moments; and FE following the entropy balancing procedure. All four methods point to the same result: a substantial relationship between what individuals think about the future and their satisfaction with their life. In finding this result, this investigation confirms and extends previous similar findings. For example, Becchetti et al. (2012) investigate life satisfaction via eleven sub-components and find that answers to the question "How often do you look forward to another day?" are an important contributor to an understanding of well-being. Senik (2008) uses Russian Panel data to link life satisfaction to an individual's expectations about whether they and their family will live better in the next twelve months. These results just mentioned, including those of this investigation, suggest that individuals' thoughts about the future should be more widely considered in well-being investigations than they are now; the resulting increase in explanatory power over "standard" well-being equations can approach 40%. Such thoughts are important determinants of current well-being and, in terms of size, of larger effect than unemployment which, as many studies show (including this one), is a major negative influence on well-being.

Other research within economics has acknowledged the possibility that the thoughts and feelings an individual has about the future may have an impact on current well-being. Haucap and Heimeshoff (2014) investigate the causal effect of studying economics on well-being and find that perceived good future job prospects (which they suggest could also be a proxy for future income) are positively associated with student life satisfaction scores. Similarly Hetschko et al. (2014), using the German Socio-Economic Panel (SOEP), investigate, as part of their analysis, the possibility that uncertain future income and employment prospects can impact current well-being. Frijters et al. (2012) use a Chinese household cross-section survey and show evidence that optimistic expectations are among the most important explanatory variables for general happiness. Using a wave of the SOEP, Grözinger and Matiaske (2004) investigate, in part, the impact of regional unemployment on overall life satisfaction. They argue that the higher regional unemployment is higher the fear about future unemployment, and thus the lower individual life satisfaction is. One study links the future and the present via climate change, with expectations about climate change demonstrated to have an impact on current well-being. Osberghaus and Kühling (2016) investigate this and provide robust evidence that worsening expectations about future climate change negatively affect well-being, though the size of the effect is not large.

A literature review about optimism provides a summary of the main findings from psychology, making positive links with it and subjective well-being, better health and business and career success while demonstrating that optimism is a nuanced concept (Forgeard and Seligman 2012). Similarly, Kleiman et al. (2017) discuss optimism as a nuanced concept and link it, in part, to overconfidence and a sense of invulnerability. Generally, optimism seems to have been studied more than pessimism. A simple Google

Scholar search supports this claim, with optimism resulting in over three times as many hits as pessimism. This might be slightly unfortunate: the results below suggest a greater impact on individual well-being of pessimism than optimism. A recent study using the same data that this study uses finds that pessimism may better promote future physical health outcomes which may, in turn, promote well-being, if not current well-being (Lang et al. 2013).

Rather than discuss the concepts of optimism and pessimism, this empirical investigation uses many waves of a nationally representative panel dataset to investigate the association of life satisfaction with whether individuals are optimistic or pessimistic about the future. This investigation takes advantage of the longitudinal nature of the data, and the rich socio-economic information it contains, and employs different estimation techniques each with advantages. These advantages are discussed more in the next two sections, but as a brief summary the estimates control for some potentially important factors (all methods), account for individual unobserved heterogeneity (all methods), account for the potential endogeneity of optimism and pessimism with life satisfaction (System General Method of Moments), and employ a statistical procedure to generate substantial overlap between the optimistic and pessimistic with respect to observable control values (entropy balancing. The rest of this empirical investigation is organised as follows: Section 2 describes the data and methods used; the results are presented in two subsections within Section 3, which also discusses a variety of robustness tests; a discussion of the results and their implications is found in Section 4, which includes limitations of the investigation and suggestions for future research; and Section 5 concludes.

2. Data description, sample, and methods used.

The dataset employed here is the SOEP, and the main question used in this investigation asks about the 'future in general' and individuals can choose whether they are optimistic, more optimistic than pessimistic, more pessimistic than optimistic, or pessimistic. This question was asked in the following years: 1990-1993; 1995-1997; 1999; 2005; and 2008-2009.[1] In most of the equations estimated, the responses have been turned into dummy variables and added to a standard well-being equation. Well-being itself is captured by a question which asks individuals to rate how satisfied they are with life on an 11-point Likert scale. Reviews of economic well-being studies which often make use of such scales can be found in Clark et al. (2008a), Stutzer and Frey (2012), and Clark (2018). As the SOEP is well-known, and frequently utilised for well-being work it is not described here. Instead information regarding the dataset can be found in Goebel et al. (2018).

Appendix A1 reveals some substantial differences between individuals who are in differing optimistic and pessimistic categories. Most notably, there is a difference in excess of 2 points (on the 11-point scale) for life satisfaction between those who are optimistic and pessimistic; individuals who are quite optimistic and quite pessimistic (and not fully) are also reasonably far apart (being about 0.8 different). These are large differences, and larger than those normally found in investigations of objective data. Given some of the differences with these categories of groups, regression analysis will be important to take into account the fact that the unemployed, for example, are much more represented in the pessimistic (and therefore low life satisfaction) group compared to the optimistic (and most satisfied with life) group. This table of descriptive statics (A1) shows also shows that average income has a clear negative relationship with pessimism, as well as illustrating that the relationship with

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[1] As is explained below, due to the methods used and the desire for a consistent sample, not all of these years are used in the analysis.

health and perceptions of the future is interesting (though perhaps unsurprising) and emphasises the need for health to be controlled for in the estimations too.

Reflecting this, an important part of the research strategy is that the standard correlates from the literature are used as control variables: hence the investigation is asking what, if we take into account marital status, labour force status (etc.), is the impact of an individual's thoughts about the future on their life satisfaction. These control variables are important. It is well-known that unemployed people are less satisfied with life, for example, and the SOEP data shows that, in this sample on average, they feel more pessimistic about the future than the employed. Thus not controlling for unemployment may mean that the results reflect the lower life satisfaction of the unemployed and not pessimistic thoughts about the future itself. A differing impact by income is also possible, and hence income is also used as a control variable. Similar reasoning applies to the other control variables.

Although many of the variables are well-known, and somewhat self-explanatory, the labour force status variables need some explanation. The 'conventionally' employed are split into two categories: employed; and government employed. This is because of the greater security that German government employees possess, for example in terms of job security, regarding their pensions and also private health insurance, which is more than most other employees. It is perhaps likely that these additional benefits will make government employees systematically less pessimistic about the future than other employees. Unemployed refers to individuals who are in the labour market but cannot find work, in contrast to individuals not in the labour market (a house husband, for example).

The estimations are undertaken with four different methods: OLS; FE; and FE following entropy balancing, and System GMM.[2] For comparability, the same sample is used in each case. In practice this means that the person-year observations used in the System GMM estimation (which is more demanding in terms of its data needs, and hence has the smallest sample) are also used for OLS and both types of FE estimation. In the particular sample generating the main results, the sample size is 40,590 and the mean number of observations per individual is 3.05 (3.14. for men and for women 2.94). These results are, however, robust to relaxing this restriction, thereby allowing the OLS and FE estimations to use the full SOEP sample. Descriptive statistics are presented for this consistent sample in Appendix table A1, which also shows differences in the means for the control variables between the different optimism and pessimism categories. This table shows that the speculation made about unemployment is supported: 6% of the sample is unemployed, but the unemployed make up 14% of the pessimistic people (and 4% of the optimistic people). Average income has a clear negative relationship with pessimism too. As the Appendix illustrates, the relationship with health and perceptions of the future is interesting (though perhaps unsurprising) and emphasises the need for health to be controlled for in the estimations too.

Table A1 in the appendix demonstrates that there are some considerable differences in the characteristics of individuals who have differing perceptions of the future; the aim of the next section is to investigate the association of these perceptions of the future (being optimistic, quite optimistic, and so on) with respect to life satisfaction after controlling for

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[2] The discussion of, and results from, System General Method of Moments (GMM) are limited to Appendix B. These results, fully supportive of those from the other methods, are not presented in the main text due to not being able to perform all the necessary diagnostic tests. Because of how often the questions are asked there is not enough annually consecutive information to perform the AR(2) test. The other diagnostic tests present no issues. See Appendix B.

these differing characteristics. Firstly, this investigation uses OLS for an initial inspection of any association. Secondly, the empirical analysis proceeds to employ FE estimation taking advantage of the longitudinal nature of the data and, importantly, being able to control for the personality and disposition of individuals (assuming that these don't change much over the duration of the dataset). Additional to the advantages of FE estimation, System GMM provides capabilities to estimate a dynamic model, estimation of coefficients for time-invariant variables, an ability to address the potential endogeneity of the optimism and pessimism variables with respect to life satisfaction, and – to the extent that the sample is representative – provides results that can be generalised to a wider population.[3] Finally, the entropy balancing procedure makes the optimistic individuals the same as the non-optimistic individuals in terms of the first three moments of the control variables and then fixed effects estimation is used to additionally control for unobserved heterogeneity. The next section discusses these methods further within the context of the investigation, and presents their results. Robustness tests are also explained, and include controlling for upcoming events which the (optimistic or pessimistic) individual may already perceive. No matter what method is used, and no matter what the robustness test is the outcome is qualitatively the same.

3. Results from OLS and FE estimations.

This discussion of the results first includes those from OLS, then FE, and finally FE following the entropy balancing procedure, with the results from the System GMM analysis presented in the appendix. As discussion proceeds from one model's results to the next, supporting

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[3] Fixed effects estimates, which result from the change 'within' individuals' variables, should not be generalised to other samples or a population of interest. This is not always made clear in life satisfaction studies that employ FE estimation.

methodological comments are made. As mentioned in the previous section, for all models the same person-year observations are employed for reasons of consistency and (to some extent) comparability.[4] For all the estimates apart from the one(s) following the entropy balancing procedure, the base category, against which the results for the dummy variables for being optimistic, quite pessimistic, and pessimistic are to be compared, is quite optimistic. Thus in Table 1, for both genders combined (the left column of coefficients), the individuals who are optimistic about the future are, on average, 0.4 more satisfied (on the positively coded 0 to 10 scale) with their life than people who are quite optimistic. Individuals who are quite pessimistic or pessimistic are 0.6 and 1.3 less satisfied with life respectively. These are substantial values: their size demonstrates a comparable or greater association with life satisfaction than most of the control variables, which are generally considered important confounders in well-being investigations (and hence are necessary to include). These results also include time and region dummies to control for otherwise unobserved influences specific to a particular year or to a particular region.[5]

[Table 1 about here]

Regarding the variables employed (largely) as control variables typical of those in the literature, the coefficients in Table 1 are, on the whole, unsurprising: they have the expected sign; and are similar to those generally reported in the literature (see the reviews mentioned above). The inclusion of the perception of the future dummy variables increases considerably the explained variation of life satisfaction. Compared to the same estimation without these variables, there is an increase in the R^2 of 6 percentage points (representing

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[4] Though as explained below, direct comparisons of coefficients obtained from System GMM should not be made with OLS or FE.
[5] Cluster robust standard errors on the level of the individual are applied to the estimates here, and to the FE estimations below.

30% of the originally explained variation). This figure is for the whole sample, but is similar to those for each of the individual genders.

However, pooled cross section OLS results cannot account for individual unobserved heterogeneity, which includes individuals' personalities and dispositions. Plausibly, an individual's personality and disposition can have an impact on the relationship between an individual's perception of the future and their satisfaction with life. Thus, such results should be treated cautiously. Addressing this, the estimates that comprise table 2 exploit the panel nature of the SOEP, and control for an individual's personality and disposition with the important caveat that this requires each individual's personality and disposition to be fixed or slowly moving.[6] As shown in table 2 the fixed effects results for optimism and pessimism are similar to those obtained by pooled OLS, though the coefficients are smaller.

[Table 2 about here]

Controlling for individual fixed effects (which include personality, disposition, and other time-invariant and slowly moving individual effects), and relying just on 'within' variation for estimation, the coefficients have approximately halved. The coefficients are also smaller for other variables like health and unemployment. Thus table 2 contains results that are qualitatively supportive of those found via OLS. Individuals who are optimistic about the future enjoy more life satisfaction now than individuals who are pessimistic about the future.[7] In both cases (OLS and FE) – and all six estimates – the variation of explained life

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[6] There is evidence that this caveat holds: previous research shows that changes of the big 5 personality traits after adolescence and before old age need a very long time and are of negligible size (Lucas and Donnellan 2011, Cobb-Clark and Schurer 2012).

[7] An exception is for males who are not in the labour market. With OLS such individuals are found to be rather unhappy compared to employed individuals, and with FE estimation there is no statistically significant difference between these two groups. The explanation for this difference is because 'not in the labour market' is a largely time invariant variable, and cannot be estimated precisely with FE. A situation remedied in the system GMM model (see s Appendix A).

satisfaction increases when these variables are included in the analysis. This informs us of two things: what people think about the future is important for current well-being; and, as a corollary, the inclusion of hopes and fears helps well-being regressions to explain more of what makes up individual well-being. Analysis employing System GMM also supports this assertion (see Appendix B).

Going further than just including control variables in the estimation, it is possible to match the optimistic and non-optimistic with respect to the control variables. The entropy balancing procedure (see Hainmuller 2012) was undertaken to match the first three moments of the control variables, which means that the 'control' group, the non-optimistic, have the same mean, variance and skewness as the 'treated' group, the optimistic. That is, from a statistical point of view, the distributions of the control variables of treated and control observations largely overlap. The entropy balancing procedure was undertaken for the controls as they were at period t-1; fixed effects analysis following the procedure enables this comparison.[8] To operationalise this, a dummy variable was created indicating whether someone was optimistic or quite optimistic (1) or not (0), and the obtained coefficients for this dummy variable are of the most interest. The results are shown in table 3, and indicate that, even if the optimistic and the non-optimistic are made to be the same for one lag of a set of controls (mean, variance and skewness), and the contemporaneous controls are included in the equation estimated, the optimistic are substantially more satisfied with life than the non-optimistic.

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[8] The user-written programme "ebalance" (Hainmueller and Xu 2013) in Stata was employed to implement entropy balancing. Valuable empirical studies which make use of this procedure in an economics context are provided by Hetschko et al. (2016) and Gamboni et al. (2018).

The results in the first three tables come from a restricted sample to enable consistency between the four methods. (Estimating a dynamic model entails loss of the first observation for each individual.) Relaxing this restriction so that the full SOEP sample can be used supports the results above. Optimism and pessimism still have their statistically significant associations with life satisfaction. The biggest difference between the consistent sample and the full sample is the presence of individuals aged 61 plus. The full sample was used with everybody, and again with an upper age limit of 60, with very similar results.

Additional robustness tests were undertaken by holding constant future changes in circumstances. This recognises the possibility that, to some extent, pessimism or optimism might reflect current events and changes today that may be expected to give rise to future changes but are not captured by the control variables. For example, an individual's partner may be very ill and this is likely to be a cause of pessimism about the future. Or an employed individual's job situation is giving them cause for concern about the future. With longitudinal data it is easy to identify and control for individuals who will become unemployed, or widowed, in the next year; similarly, it is easy to control for individuals who will become married within the next year (a potential source of optimism) or divorced within the next year (a potential source of optimism or pessimism). By holding these future changes in circumstances constant, i.e. by respecifying our models to include leading values of the respective variables, the coefficients on the optimism and pessimism dummy variables of interest provide details of their association with life satisfaction independent of such foreseeable future circumstances. Some of these lead variables are significantly associated with life satisfaction (unemployment[9], marriage) and some are not (divorce,

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[9] A result which supports the findings of Clark et al. (2008b) who provided evidence that employed individuals are less happy before they experience unemployment.

widowhood). However, their inclusion does not change the sign or significance of the optimism and pessimism variables and, in each case, the size of the coefficients is remarkably similar to estimates without them. The results tables can be seen in the appendix (table A2 for OLS; A3 for FE; A4 for FE after entropy balancing; and B2 for System GMM). In summary, controlling for changes in future circumstances does not seem to affect the associations found between perceptions of the future and life satisfaction.

The next section briefly discusses these results, and provides some limitations and suggestions for future research.

4. Discussion of results, limitations and suggestions for future research.

What individuals think about their future appears to have a strong association with their current life satisfaction, even when accounting for unobserved individual heterogeneity, the likely endogeneity of such thoughts to life satisfaction, and some foreseeable future developments in individuals' lives. Thoughts are important, and their direction is as expected: individuals who are optimistic about the future enjoy more life satisfaction *now*, whereas individuals who are pessimistic about the future have, on average, lower life satisfaction *now*. This was demonstrated with unconditional descriptive statistics as well as by successively more conditional regression analysis.

The impact of pessimism (when measured in terms of life satisfaction, and as estimated by OLS, FE, entropy balanced FE, and dynamic System GMM) is greater than that of optimism.[10] This is reminiscent of loss aversion, whereby individuals are affected by losses to a greater degree than they are by gains, a phenomenon that has received support in a well-being

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[10] This finding is upheld when the reference category is quite pessimistic rather than quite optimistic.

context (Boyce et al. 2013; De Neve et al. 2018).[11] This latter study employs three different datasets and finds, overall, an asymmetric effect on life satisfaction between recessions and periods of economic growth consistent with loss aversion.[12] Because of this, the authors argue for policy responses that are not just concerned with growth itself, but also with how that growth occurs; with smooth business cycles being preferred to more volatile ones. Furthermore, long periods of smooth growth may, somewhat, help lower individuals' pessimism and increase optimism and thus be beneficial to their life satisfaction.

Potential policy conclusions stem from this, though they may be difficult to undertake. Given the importance of individuals' thoughts about the future, policymakers could try to create credible reasons for optimism. Macroeconomic initiatives encouraging more employment and more employment stability (thus reducing pessimism about the future) may help to increase life satisfaction. More stability in terms of economic growth is called for by De Neve et al. (2014), as mentioned above, for promoting life satisfaction and the analysis here supports such a call. This may affect future happiness, and also likely to affect current life satisfaction through its role in changing expectations as the analysis in this investigation shows. Similarly, Boyce et al. (2013) make the suggestion regarding both individual and national incomes that lower, though stable, growth is likely to be preferable for well-being than the riskier pursuit of higher incomes. Again, the analysis of this investigation is supportive of such a conclusion. More stable GDP growth and income growth may well generate less pessimism (albeit with less exuberance) about the future and pessimism appears to play a greater role in current life satisfaction than does optimism.

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[11] A notable previous attempt to investigate loss aversion, income and life satisfaction was made by Vendrik and Woltjer (2007).

[12] De Neve et al. (2018) explicitly include dummies for expectations about the future in one of their robustness tests. Their inclusion confirms their result about the asymmetry of GDP changes for life satisfaction, and the expectation dummies themselves support the results of section 3 above.

This research, with its demonstration of the importance of an individual's thoughts for life satisfaction, indicates that individuals should "guard their thoughts" and do their best to not get trapped into too much negative thinking. This is an aim of cognitive behavioural therapy, and something that the well-known happiness researcher, Richard Layard, has argued should receive more public resources along with greater funding for, and increased appreciation of, mental health. In section 3 of Layard (2013, p.6), he explicitly argues for policymakers to make more use of evidence based methods of psychological therapy, with the most researched being 'cognitive behavioural therapy (or CBT), which helps people to reorder their thoughts and thus manage their feelings and behaviour"'. A further economic argument for increased resources for mental health has been made by Knapp and Lemmi (2014). The results here support these calls. Thoughts are very important for our current life satisfaction, similar in effect to that of our physical health. Furthermore the analysis above has shown that our thoughts about the future can be responsible for a larger impact on well-being than such well-known causes of reduced life satisfaction as unemployment.

Now the discussion turns to limitations and suggestions for future research. Identifying the association between the thoughts an individual has about the future and life satisfaction is a difficult task. The key right hand side variables may reflect an individual's mood, their personality, or disposition (or all three) and may well be endogenous with or to life satisfaction. Using generally well-understood models, these possibilities have been addressed and the hypothesised association between optimism and pessimism, and life satisfaction have been shown to remain.[13] Additional research will be needed to find out what is driving this association. The impact of thoughts may be different for individuals with

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[13] These methods, particularly System GMM and FE following entropy balancing, are suggestive of a causal path of optimism and pessimism to life satisfaction, but as this section states the actual link might be more complex.

different personality types. For example, introverts may be more affected by their thoughts about the future than extroverts. Other "Big Five" personality traits would also be interesting to investigate.[14] For example, how do optimism and pessimism affect life satisfaction for individuals with differing levels of neuroticism? Does being very conscientious have an impact on an individual's thoughts on the future and their impact on well-being? Are these linked to the notion that optimism, for some people, reflects overconfidence? Other interesting questions are easily found. One relates to the finding that males are seemingly more affected by thoughts than females. Is it possible that this reflects a "breadwinner effect", whereby males are more (on average) financially responsible for the family and their life satisfaction more keenly responds to their thoughts about the future? Future research can test this, along with different age cohort profiles and other subsamples via the use of interaction effects.

Perhaps a more satisfactory way to conceptualise the relationship studied might be to consider that both optimism/pessimism and life satisfaction are jointly determined within a system of underlying factors (both observed - education, health, etc.; and unobserved - psychological dispositions and so forth). If so, then optimism/pessimism and life satisfaction are correlated (because jointly determined) but not causally related. With this conception, a potential modelling strategy is one of Seemingly Unrelated Regression, perhaps as part of a Structural Equation Model.[15]

The analysis above has used overall life satisfaction, which is generally considered an evaluative measure of well-being. Future research could consider other measures of well-

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[14] A recent investigation linking life satisfaction, optimism and pessimism and the 'Big 5' personality traits has been made with an Asian American student sample (Liu et al. 2016).
[15] An example of this use following such a conceptualisation of key variables, due to the potential simultaneity of formal and informal institutions is provided by Efendic et al. (2011). See particularly Figure 2 (p.530).

being. Perhaps more affect based (or even eudaimonic) measures of well-being have a larger or smaller association with perceptions of the future. This would be interesting to find out, and could be combined with an analysis of the 'Big Five' personality types when researching an association between well-being and perceptions of the future. Finally, it would be interesting to learn about how the general negative impact of pessimism found here is driven by domain-specific concerns like, for example, the fear of unemployment. Similarly an individual's degree of optimism or pessimism may play a substantial role in moderating the non-pecuniary aspect of the loss of well-being in becoming unemployed, as mentioned in the introduction, and may well affect how quickly someone finds employment again. The combination of subjective factors can help aid better the understanding of objective phenomena, and is likely a fruitful path for future research.

5. Concluding remarks

This investigation has provided evidence that peoples' perceptions of the future in general, and particularly their fears of the future, have an impact on their current life satisfaction. This was found via three separate regression models (OLS, FE, and dynamic GMM) to take into account unobserved individual heterogeneity as well as to recognise, and appropriately deal with, the possibility that such perceptions might be endogenous. Being pessimistic about the future has a large negative effect on well-being, larger than such well-known and studied factors as being unemployed. In the results of Section 3, the largest negative impact on life satisfaction is pessimism about the future (similar in size to the positive effect of reported very good health compared to poor health). This result, and particularly its size, is important.

The inclusion of an individual's thoughts about the future in an assessment of well-being is also important because of the substantial increase in explanatory power that such an inclusion offers. Where it can be calculated, regression fit increases sizeably, indicative of a higher level of explained variation of life satisfaction in the models. It is often difficult to know what to include in multivariate regressions of life satisfaction, and data often plays a key role in what can be chosen. With current datasets it may not always be possible to include thoughts about the future in well-being models. Where possible, the results of this analysis suggest that thoughts about the future should be included. Given the size of the effect, the likely gender difference (such thoughts seemingly affect males more than females), and the role in explaining variation in life satisfaction, thoughts about the future should be considered for inclusion even if they are not of direct interest. They are likely to be important control variables.

Economics deals largely with objective factors (unemployment, marriage) and assesses their direct association with well-being. The analysis above indicates that subjective factors are also important and should also be considered, whether directly or as a control variable, in future investigations of well-being. With GMM, scholars have more ability to address these potentially important subjective factors. This may mean that future datasets should also include more subjective questions: the inner life of individuals is likely to be as important for satisfaction with life as objective factors. An enhanced understanding of life satisfaction needs to include both subjective and objective elements of an individual's life. As is very often the case, more research would be useful and informative.

References

Baumeister, R. F., Campbell, J. D., Krueger, J. I., and Vohs, K. D. (2003) Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *Psychological Science in the Public Interest*, 4(1), 1-44

Becchetti, L., Corrado, L. and Samà, P. (2013) Inside the Life Satisfaction Blackbox, *CEIS Research Paper* 259, Tor Vergata University, CEIS, revised 09 Jan 2013.

Becchetti, L. and Pelloni, A. (2013) What are we learning from the life satisfaction literature? *International Review of Economics,* 60(2), 113-155.

Boyce, C., Wood, A., Banks, J., Clark, A. E. and Brown, G. D. A. (2013) Money, Well-being and Loss Aversion: Does an Income Loss Have a Greater Effect on Well-being than an Equivalent Income Gain? *Psychological* Science, 24(12), 2557-2562

Clark, A. E. (2018). Four Decades of the Economics of Happiness: Where Next? *Review of Income and Wealth*, 64(2), 245-269.

Clark, A. E., Frijters, P. and Shields, M. A. (2008a) Relative Income, Happiness and Utility: An Explanation for the Easterlin Paradox and Other Puzzles, *Journal of Economic Literature,* 46(1), 95-144.

Clark, A. E., Diener, E., Georgellis, Y. and Lucas, R. (2008b) Lags and Leads in Life Satisfaction: A Test of the Baseline Hypothesis, *Economic Journal,* 118(529), F222-F243.

Cobb-Clark, D. A., and Schurer, S. (2012) The stability of big-five personality traits", *Economics Letters* 115, 11-15.

Cornaglia, F., Feldman, N. E., and Leigh, A. (2014) Crime and Mental Well-Being, *Journal of Human Resources*, 49(1), 110-140.

De Neve, J., Ward, G.W., De Keulenaer, F., Van Landeghem, B., Kavetsos, G. and Norton, M. I. (2018) The Asymmetric Experience of Positive and Negative Economic Growth: Global Evidence Using Subjective Well-Being Data, *The Review of Economics and Statistics,* 100(*2*), 362-375.

Efendic, A., Pugh, G. T., and Adnett, N. J. (2011) Confidence in formal institutions and reliance on informal institutions in Bosnia and Herzegovina: An empirical investigation using survey data, *Economics of Transition,* 19(3), 521-540.

Forgeard, M. J. C., and Seligman, M. E. P. (2012) Seeing the glass half full: A review of the causes and consequences of optimism, *Pratiques Psychologiques*, 18, 107–120.

Frijters, P., Liu, A. Y. C. and Meng, X. (2012) Are Optimistic Expectations Keeping the Chinese Happy? *Journal of Economic Behavior and Organization*, 81(1), 159–171.

Gambaro, L., Marcus, J. and Peter, F. (2018) School entry, afternoon care, and mothers' labour supply. *Empirical Economics* https://doi.org/10.1007/s00181-018-1462-3

Goebel, J., Grabka, M., Liebig, S., Kroh, M., Richter, D., Schröder, C. and Schupp, J. (2018) The German Socio-Economic Panel (SOEP): Jahrbücher für Nationalökonomie und Statistik/Journal of Economics and Statistics, URL: https://doi.org/10.1515/jbnst-2018-0022.

Greene, W. (2008) *Econometrics Analysis,* Sixth Edition. Upper Saddle River, New Jersey: Prentice Hall.

Grözinger, G. and Matiaske, W. (2004) Regional unemployment and individual satisfaction. In Grözinger, G. and van Aaken, A. (Eds.), Inequality: New Analytical Approaches. Marburg: Metropolis, pp. 87–104.

Hainmueller, J (2012). Entropy balancing for causal effects: a multivariate reweighting method to produce balanced samples in observational studies, *Political Analysis*, 20(1), 25–46.

Hainmueller, J. and Xu, Y. (2013) Ebalance: a stata package for entropy balancing, *Journal of Statistical Software*, 54(7), 1–18.

Haucap, J. and Heimeshoff, U. (2014) The happiness of economists: Estimating the causal effect of studying economics on subjective well-being, *International Review of Economics Education* 17, pp. 85–97.

Hetschko, C., Knabe, A. and Schöb, R. (2014) Looking Back in Anger?: Retirement and Unemployment Scarring, *SOEPpapers on Multidisciplinary Panel Data Research* 652, DIW Berlin, The German Socio-Economic Panel (SOEP).

Hetschko, C., Schöb, R. Wolf, T. (2016) Income Support, (Un-)Employment and Well-Being, *CESifo Working Paper Series* 6016, CESifo Group Munich.

Ho, M. Y., Cheung, F. M., and Cheung, S. F. (2010). The role of meaning in life and optimism in promoting well-being, *Personality and Individual Differences*, 48(5), 658-663

Kleiman, E. M., Chiara, A. M., Liu, R. T., Jager-Hyman, S. G., Choi, J. Y., and Alloy, L. B. (2017) Optimism and well-being: a prospective multi-method and multi-dimensional examination of optimism as a resilience factor following the occurrence of stressful life events, *Cognition and Emotion*, 31(2), 269-283.

Knapp, M. and Lemmi, V. (2014) The Economic Case for Better Mental Health. In: Davies, Sally, (ed.) *Annual Report of the Chief Medical Officer 2013, Public Mental Health Priorities: Investing in the Evidence*. Department of Health, London, UK, pp. 147-156.

Lang, F. R., Weiss, D., Gerstorf, D., and Wagner, G. G. (2013). Forecasting life satisfaction across adulthood: Benefits of seeing a dark future? *Psychology and Aging*, 28(1), 249-261.

Layard, R. (2013) Mental health: the new frontier for labour economics, *IZA Journal of Labor Policy* 2, 1: pp. 1-16.

Lui, P. P., Rollock, D., Chang, E. C., Leong, F. T. L., and Zamboanga, B. L. (2016) Big 5 personality and subjective well-being in Asian Americans: Testing optimism and pessimism as mediators, *Asian American Journal of Psychology*, 7(4), 274-286.

Lucas, R. E. and Donnellan, M. B. (2011) Personality development across the life span: longitudinal analyses with a national sample from Germany, *Journal of Personality and Social Psychology*, 101, pp. 847-861.

Mogilner, C., Kamvar, S., and Aaker, J. (2011). The shifting meaning of happiness, *Social Psychology and Personality Science*, 2(4), 395-402.

Osberghaus, D. and Kühling, J. (2016) Direct and indirect effects of weather experiences on life satisfaction: Which role for climate change expectations? *Journal Of Environmental Planning and Management*, 59(12), 2198-2230.

Piper, A. T. (2014) The Benefits, Challenges and Insights of a Dynamic Panel assessment of Life Satisfaction, *MPRA Paper 59556*, University Library of Munich, Germany.

Piper, A. T. (2018). Adult life satisfaction: largely (though not wholly) contemporaneous? A System General Method of Moments dynamic panel analysis, *MPRA Paper 85601*, University Library of Munich, Germany.

Roodman, D. (2009a) How to do xtabond2: An Introduction to Difference and System GMM in Stata, *The Stata Journal*, 9(1) pp.86-136.

Roodman, D, (2009b) A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics* 71, 1: pp. 135-158.

Senik, C. (2008) Is Man Doomed to Progress? *Journal of Economic Behavior and Organization*, 68, 140–152.

Stutzer, A. and Frey, B.S. (2006). Does Marriage Make People Happy, Or Do Happy People Get Married? *Journal of Socio-Economics*, vol. 35, pp. 326-347.

Stutzer, A. and Frey, B. (2012) Recent Developments in the Economics of Happiness: A Selective Overview, *IZA Discussion Papers* 7078, Institute for the Study of Labor (IZA).

Vendrik, M. C. M., and Woltjer, G. B. (2007) Happiness and loss aversion: Is utility concave or convex in relative income? *Journal of Public Economics, 91*, 1423-1448.

Windmeijer, F. (2005) A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics,* 126, 25-51.

Winkelmann, L., and Winkelmann, R. (1998) Why are the unemployed so unhappy? Evidence from panel data, *Economica*, 65(257), 1-15.

Table 1: Optimism, pessimism and life satisfaction: Pooled OLS estimations

VARIABLES	(1) Life Satisfaction All	(2) Life Satisfaction Males	(3) Life Satisfaction Females
Optimistic	0.40***	0.38***	0.43***
	(0.021)	(0.027)	(0.033)
Quite Pessimistic	-0.61***	-0.63***	-0.56***
	(0.018)	(0.024)	(0.027)
Pessimistic	-1.30***	-1.34***	-1.23***
	(0.048)	(0.065)	(0.070)
Log Real Income	0.07***	0.20***	0.05***
	(0.009)	(0.017)	(0.013)
Married	0.24***	0.16***	0.26***
	(0.022)	(0.029)	(0.034)
Divorced	-0.05	-0.13**	-0.05
	(0.038)	(0.057)	(0.053)
Separated	-0.44***	-0.72***	-0.24***
	(0.070)	(0.104)	(0.091)
Widowed	0.23***	0.04	0.19**
	(0.063)	(0.118)	(0.078)
Self-employed	-0.19***	-0.25***	-0.02
	(0.029)	(0.036)	(0.049)
Government employed	0.17***	0.22***	0.14**
	(0.032)	(0.039)	(0.059)
Apprentice	0.10*	0.18**	0.08
	(0.050)	(0.070)	(0.071)
Unemployed	-0.80***	-0.80***	-0.72***
	(0.040)	(0.056)	(0.057)
Retired	0.07	0.24***	-0.05
	(0.055)	(0.074)	(0.087)
In Education	0.05	0.22***	0.08
	(0.059)	(0.079)	(0.093)
Not in Labour Market	-0.02	-1.06***	0.06
	(0.054)	(0.198)	(0.054)
Health: V good	1.95***	1.93***	1.97***
	(0.037)	(0.051)	(0.054)
Health: Good	1.43***	1.41***	1.44***
	(0.031)	(0.043)	(0.044)
Health: Satisfactory	0.81***	0.78***	0.81***
	(0.031)	(0.044)	(0.045)
Education: High	0.06**	0.00	0.06
	(0.027)	(0.037)	(0.040)
Education: Medium	0.06***	0.08**	0.03

	(1)	(2)	(3)
	(0.021)	(0.029)	(0.031)
Age 21-30	-0.20***	-0.34***	-0.14*
	(0.053)	(0.074)	(0.075)
Age: 31-40	-0.31***	-0.45***	-0.25***
	(0.057)	(0.079)	(0.081)
Age: 41-50	-0.27***	-0.43***	-0.21**
	(0.058)	(0.081)	(0.083)
Age: 51-60	-0.01	-0.15*	0.08
	(0.059)	(0.082)	(0.085)
Age: 61 and above	0.38***	0.29***	0.51***
	(0.073)	(0.096)	(0.118)
Constant	5.74***	5.26***	5.94***
	(0.083)	(0.113)	(0.182)
Observations	40,590	22,606	17,984
R-squared	0.262	0.278	0.256

Table 2: Optimism, pessimism and life satisfaction: FE estimations

VARIABLES	(1) Life Satisfaction All	(2) Life Satisfaction Males	(3) Life Satisfaction Females
Optimistic	0.20***	0.17***	0.25***
	(0.023)	(0.029)	(0.036)
Quite Pessimistic	-0.36***	-0.39***	-0.31***
	(0.020)	(0.026)	(0.031)
Pessimistic	-0.74***	-0.78***	-0.67***
	(0.050)	(0.069)	(0.071)
Log Real Income	0.11***	0.13***	0.10***
	(0.016)	(0.024)	(0.021)
Married	0.10*	0.07	0.11
	(0.055)	(0.075)	(0.080)
Divorced	-0.06	-0.16	0.02
	(0.085)	(0.120)	(0.121)
Separated	-0.28***	-0.52***	-0.09
	(0.099)	(0.140)	(0.138)
Widowed	-0.13	0.05	-0.22
	(0.190)	(0.279)	(0.252)
Self-employed	-0.06	-0.10	-0.02
	(0.061)	(0.078)	(0.096)
Government employed	-0.02	0.00	-0.07
	(0.085)	(0.108)	(0.142)
Apprentice	0.09	0.15	-0.00
	(0.070)	(0.096)	(0.099)
Unemployed	-0.69***	-0.74***	-0.65***
	(0.045)	(0.061)	(0.067)
Retired	0.08	0.13	0.03
	(0.073)	(0.091)	(0.126)
In Education	0.07	0.06	0.08
	(0.083)	(0.101)	(0.144)
Not in Labour Market	-0.14**	-0.97***	-0.02
	(0.061)	(0.222)	(0.059)
Health: V good	1.11***	1.12***	1.08***
	(0.046)	(0.062)	(0.068)
Health: Good	0.88***	0.87***	0.88***
	(0.038)	(0.052)	(0.055)
Health: Satisfactory	0.56***	0.54***	0.57***
	(0.035)	(0.047)	(0.051)
Education: High	-0.01	0.03	-0.07
	(0.121)	(0.174)	(0.164)
Education: Medium	0.02	0.04	-0.02
	(0.091)	(0.130)	(0.126)
Age 21-30	-0.08	-0.17	0.01
	(0.072)	(0.104)	(0.097)
Age: 31-40	-0.07	-0.16	0.02
	(0.083)	(0.117)	(0.117)
Age: 41-50	-0.15	-0.26*	-0.03

	(0.112)	(0.132)	(0.138)
Age: 51-60	-0.014	-0.29*	0.05
	(0.096)	(0.152)	(0.165)
Age: 61plus	0.06	-0.07	0.21
	(0.112)	(0.179)	(0.215)
Constant	5.99***	5.76***	5.11***
	(0.257)	(0.309)	(0.468)
Observations	40,590	22,606	17,984
No. Individuals	13,299	7,190	6,109
R-squared	0.262	0.278	0.256

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1; all columns include region and wave dummy variables. Base categories are as follows: single, employed, poor health, low education, age 15-20, quite optimistic. SOEP data used: Socio-Economic Panel (SOEP), data for years 1991-2000, version 29, SOEP, 2013, doi:10.5684/soep.v29.

Table 3: Optimism, pessimism and life satisfaction: Entropy Balanced FE estimations

VARIABLES	(1) Life Satisfaction All	(2) Life Satisfaction Males	(3) Life Satisfaction Females
Optimistic	0.43***	0.39***	0.46***
	(0.024)	(0.039)	(0.030)
Log Real Income	0.14***	0.10***	0.17***
	(0.021)	(0.028)	(0.031)
Married	0.04	0.04	0.00
	(0.067)	(0.094)	(0.093)
Divorced	-0.16	0.11	-0.37***
	(0.098)	(0.138)	(0.133)
Separated	-0.33**	-0.01	-0.64***
	(0.131)	(0.172)	(0.193)
Widowed	0.04	-0.22	0.41
	(0.245)	(0.312)	(0.317)
Self-employed	-0.05	0.01	-0.11
	(0.083)	(0.136)	(0.100)
Government employed	-0.20	-0.49*	-0.07
	(0.125)	(0.273)	(0.127)
Apprentice	0.12	-0.06	0.21*
	(0.099)	(0.144)	(0.123)
Unemployed	-0.78***	-0.72***	-0.83***
	(0.058)	(0.083)	(0.079)
Retired	0.11	0.06	0.18*
	(0.077)	(0.133)	(0.099)
In Education	0.24**	0.21	0.24*
	(0.108)	(0.200)	(0.126)
Not in Labour Market	-0.20**	-0.02	-1.19***
	(0.087)	(0.081)	(0.299)
Health: V good	1.17***	1.14***	1.17***
	(0.058)	(0.089)	(0.077)
Health: Good	0.91***	0.91***	0.90***
	(0.046)	(0.068)	(0.063)
Health: Satisfactory	0.59***	0.62***	0.55***
	(0.043)	(0.062)	(0.059)
Education: High	-0.02	-0.32	0.21
	(0.179)	(0.269)	(0.231)
Education: Medium	-0.10	-0.33*	0.08
	(0.125)	(0.189)	(0.156)
Age 21-30	0.05	0.21	-0.10
	(0.101)	(0.153)	(0.134)
Age: 31-40	0.05	0.12	-0.06
	(0.115)	(0.176)	(0.149)
Age: 41-50	-0.03	0.08	-0.16
	(0.129)	(0.202)	(0.165)
Age: 51-60	-0.07	0.13	-0.24
	(0.150)	(0.229)	(0.194)
Age: 61plus	0.18	0.31	0.05
	(0.173)	(0.277)	(0.221)

Constant	6.56***	4.51***	7.15***
	(0.559)	(0.552)	(0.374)
Observations	40,068	17,511	22,557
No. Individuals	0.087	0.082	0.100
R-squared	11,296	5,047	6,249

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1; all columns include region and wave dummy variables. Base categories are as follows: single, employed, poor health, low education, age 15-20, quite optimistic. SOEP data used: Socio-Economic Panel (SOEP), data for years 1991-2000, version 29, SOEP, 2013, doi:10.5684/soep.v29.

Appendix Table A1: Descriptive statistics from the consistent SOEP: range; mean according to the dummy variables for degrees of pessimism/optimism; and overall

	Range	Optimistic	Rather Optimistic	Rather Pessimistic	Pessimistic	Overall
Life satisfaction	0 – 10	7.72	7.15	6.33	5.46	6.93
Real income	0 – 494	25.30	24.33	21.83	19.77	23.56
Single	0 – 1	0.32	0.27	0.20	0.19	0.25
Married	0 – 1	0.59	0.65	0.70	0.68	0.65
Divorced	0 – 1	0.06	0.05	0.07	0.09	0.06
Separated	0 – 1	0.02	0.02	0.01	0.02	0.02
Widowed	0 – 1	0.01	0.01	0.02	0.03	0.02
Self employed	0 – 1	0.08	0.07	0.07	0.05	0.07
Employed	0 – 1	0.69	0.70	0.71	0.66	0.70
Gov. employed	0 – 1	0.05	0.05	0.04	0.03	0.05
Apprentice	0 – 1	0.06	0.04	0.03	0.02	0.04
Unemployed	0 – 1	0.04	0.05	0.08	0.14	0.06
Retired	0 – 1	0.02	0.02	0.03	0.04	0.03
In education	0 – 1	0.03	0.02	0.01	0.01	0.02
Not in lab mkt	0 – 1	0.03	0.03	0.03	0.03	0.03
Very good health	0 – 1	0.22	0.10	0.07	0.07	0.11
Good health	0 – 1	0.51	0.52	0.40	0.32	0.48
Satisfactory health	0 – 1	0.20	0.29	0.37	0.35	0.30
Poor health	0 – 1	0.06	0.08	0.16	0.25	0.10
Education: high	0 – 1	0.17	0.18	0.13	0.11	0.16
Education: medium	0 – 1	0.60	0.63	0.66	0.65	0.64
Education: low	0 – 1	0.23	0.19	0.21	0.25	0.20
Age: 15-20	0 – 1	0.06	0.04	0.03	0.02	0.04
Age: 21-30	0 – 1	0.30	0.26	0.18	0.14	0.24
Age 31: 40	0 – 1	0.29	0.30	0.27	0.23	0.28
Age: 41-50	0 – 1	0.19	0.22	0.26	0.27	0.23
Age: 51-60	0 – 1	0.13	0.15	0.23	0.27	0.18
Age: 61 plus	0 – 1	0.03	0.03	0.04	0.05	0.03

Table A2: Optimism, pessimism and life satisfaction with lead variables: Pooled OLS estimations

VARIABLES	(1) Life Satisfaction All	(2) Life Satisfaction Males	(3) Life Satisfaction Females
Optimistic	0.40***	0.37***	0.44***
	(0.022)	(0.028)	(0.034)
Quite Pessimistic	-0.60***	-0.63***	-0.55***
	(0.018)	(0.024)	(0.028)
Pessimistic	-1.27***	-1.35***	-1.16***
	(0.049)	(0.067)	(0.071)
Log Real Income	0.06***	0.19***	0.05***
	(0.010)	(0.017)	(0.014)
Married	0.25***	0.16***	0.28***
	(0.023)	(0.030)	(0.036)
Divorced	-0.06	-0.15**	-0.05
	(0.040)	(0.059)	(0.055)
Separated	-0.46***	-0.71***	-0.28***
	(0.083)	(0.123)	(0.109)
Widowed	0.23***	0.00	0.21***
	(0.064)	(0.124)	(0.079)
Self-employed	-0.19***	-0.25***	-0.03
	(0.030)	(0.037)	(0.050)
Government employed	0.16***	0.21***	0.14**
	(0.033)	(0.040)	(0.060)
Apprentice	0.09*	0.19***	0.06
	(0.053)	(0.073)	(0.076)
Unemployed	-0.82***	-0.83***	-0.72***
	(0.041)	(0.058)	(0.058)
Retired	0.04	0.21***	-0.05
	(0.056)	(0.076)	(0.086)
In Education	0.04	0.21**	0.08
	(0.062)	(0.082)	(0.098)
Not in Labour Market	-0.02	-1.04***	0.05
	(0.057)	(0.219)	(0.056)
Health: V good	1.93***	1.91***	1.95***
	(0.038)	(0.053)	(0.056)
Health: Good	1.41***	1.41***	1.41***
	(0.032)	(0.045)	(0.045)
Health: Satisfactory	0.79***	0.78***	0.78***
	(0.032)	(0.045)	(0.046)
Education: High	0.03	-0.03	0.05
	(0.028)	(0.038)	(0.041)
Education: Medium	0.05**	0.06*	0.03
	(0.022)	(0.030)	(0.032)
Age 21-30	-0.21***	-0.36***	-0.14*
	(0.055)	(0.076)	(0.080)
Age: 31-40	-0.31***	-0.46***	-0.25***

	(0.059)	(0.081)	(0.086)
Age: 41-50	-0.27***	-0.43***	-0.21**
	(0.061)	(0.084)	(0.088)
Age: 51-60	0.00	-0.14*	0.08
	(0.062)	(0.085)	(0.090)
Age: 61 and above	0.40***	0.30***	0.51***
	(0.075)	(0.098)	(0.120)
Lead: Unemployed	-0.32***	-0.27***	-0.28***
	(0.041)	(0.055)	(0.062)
Lead: Widowed	-0.27	0.12	-0.59**
	(0.189)	(0.283)	(0.250)
Lead: Married	0.27***	0.29***	0.23***
	(0.053)	(0.071)	(0.080)
Lead: Divorced	0.03	-0.03	0.05
	(0.108)	(0.156)	(0.146)
Constant	6.30***	6.20***	6.27***
	(0.132)	(0.176)	(0.148)
Observations	37,961	21,116	16,845
R-squared	0.264	0.284	0.254

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1; all columns include region and wave dummy variables. Base categories are as follows: single, employed, poor health, low education, age 15-20, quite optimistic. SOEP data used: Socio-Economic Panel (SOEP), data for years 1991-2000, version 29, SOEP, 2013, doi:10.5684/soep.v29.

Table A3: Optimism, pessimism and life satisfaction with lead variables: FE estimations

VARIABLES	(1) Life Satisfaction All	(2) Life Satisfaction Males	(3) Life Satisfaction Females
Optimistic	0.19***	0.14***	0.25***
	(0.023)	(0.029)	(0.037)
Quite Pessimistic	-0.35***	-0.39***	-0.30***
	(0.020)	(0.027)	(0.031)
Pessimistic	-0.71***	-0.76***	-0.62***
	(0.050)	(0.069)	(0.070)
Log Real Income	0.12***	0.14***	0.10***
	(0.016)	(0.025)	(0.021)
Married	0.16**	0.15*	0.13
	(0.063)	(0.086)	(0.092)
Divorced	-0.08	-0.17	0.00
	(0.093)	(0.129)	(0.134)
Separated	-0.35***	-0.53***	-0.20
	(0.109)	(0.153)	(0.157)
Widowed	-0.12	-0.09	-0.15
	(0.225)	(0.348)	(0.292)
Self-employed	-0.06	-0.09	-0.03
	(0.063)	(0.081)	(0.098)
Government employed	0.00	0.03	-0.05
	(0.086)	(0.109)	(0.146)
Apprentice	0.10	0.15	0.01
	(0.074)	(0.103)	(0.104)
Unemployed	-0.77***	-0.82***	-0.70***
	(0.048)	(0.066)	(0.071)
Retired	0.08	0.11	0.05
	(0.073)	(0.091)	(0.125)
In Education	0.10	0.09	0.08
	(0.085)	(0.105)	(0.145)
Not in Labour Market	-0.15**	-1.00***	-0.03
	(0.062)	(0.232)	(0.060)
Health: V good	1.09***	1.08***	1.06***
	(0.047)	(0.063)	(0.069)
Health: Good	0.86***	0.84***	0.87***
	(0.038)	(0.052)	(0.056)
Health: Satisfactory	0.56***	0.53***	0.57***
	(0.035)	(0.048)	(0.052)
Education: High	-0.03	0.00	-0.09
	(0.125)	(0.183)	(0.168)
Education: Medium	0.04	0.04	0.04
	(0.095)	(0.136)	(0.131)
Age 21-30	-0.10	-0.18	-0.00
	(0.076)	(0.110)	(0.102)
Age: 31-40	-0.08	-0.15	-0.01
	(0.087)	(0.123)	(0.122)

Age: 41-50	-0.16	-0.23*	-0.07
	(0.099)	(0.138)	(0.143)
Age: 51-60	-0.14	-0.27*	0.02
	(0.116)	(0.158)	(0.170)
Age: 61plus	0.06	-0.03	0.16
	(0.140)	(0.186)	(0.217)
Lead: Unemployed	-0.18***	-0.18***	-0.14**
	(0.045)	(0.060)	(0.066)
Lead: Widowed	-0.22	-0.35	-0.15
	(0.210)	(0.339)	(0.268)
Lead: Married	0.20***	0.24***	0.15*
	(0.059)	(0.078)	(0.087)
Lead: Divorced	0.13	0.03	0.22
	(0.114)	(0.158)	(0.163)
Constant	6.44***	5.64***	6.49***
	(0.331)	(0.319)	(0.535)
Observations	37,961	21,116	16,845
No. Individuals	12,428	6,714	5,714
R-squared	0.262	0.278	0.256

Standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$; all columns include region and wave dummy variables. Base categories are as follows: single, employed, poor health, low education, age 15-20, quite optimistic. SOEP data used: Socio-Economic Panel (SOEP), data for years 1991-2000, version 29, SOEP, 2013, doi:10.5684/soep.v29.

Table A3: Optimism, pessimism and life satisfaction with lead variables: Entropy Balanced FE estimations

VARIABLES	(1) Life Satisfaction All	(2) Life Satisfaction Males	(3) Life Satisfaction Females
Optimistic	0.43***	0.45***	0.39***
	(0.025)	(0.031)	(0.039)
Log Real Income	0.14***	0.17***	0.11***
	(0.021)	(0.031)	(0.029)
Married	0.09	0.09	0.05
	(0.073)	(0.102)	(0.104)
Divorced	-0.18*	-0.36**	0.06
	(0.107)	(0.146)	(0.151)
Separated	-0.30**	-0.49**	-0.12
	(0.144)	(0.209)	(0.199)
Widowed	0.06	0.33	-0.18
	(0.305)	(0.394)	(0.396)
Self-employed	-0.05	-0.09	-0.02
	(0.089)	(0.106)	(0.145)
Government employed	-0.18	-0.05	-0.48*
	(0.130)	(0.129)	(0.283)
Apprentice	0.10	0.18	-0.07
	(0.103)	(0.130)	(0.148)
Unemployed	-0.84***	-0.89***	-0.76***
	(0.062)	(0.085)	(0.089)
Retired	0.13	0.19*	0.10
	(0.078)	(0.102)	(0.128)
In Education	0.29***	0.28**	0.27
	(0.111)	(0.128)	(0.210)
Not in Labour Market	-0.19**	-1.18***	-0.01
	(0.088)	(0.308)	(0.080)
Health: V good	1.15***	1.13***	1.13***
	(0.061)	(0.080)	(0.093)
Health: Good	0.90***	0.87***	0.91***
	(0.048)	(0.065)	(0.070)
Health: Satisfactory	0.58***	0.53***	0.62***
	(0.044)	(0.060)	(0.064)
Education: High	-0.02	0.17	-0.27
	(0.183)	(0.234)	(0.278)
Education: Medium	-0.10	0.06	-0.30
	(0.129)	(0.159)	(0.195)
Age 21-30	0.03	-0.12	0.18
	(0.107)	(0.140)	(0.163)
Age: 31-40	0.03	-0.06	0.08
	(0.121)	(0.155)	(0.188)
Age: 41-50	-0.03	-0.14	0.04
	(0.135)	(0.172)	(0.214)
Age: 51-60	-0.08	-0.22	0.08
	(0.156)	(0.200)	(0.241)
Age: 61plus	0.19	0.10	0.24

	(0.179)	(0.228)	(0.287)
Lead: Unemployed	-0.19***	-0.19***	-0.13
	(0.057)	(0.074)	(0.083)
Lead: Widowed	-0.23	-0.51	-0.09
	(0.274)	(0.413)	(0.347)
Lead: Married	0.17***	0.21**	0.11
	(0.066)	(0.087)	(0.099)
Lead: Divorced	-0.03	-0.22	0.19
	(0.144)	(0.200)	(0.195)
Constant	6.33***	6.77***	4.50***
	(0.531)	(0.429)	(0.460)
Observations	37,868	21,284	16,584
No. Individuals	0.088	0.101	0.083
R-squared	11,012	6,086	4,926

Standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$; all columns include region and wave dummy variables. Base categories are as follows: single, employed, poor health, low education, age 15-20, quite optimistic. SOEP data used: Socio-Economic Panel (SOEP), data for years 1991-2000, version 29, SOEP, 2013, doi:10.5684/soep.v29.

Appendix B: Results from System GMM analysis

Fixed effects estimates are conditioned on the individuals in the sample. Hence, the results cannot be generalised out of the sample. This issue does not arise in System GMM estimation; because the individual fixed effects are randomly distributed as part of the error term, results are generalizable to a larger population (assuming the sample is representative). However, the random effects approach to estimation entails the corollary that any independent variable correlated with these unobserved individual effects is endogenous, as is the lagged dependent variable in a dynamic model by construction. Moreover, a second source of potential endogeneity is simultaneity between optimism/pessimism and subjective well-being, such that they continuously condition one another. The main advantage of system GMM estimation is the ability to address the potential endogeneity of our variables of interest by exploiting the time-series depth of panel data to generate internal instruments for potentially endogenous variables. Here "system" refers to two equations: one in which differenced variables can be instrumented by lagged levels; and one in which variables in levels are instrumented by lagged differences (Arellano and Bover, 1995; Blundel and Bond, 1998; Roodman, 2009a and 2009b). External instruments can also be used, but the ability to address potential endogeneity only with internal instruments is a huge advantage when analysing survey data that lacks variables providing valid instruments.

We also use system GMM for its typical application; namely, to estimate a dynamic model.[16] The addition of the lagged dependent variable controls for the past history of the model (Greene 2008, p.468) so that the estimated effects of the other explanatory variables represent contemporaneous associations. In addition, by taking into account the persistence measured by the estimated coefficient on the lagged dependent variable, it is possible to derive the long-run effects of each independent variable. This changes the interpretation of the results and means that the results

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[16] Furthermore, the standard test for serial correlation with panel data (Wooldridge 2002; Drukker 2003) rejects a null hypothesis of no serial correlation, providing evidence of dynamic misspecification in the standard static panel models typically estimated in the "happiness" literature. This evidence strongly supports a dynamic specification, which is an additional reason for our use of system GMM.

obtained should not be compared with those obtained by OLS and FE estimation.[17] Table B1

presents the results along with the standard diagnostics. We use the default instrumentation – i.e.

all available instruments – and treat only the variables of especial interest as endogenous.

Alternative specifications and their outcomes are discussed below.

[Table B1 about here]

The diagnostic tests indicate that the model is statistically well specified.[18] The figures in the tables

are p-values and represent the probability of error when rejecting the null of exogenous over-

identifying instruments.[19] Roodman (2009b) suggests that a 'common sense' level of 0.25 is more

appropriate than the conventional 0.05. Here the p-values for the different Hansen tests are higher

than this more demanding threshold and hence fail to reject the null hypothesis of exogenous over-

identifying instruments.

As for the results, the biggest change from tables 1 and 2 is for the "quite pessimistic" coefficients.

With GMM analysis, and the related treatment of our variables of interest as endogenous, being

quite pessimistic about the future is insignificantly different from being quite optimistic about the

future (the omitted category) with respect to life satisfaction. However, being pessimistic about the

future has a substantial and negative association with life satisfaction. Interestingly, perceptions

about the future in general seem to play a larger role in the life satisfaction of men rather than

women, though the life satisfaction of women is still substantially affected by such perceptions.

Coupled with the previous tables, these results, and the increase in explanatory power they offer,

indicate that, where possible, perceptions of the future should be modelled in standard well-being

estimations. Accounting for endogeneity can be important too: when the likely endogeneity of the

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[17] In all cases, the GMM estimations employed the twostep robust procedure that utilises the Windmeijer finite sample correction for the two-step covariance matrix. Without this, standard errors have been demonstrated to be biased downwards (Windmeijer 2005).
18 The low average observations per person means that the *m1* test for second order correlation – AR (2) – of the first differenced residuals cannot be performed.
[19] Some studies in the "well-being" literature that misinterpret these diagnostic tests are discussed in Piper (2014).

optimistic-pessimistic variables is taken into consideration, being quite pessimistic is insignificant for well-being but being optimistic or pessimistic is still important for satisfaction with life. Recall that these variables show contemporaneous effects (controlling for the history of the model), so being pessimistic about the future *now* is associated with lower life satisfaction *now.*

The coefficients obtained for the other explanatory variables are in line with expectations from previous results in the literature, and those presented in tables 1 and 2. As examples, marriage is positively associated with life satisfaction, and unemployment negatively associated. Interesting to note is that government employees ('*Beamte*') are more satisfied with life than are other employees (the reference category). The lagged dependent variable deserves comment. Its uniformly high level of statistical significance supports our dynamic specification, and at just under 0.1 is in line with previous estimates arising from different samples and datasets.[20] These estimates indicate (as briefly mentioned above) that the direct influence of the past is small and that much of what makes up well-being is contemporaneous (see Piper 2018 for a more detailed discussion of the lagged dependent variable, its size, and robustness, in well-being estimations).

The choices necessary for a dynamic panel System GMM analysis should, by necessity, be tested for robustness. Firstly, the choice about the potential endogeneity of different variables: the results in table B1 reflect estimations where only the main variables of interest (optimistic, quite pessimistic, and pessimistic) are treated as potentially endogenous. Currently, there is little theoretical guidance within the literature to help the well-being researcher with this choice – a task for future research – but there is empirical evidence which suggests that marriage is likely to be endogenous to life satisfaction: Stutzer and Frey (2006), using the SOEP, show both that happier people get married and that marriage makes people happier. Treating the marital status variables as being potentially endogenous (as well as the optimism/pessimism variables) does not qualitatively change the results:

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[20] The coefficient for the lagged dependent variable demonstrates that the model passes Bond's informal test for a consistent dynamic estimator; namely, that it should be between the equivalent estimates from OLS and FE (outputs not shown but available on request) (Bond, 2002).

optimistic people are more satisfied with life *now* than are quite optimistic people, and pessimistic people are less satisfied than are quite optimistic (and optimistic) people.

The second main choice a researcher can make is with regards to how many instruments should be employed. The Table B1 estimates make use of all of the instruments available. Restricting the instrument set does not change the results found above. Moreover, a combination of making marital status endogenous and restricting the instrument count does not change the results. The results for the perception of the future dummy variables and their association with life satisfaction appear robust. And, as with OLS and both FE estimates, this remains so when some future events are controlled for (see table B2).

Table B1: Optimism, pessimism and life satisfaction: System GMM estimations

VARIABLES	(1) Life Satisfaction All	(2) Life Satisfaction Males	(3) Life Satisfaction Females
Lagged Life Satisfaction	0.08***	0.08***	0.08***
	(0.012)	(0.017)	(0.018)
Optimistic	0.99***	0.92**	0.89**
	(0.347)	(0.431)	(0.454)
Quite Pessimistic	-0.20	-0.20	-0.13
	(0.203)	(0.262)	(0.272)
Pessimistic	-1.38***	-1.71***	-1.38**
	(0.399)	(0.529)	(0.546)
Log Real Income	0.06***	0.15***	0.04***
	(0.011)	(0.020)	(0.015)
Married	0.21***	0.13***	0.22***
	(0.028)	(0.037)	(0.043)
Divorced	-0.07	-0.13*	-0.08
	(0.048)	(0.071)	(0.067)
Separated	-0.35***	-0.53***	-0.23**
	(0.080)	(0.117)	(0.111)
Widowed	0.20***	0.08	0.16*
	(0.076)	(0.128)	(0.096)
Self-employed	-0.18***	-0.24***	-0.02
	(0.037)	(0.047)	(0.060)
Government employed	0.15***	0.19***	0.15**
	(0.043)	(0.053)	(0.073)
Apprentice	0.06	0.16**	0.00
	(0.052)	(0.076)	(0.074)

Unemployed	-0.71***	-0.72***	-0.64***
	(0.047)	(0.069)	(0.064)
Retired	0.05	0.17**	-0.03
	(0.058)	(0.076)	(0.093)
In Education	0.02	0.08	0.10
	(0.060)	(0.080)	(0.098)
Not in Labour Market	-0.08	-0.98***	0.02
	(0.060)	(0.216)	(0.059)
Health: V good	1.55***	1.50***	1.61***
	(0.060)	(0.083)	(0.082)
Health: Good	1.18***	1.14***	1.21***
	(0.040)	(0.056)	(0.056)
Health: Satisfactory	0.70***	0.65***	0.71***
	(0.036)	(0.051)	(0.050)
Education: High	0.06**	0.07*	0.04
	(0.028)	(0.038)	(0.040)
Education: Medium	0.08**	0.03	0.09*
	(0.037)	(0.049)	(0.053)
Age 21-30	-0.14***	-0.20***	-0.14*
	(0.053)	(0.076)	(0.075)
Age: 31-40	-0.24***	-0.30***	-0.24***
	(0.059)	(0.084)	(0.084)
Age: 41-50	-0.23***	-0.29***	-0.24***
	(0.062)	(0.090)	(0.089)
Age: 51-60	-0.01	-0.06	-0.01
	(0.064)	(0.091)	(0.093)
Age: 61 and above	0.33***	0.29***	0.41***
	(0.080)	(0.104)	(0.134)
Constant	4.74***	4.57***	4.83***
	(0.146)	(0.204)	(0.193)
Observations	40,590	22,606	17,984
No. Individuals	13,299	7,190	6,109
No. Instruments	74	74	74
Hansen's *J* test	0.895	0.565	0.899
Diff-in-Hansen for Levels	0.706	0.655	0.808
Diff-in-Hansen (lag depvar)	0.928	0.393	0.754

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1; all columns include region and wave dummy variables. Base categories are as follows: single, employed, poor health, low education, age 15-20, quite optimistic. In each column the variables treated as endogenous are the optimism-pessimism variables; default (i.e. all available) instrumentation is used. SOEP data used: Socio-Economic Panel (SOEP), data for years 1984-2012, version 29, SOEP, 2013, doi:10.5684/soep.v29.

Table B2: Optimism, pessimism and life satisfaction: System GMM estimations

VARIABLES	(1) Life Satisfaction All	(2) Life Satisfaction Males	(3) Life Satisfaction Females
Lagged Life Satisfaction	0.09***	0.09***	0.09***
	(0.013)	(0.017)	(0.018)

Optimistic	0.91***	0.87**	0.94*
	(0.347)	(0.409)	(0.491)
Quite Pessimistic	-0.22	-0.09	-0.25
	(0.204)	(0.259)	(0.274)
Pessimistic	-1.22***	-1.59***	-1.06*
	(0.431)	(0.561)	(0.580)
Log Real Income	0.05***	0.15***	0.03**
	(0.012)	(0.021)	(0.016)
Married	0.22***	0.13***	0.24***
	(0.030)	(0.039)	(0.046)
Divorced	-0.08	-0.14*	-0.08
	(0.049)	(0.074)	(0.069)
Separated	-0.38***	-0.55***	-0.28**
	(0.092)	(0.135)	(0.126)
Widowed	0.20**	0.05	0.18*
	(0.078)	(0.136)	(0.099)
Self-employed	-0.17***	-0.23***	-0.04
	(0.038)	(0.049)	(0.061)
Government employed	0.15***	0.18***	0.13*
	(0.043)	(0.054)	(0.074)
Apprentice	0.06	0.16**	-0.02
	(0.054)	(0.079)	(0.077)
Unemployed	-0.80***	-0.81***	-0.71***
	(0.050)	(0.072)	(0.066)
Retired	0.04	0.15*	-0.04
	(0.057)	(0.076)	(0.091)
In Education	0.01	0.05	0.11
	(0.064)	(0.085)	(0.105)
Not in Labour Market	-0.09	-1.00***	-0.00
	(0.062)	(0.238)	(0.060)
Health: V good	1.54***	1.50***	1.57***
	(0.062)	(0.085)	(0.086)
Health: Good	1.17***	1.15***	1.18***
	(0.041)	(0.058)	(0.057)
Health: Satisfactory	0.69***	0.66***	0.70***
	(0.037)	(0.053)	(0.050)
Education: High	0.05*	0.05	0.04
	(0.029)	(0.040)	(0.041)
Education: Medium	0.06*	0.00	0.09
	(0.037)	(0.050)	(0.054)
Age 21-30	-0.15***	-0.22***	-0.14*
	(0.055)	(0.079)	(0.078)
Age: 31-40	-0.25***	-0.32***	-0.24***
	(0.061)	(0.087)	(0.088)
Age: 41-50	-0.24***	-0.31***	-0.23**
	(0.064)	(0.092)	(0.092)
Age: 51-60	-0.02	-0.07	0.00
	(0.066)	(0.093)	(0.097)
Age: 61 and above	0.32***	0.28***	0.40***

	(0.082)	(0.107)	(0.135)
Lead: Unemployed	-0.25***	-0.21***	-0.23***
	(0.044)	(0.061)	(0.064)
Lead: Widowed	-0.08	0.03	-0.17
	(0.163)	(0.279)	(0.208)
Lead: Married	0.21***	0.22***	0.19**
	(0.053)	(0.073)	(0.079)
Lead: Divorced	0.03	-0.04	0.08
	(0.106)	(0.152)	(0.144)
Constant	4.79***	4.57***	4.88***
	(0.146)	(0.199)	(0.195)
Observations	37,961	21,116	16,845
No. Individuals	12,428	6,714	5,714
No. Instruments	78	78	78
Hansen's *J* test	0.721	0.515	0.894
Diff-in-Hansen for Levels	0.444	0.371	0.832
Diff-in-Hansen (lag depvar)	0.797	0.426	0.734

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1; all columns include region and wave dummy variables. Base categories are as follows: single, employed, poor health, low education, age 15-20, quite optimistic. In each column the variables treated as endogenous are the optimism-pessimism variables; default (i.e. all available) instrumentation is used. SOEP data used: Socio-Economic Panel (SOEP), data for years 1984-2012, version 29, SOEP, 2013, doi:10.5684/soep.v29.