Happier people are less likely to be unemployed
Evidence from longitudinal data in the United States and Germany

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A one standard deviation improvement in lagged subjective well-being (SWB) is associated with more than a one-percentage point reduction in the probability of being unemployed in the United States during the Great Recession, and a similar but smaller relationship is found in Germany. Results are based on dynamic and fixed-effects regressions using SWB residuals. SWB residuals represent higher or lower SWB than would be predicted by typical controls including employment status, income, and fixed effects. They are often interpreted as relating to character skills, which is supported with the use of the Big-Five personality traits. Changes in the Big-Five (e.g. neuroticism and extraversion) are associated with changes in residual SWB (within person). Residual SWB is also shown to be comparable with cognitive ability for predicting wages. The data come from the U.S. General Social Survey Panel (2006-2014) and German Socio-Economic Panel (1984-2013).

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I. Introduction

Happier people are less likely to be unemployed. A one standard deviation increase in lagged subjective well-being (SWB) is associated with more than a one-percentage point decline in the probability of being unemployed in the United States during the Great Recession. A similar but smaller relationship, 0.3 percentage points, is identified in Germany (1996-2013). The relationship is understandably smaller given the different institutional and macroeconomic settings. The data come from the relatively new and underused U.S. General Social Survey Panel and the familiar German Socio-Economic Panel (GSOEP).

One way the effects of SWB on unemployment can be understood is through SWB’s relation with character skills. Character skills affect labor market outcomes independently of more traditional human capital measures. This assertion is true both in theory and empirically. In some cases they may even be more important than cognitive ability. Broadly defined by Heckman and Kautz (2013), character skills include non-cognitive measures such as personality traits like neuroticism and extraversion. In general SWB can be thought of as a supplementary measure to character skills, because while SWB is both caused by and determines personality traits, it is also distinct. SWB positively determines many factors that affect labor market outcomes, including: productivity, health, education, and social capital. However for purposes of this paper, SWB primarily operates through character skills because alternative mechanisms are controlled through the use of residual SWB as the main explanatory variable.

Residual, in contrast to observed, SWB is used to predict unemployment in order to capture only the direct effects of SWB. The indirect effects of confounders, health for
example, are captured in a first stage regression of SWB, because residuals are by
construction unrelated to the determinants of SWB (including health among others).
Specifically, the method first generates residual SWB from a fixed-effects regression of
SWB on a rich set of controls. In the second stage, unemployment is regressed on lagged
residual SWB, both in fixed-effects and dynamic specifications. Controls for the
individual’s perceptions of job security and job satisfaction were also included in each
stage. This method eliminates reverse causality, accounts for many potential omitted
variables, but also shuts down several channels through which SWB affects labor market
outcomes (e.g. health). The obtained relationship between SWB residuals and
unemployment is due to the remaining variation, which I show is partially explained by
time-varying character skills including personality traits.

In addition to the main result that residual SWB predicts the likelihood of
unemployment, there are two additional sets of results. First, the Big-Five personality
traits are statistically significant determinants of residual SWB in a fixed-effects
regression in Germany (comparable variables are not available in the U.S.). Not only do
the personality traits change over time for a given person (c.f. Costa and McCrae, 1994),
but also their changes can be used to predict the change in residual SWB for that person.
As might be expected, neuroticism was negatively related to SWB and the strongest
determinant among the Big-Five traits. Second, residual SWB explains log wages
comparatively as well as cognitive ability. Character skills are empirically of similar
importance as traditional human capital measures (Heckman and Kautz 2013), but little
research has compared SWB with cognitive abilities.
There are two primary implications. First, labor market equations should include measures of character skills, whether personality or SWB depends in part on the data available. There is substantial support for the use of character skills in labor equations (Borghans et al. 2008), and this paper adds new support for the use of SWB. Indeed should a researcher prefer character skills, but measures are unavailable, they may use residual SWB as a proxy. This was first suggested by (Guven 2011), and further supported here. For example, neuroticism and optimism are closely related to residual SWB, but they are only observed in two years while SWB is observed every year (in the GSOEP). Second, there are implications for policy makers. Policy makers should encourage educational and occupational structures that emphasize character skill development. The result of which will not only improve labor market performance, but also the well-being of participants.

This paper adds to the settings studied and advances on the methods used in similar studies. Most past studies that use SWB as a predictor are dynamic and some use residuals. They are confined to countries with suitable panel data, especially Germany and Britain. I am not aware of any similar studies that appropriately use fixed-effects models, or any that predict the likelihood of being unemployed in the United States. Support for character skills as a potential mechanism is also provided. Last, an additional method presented in the appendix that is both dynamic and includes fixed effects also supports the main results for men but not women (conducted in first-differences and using twice-lagged values as instruments).
II. What is SWB and Evidence for its Relation with Unemployment

A. What is Subjective Well-Being

As the name implies, subjective well-being measures are based on the responses to survey questions concerning one’s well-being. While there are different types of SWB, the focus of this paper is on evaluative measures. As the name implies evaluative measures ask the respondent to evaluate their lives. They are thought to provide consistent and meaningful measures of well-being. They: show a high degree of correlation between subject responses over a short period of time, are well explained by life circumstances, predict future behavior, and correlate well with other subjective and objective measures of well-being. Alternative experiential or emotional SWB measures, such as positive affect, are not as closely related to life circumstances (Helliwell and Wang 2012).1 For a further discussion of the types of SWB questions and their reliability and validity see (Kapteyn et al. 2015) and (Helliwell and Wang 2012).

The economics of happiness (or SWB) is becoming an increasingly important area of research. Official statistics are being recorded by a growing number of countries and organizations (including the United States and OECD) (Durand and Smith 2013), and at least six Nobel laureates in economics have advocated obtaining subjective measures of well-being (Stiglitz, Sen, and Fitoussi 2009). For skeptics of SWB measures, Appendix A briefly addresses some of the common concerns, and explains why measuring SWB is important for policy making. For example, interpersonal comparison of utility is not an issue when using individual fixed effects.

Much of the literature uses SWB as an outcome variable. It has even been suggested as a measure of utility. For example in a 2007 article, Gary Becker and Luis

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1 An example of an experiential question is, “How happy were you yesterday?”.
Rayo state, “… we consider that maximizing happiness is closely linked, if not identical, to maximizing utility in the standard economic way (Rayo and Becker 2007, 487).” However, what is important for this paper is that SWB can be used as a determinant. Indeed the United Nations publication, *World Happiness Report* (2013), summarizes the evidence for the benefits of SWB on health and longevity, income, productivity, and individual, organizational, and social behavior (De Neve et al. 2013, 56-57). More recently the results published in a *Journal of Labor Economics* article, led the authors to say, “… it appears that economists and other social scientists may need to pay more attention to emotional well-being as a causal force (Oswald, Proto, and Sgroi 2015, 807).”

**B. Past Evidence for the Effects of SWB on Unemployment**

Happier people have better labor market outcomes. Important mechanisms include productivity, health, and character skills. Productivity is shown in an experimental setting, the details of which are discussed below (Oswald et al. 2015). The positive relation with health is partially attributed to “improve[d] immune, cardiovascular, and endocrine functioning (De Neve et al. 2013, 55).”\(^2\) The evidence relating to character skills or personality traits is discussed in Section V.

Positive effects of SWB are shown both in the psychology and economics literature. A review of the evidence from psychology led Boehm and Lyubomirsky to conclude, “happiness often precedes measures of success and that induction of positive affect leads to improved workplace outcomes. (Boehm and Lyubomirsky 2008, 101)” The focus here, however, is on the methods and results from economics studies. For an

\(^2\) However, not all studies find significant effects on health (c.f. Liu et al. 2016).
introduction to the reverse relationship that focuses on unemployment as a determinant of SWB, see reviews in Layard, Clark, and Senik (2012) and Krause (2014).

Among the most notable of the related economics studies are Oswald, Proto, and Sgroi (2015) and De Neve and Oswald (2012). Oswald, Proto, and Sgroi (2015) is unique for showing that increasing SWB will causally increase productivity, which they accomplished by inducing positive affect in three lab experiments.\(^3\) To extend the lab results, the authors also implement a fourth trial, which showed that, participants who reported having experienced a family tragedy (akin to a natural experiment) also reported lower happiness and had lower productivities. Collectively, results from the three lab experiments and the fourth trial suggest that increases in emotional- and evaluative-SWB are likely to improve productivity.\(^5\) This conclusion is further supported by De Neve and Oswald (2012), which shows that emotional- and evaluative-SWB are positively correlated to log income seven or more years later, using data from a representative U.S. panel (Add Health). The results are net of the effects from traditional human capital variables, including IQ, and also sibling fixed effects.\(^6\) The positive effects of SWB on income are shown in additional studies too, for example in the U.S. (Mohanty 2009a; Mohanty 2009b; Mohanty and Ullah 2012), and more generally (De Neve et al. 2013, 56-57).

\(^3\) In two experiments Oswald et al. induce positive affect by showing a randomly selected group of participants a comedy clip. In a third experiment, the treatment group is provided chocolate, fruit, and drinks. Productivity, measured on a standardized task, is increased in each case. In experiment three they spent approximately $2 per person to raise productivity by 20 percent for a short period of concentrated work.

\(^4\) Similar lab experiments are rare; however, Ifcher and Zarghamee (2011) also randomly induce positive affect and show that it reduces time preferences over money.

\(^5\) Remember positive affect differs from evaluative SWB, yet family tragedy is likely to have longer lasting effects on evaluative SWB than positive affect (Helliwell and Wang 2012).

\(^6\) When entered together life satisfaction has a larger standardized effect on log income than positive affect, though admittedly the life satisfaction value was observed closer to the income observation.
Note that the De Neve and Oswald (2012) study is prospective. Prospective studies are common, but initial characteristics are not exogenous and they may still face challenges. Two more examples include Marks and Fleming (1999) and Roberts, Caspi, and Moffitt (2003). Each show positive effects of lagged SWB on work experiences years later (in Australia and New Zealand). To obtain better-identified estimates, several studies have turned to SWB residuals. SWB residuals are constructed to be unrelated to anything affecting the lagged outcome variable (observed and unobserved), and they are not simultaneously determined. The first study using happiness residuals shows that individuals with higher residual happiness in 1995 made more money and were in better health five years later (controlling for income, education, and other socio-demographic variables using the Russia Longitudinal Monitoring Survey) (Graham, Eggers, and Sukhtankar 2004). More recently, residual happiness was shown to predict social capital measures more than 20 years later (Guven 2011).

The study that uses the most similar methods is that of Krause (2013). It is one of the few that uses SWB residuals to predict employment. She finds that residual SWB has an inverted U-shape relation with reemployment and reentry wage, using a sample of initially unemployed people in Germany during 2007 – 2009 (using the IZA Evaluation Dataset S). It is interesting to note that the results do not hold for women. In her study males exiting into self-employment drive the main effect on reemployment. While fixed effects are not possible because there are only two time periods, she is able to control for labor market histories and future job prospects. The applicability of Krause (2013) for the current setting may however be limited. Krause (2013) focuses on reemployment in a sample of unemployed people. The mechanisms affecting reemployment may differ from
job loss, and unemployed samples depend on the specific institutional environment and macroeconomic conditions.

The studies that discuss search behavior also have limited comparability because they discuss reemployment, but they are still informative. Indeed, unhappier people search for jobs more, which indicates a negative channel through which SWB affects employment. However, the negative effects may not be enough to offset the otherwise positive effects of SWB. The net results from the related literature are mixed (Clark 2003; Mavridis 2012; Krause 2013; Gielen and van Ours 2014). Each study uses fairly convincing identification strategies, but do not account for omitted fixed determinants of employment.

The present analysis contributes by estimating the effects of SWB on the likelihood of being unemployed in a unique setting (U.S. 2006-2014), and in Germany. The samples are nationally representative - they are not constrained to unemployed people seeking reemployment. My study also builds on the previously used methods: (1) by using lagged SWB to predict labor market outcomes as in (De Neve and Oswald 2012), (2) with SWB residuals as in (Graham, Eggers, and Sukhtankar 2004; Guven 2011; and Krause 2013), (3) and adds individual fixed-effects.

The analysis presented in Appendix D also uses two-stage dynamic panel models that account for fixed effects and Nickell Bias (Nickell, 1981). Binder and Coad (2010) also uses a dynamic model that account for fixed effects, but they do not account for Nickell Bias. While subject to some bias, their results confirm the overall story showing a positive relationship between lagged well-being and each of the variables: marriage, health, income, and employment status in Britain.
There are few studies that can account for individual fixed effects, and even fewer that can claim causality in SWB studies, because exogenous shocks that affect SWB enough to indirectly affect labor market outcomes, are also likely to affect the outcomes directly (i.e. they are not excludable). Similar descriptions of identification challenges in SWB research were described in Guven (2011), Krause (2013), and a past Review and Economics and Statistics study:

“Happiness, personal characteristics, and macroeconomic variables might be simultaneously determined. It is hard to think of a convincing instrument in such a setting. (di Tella, MacCulloch, and Oswald 2003, 820)”

III. Identification Using Residual Subjective Well-Being

SWB affects unemployment, but as illustrated in Figure 1, there are several simultaneous relationships. To overcome this challenge, residual SWB is generated, lagged, and then used as the main explanatory variable. The residuals represent the portion of SWB that is unexplained by the regressors, including traditional factors that affect wages (Mincer 1974). The resulting relationship between lagged residual SWB and unemployment is thus net of indirect effects related to traditional channels and unemployment’s effect on SWB. Unemployment’s effects on the traditional channels are also eliminated using lags. Figure 2 illustrates this basic model.

![Figure 1. Basic model of unemployment.](image-url)
A. Methods Using Residual Subjective Well-Being

First Stage:—To test the effects of SWB on unemployment, residual SWB is obtained in a first stage, and then used in second stage regressions of unemployment on lagged residual SWB. Specification (1) shows the first stage used to generate the residual SWB. $SWB_i$ is standardized-SWB for individual i at time t. $X_i$ is a vector of controls described below and $\eta_i$ represents the individual fixed effects. Following estimation, predicted residual SWB, $\hat{v}_i$, is retained for the second stage regressions.

$$SWB_i = \gamma' X_i + \eta_i + v_i$$  \hspace{1cm} (1)

The controls include: current labor market indicators (employment status, unemployment history, income, and industry and occupation categories), traditional human capital variables (education, and potential experience and its square), socio-characteristics (religious, parental, and marital status), age categories, self-reported health, month of interview, and year by region (U.S. census division or German state). Job satisfaction and expectations about future job market outcomes were also included as
unconventional controls (discussed further below). To facilitate subsequent comparison with analysis in first differences, categorical variables have been replaced with binary variables. For example self-reported health (scaled 1-4 in the U.S.) was replaced with the binary variable “Good Health” that takes the value of 1 if the respondent reported “good” or “excellent” health.

It is important to account for channels that may affect the likelihood of being unemployed directly. For example, an individual could be less happy because while currently employed, they know they are going to lose their job, or because they have a negative relationship with their boss and plan to quit. Including job satisfaction and expectations as controls captures these channels because residual SWB, $\widehat{\nu}_{it}$, is uncorrelated with concurrent covariates $X_{it}$. The additional variables are defined in the Appendix B.

**Second Stage:** Here unemployment is regressed on lagged residual SWB, the same controls used in the first stage to determine SWB, including macro-effects and individual fixed effects or lagged unemployment. The fixed-effects specification is listed below as equation (2). $U_{it}$ is a dummy variable that takes the value of one if person $i$ is unemployed at time $t$. $\widehat{\nu}_{it-1}$ is residual SWB lagged one period. $X_{it}^1$ is a vector of exogenous controls such as age, month, and year effects. Characteristics affected by the individual’s choices, including income and educational attainment, have been included in $X_{it}^2$. They were lagged to reduce concerns of reverse causality. Standard errors were bootstrapped to account for the fact the residuals were estimated.

$$U_{it} = \delta \widehat{\nu}_{it-1} + \beta_0' X_{it}^1 + \beta_1' X_{it-1}^2 + \alpha_i + \epsilon_{it} \quad (2)$$
In addition to the fixed-effects analysis, dynamic OLS (DOLS) was used. The specification, shown below as equation 3, replaces fixed effects \( \alpha_t \) with lagged unemployed status, but is otherwise unchanged.

\[
U_{lt} = \rho U_{lt-1} + \delta v_{lt-1} + \beta' X_{lt}^1 + \beta' X_{lt-1}^2 + \epsilon_{lt} \quad (3)
\]

DOLS models have some advantages even though fixed effects must be omitted.\(^7\) The true behavioral choice may be better represented with a dynamic model than fixed effects (Ashenfelter 1978). Individuals may change their behavior in anticipation of poor labor market conditions, and only dynamic models can account for certain conditions concurrent with lagged SWB. For example, industry and occupation categories can only be included when also controlling for employment status because their observation is conditional on being employed.

DOLS also allows for the inclusion of several unconventional variables. Labor market expectations and job satisfaction are particularly relevant. If individuals do anticipate poor labor market conditions, then the variables “Joblose” and “JobFind” will capture the relation. The first takes the value of one if the person believes they are likely to lose their job in the next 12 months, while “JobFind” takes the value of one if the person believes it would be difficult to find a comparable job in the event they needed to. Individuals are also likely to have better knowledge of their skills and how they might relate to a changing labor market. Job satisfaction (“High Job Sat.”) is another important variable because someone who is unsatisfied with their job, may choose to voluntarily become unemployed in search of a better job (Clark 2001). “Unemp'ed Last 10yrs” is another variable that might affect future employment. It is a dummy variable that takes

\(^7\) Fixed effects must be omitted because their inclusion in a dynamic model would cause Nickel bias (Nickell, 1981).
the value of one if the respondent had been unemployed for at least a month in the past ten years. If associated with people who are more likely to become unemployed, it should have a positive relation with being unemployed. It could also have affected individual personality traits by causing scarring (Clark, Georgellis, and Sanfey 2001). The German variables are structured similarly, and details are included in Appendix B.

**B. Subjective Well-Being Data**

The SWB and employment data are from nationally representative surveys in the United States and Germany. In the U.S. the data are from the U.S. General Social Survey (GSS), conducted by the National Opinion Research Center at the University of Chicago. The GSS is the most used survey for happiness time-trend analysis is the United States (e.g. Stevenson and Wolfers 2009). In 2006 an individual panel component was added. There are now three separate panels with three waves each that occur every two years. The survey collects demographic, economic, and attitudinal information for approximately 2000 people per panel. In Germany, the data are from the German Socio-Economic Panel (GSOEP), made available by the German Institute for Economic Research (DIW), Berlin. The GSOEP represents one of richest source of longitudinal SWB data. It began in 1984 with approximately 18,000 individuals, and with replenishment samples, allows for repeated observations of more than 35,000 individuals totaling an approximate 280,000 SWB observations for the present study.

The analyses were based on reduced samples that exclude people: who were out of the labor force throughout the entire sample period (e.g. retirees at initial observation), or if they were missing important variables, such as employment status, income,

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8 The first panel was fielded in 2006, 2008 and 2010, the second panel 2008, 2010, and 2012, while the last panel (to-date) was fielded in 2010, 2012, and 2014.
educational attainment, or SWB. People without at least three observations were also necessarily excluded in order to use lagged observations and fixed effects. People who left the sample (attrits) are discussed further in Appendix C. In Germany the period was restricted to post-1995 due to the availability of a consistent question on labor market expectations.

Standardization of the SWB variables was also necessary to ease comparison across countries. While the two questions are related to the same concept, evaluative SWB, they have a different number of response options. In the U.S., evaluative happiness is measured as the response to the question, “Taken all together, how would you say things are these days–would you say that you are very happy, pretty happy, or not too happy?” The responses are scaled from one to three, but in Germany the question is, “How satisfied are you with your life, all things considered?”, which is evaluated on a scale from zero to ten. To standardize, the sample mean was subtracted and this total was divided by the standard deviation. Standardization has also been used in past SWB research (e.g. Stevenson and Wolfers 2009).

C. Residual Subjective Well-Being
Residual SWB is generated from the analysis presented in Tables 1 and 2. Each table shows the host of variables used to determine SWB. Some of the variables may not be traditional or exhibit significant relationships with SWB, but their inclusion is still important because then the residuals are purged from any mechanism operating through them. It is true that the residual or unexplained portion of SWB is fairly high – less than ten percent of the within-person SWB variation is explained. However, low explanatory
power is common in SWB studies, and for within-person studies it is lower than between people. In the prior studies using residual SWB, the R-squareds were similarly low: 0.03 (Graham, Eggers, and Sukhtankar 2004), 0.06 (Guven 2011), and 0.12 (Krause 2013).9

The SWB relationships with individual variables are fairly consistent across countries and with the literature (e.g. Dolan, Peasgood, and White 2008). Unemployment, marriage, health, and job satisfaction are the most important time-varying determinants. Getting married was positively associated (compared to never married), and leaving a marriage (divorce, separation, or losing a spouse) was negatively associated. Improvements in self-reported health are positively related to SWB. It is not surprising that increasing job satisfaction is also positively associated. Many other variables (e.g. education) that may be expected to be significantly related are often accounted for by the fixed effects, especially in the United States sample that only has three periods. Income (ln Eqv. Inc.) serves as the best example. Increasing income is expected to increase SWB in the short term, but a significant relationship is confirmed only in Germany.

Among the other relationships, expecting it to be difficult to find a comparable job (JobFind) is negatively associated as expected, but unemployment history is not statistically significant as might be expected (Clark et al. 2008). In Germany being out of the labor force is positively associated with SWB for each category when compared with working (“Other” work status is considered in the labor force and positively related but only at ten percent). Job tenure is negatively associated with SWB, but the positive indirect effects of tenure are probably controlled by the other variables especially income.

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9 In one of the earlier micro happiness studies, their highest R-squared was less than 0.09 (between person) using U.S. GSS data (Blanchflower and Oswald 2004). Additional recent studies using the GSS do not report an R-squared (Stevenson and Wolfers 2009; Ifcher and Zarghamee 2014). The World Happiness Report reports among the highest R-squareds I have observed, explaining individual SWB data, ranging from 0.09 to 0.28 (not within person) (Layard, Clark, and Senik 2012).
Being in school is positively related to SWB when compared with an elementary or inadequate level of education. Having a child has a positive effect that persists after the child ages beyond four years. This result is somewhat surprising as parents are often less happy (Stanca 2012).

**IV. Main Results**

Happier people are less likely to be unemployed, during the Great Recession in the United States, and in Germany. Before looking at the statistical analysis, Figure 3 presents the setting and relationship in the U.S. It shows the proportion unemployed (of the total sample) by reported happiness in the previous period. The macro-economy caused much of the unemployment, but individual characteristics were important. The top line clearly shows that throughout the period 2008-2014 much of the increase in unemployment occurred within the group of people who were “not very happy” last period. Those reporting “very happy” last period were unemployed at lower rates throughout the period.

**A. Subjective Well-Being Predicts the Likelihood Of Unemployment**

Lagged residual SWB is negatively associated with unemployed status. Tables 3 and 4 present the main results. In the U.S. a one standard deviation increase in lagged residual SWB is associated with a decline of more than one-percentage point in the likelihood of being unemployed. In Germany a one standard deviation increase is associated with a decline of approximately 0.3 percentage points. The relationship is understandably
smaller in Germany because the U.S. sample is limited to a period of large
unemployment shifts and the labor market policy differs between countries.

Tables 3 and 4 are organized as follows. Column 1 in each table presents the
fixed-effects regression results, while columns 2 and 3 show the results from DOLS
regressions. Remember that SWB was standardized in each country (before estimating
the residuals), and the dependent variable is binary. Consequently the coefficients on
residual SWB reflect changes in the probability of becoming unemployed with
approximately one standard deviation change in lagged residual SWB.

The SWB-unemployment relationship is statistically significant in each
specification. SWB predicts the likelihood of being unemployed net of the effects of
unobserved-fixed characteristics. The relationship is significant even with controls for the
macro-economy, which was especially important in the U.S. during the Great Recession.
Each column includes year-by-region effects. Lagged-individual industry and occupation
controls are also added to the dynamic specifications in columns 2 and 3.\textsuperscript{10} SWB remains
a statistically significant and relevant predictor of future unemployment when also
accounting for job satisfaction and expectations. Column 2 shows the results when they
were added.\textsuperscript{11} In general, the size of the SWB-unemployment relation does not change
much across specifications. In the U.S. it ranges from 0.010 to 0.017. In Germany the
range is even tighter from 0.003 to 0.004. The true estimate likely falls in between.

\textsuperscript{10} Industry and occupation categories are conditional on employment and thus could not be included
without the main effect of employment, the inclusion of which would cause Nickell bias.
\textsuperscript{11} Conditional on employment status, they could not be included in the fixed-effects analysis.
Fixed-effects estimates can be thought of as a lower bound, while the DOLS estimates set the upper bound.  

Unemployment is persistent (columns 2 and 3). In the U.S. someone who is currently unemployed is approximately 15-percentage points more likely to be unemployed in the following period than someone who is full-time employed. In Germany the relation is even larger at more than 30-percentage points depending on the inclusion of expectations. Job expectations and satisfaction are not significant in the U.S., but they are in Germany. Thinking it will be more difficult to find a comparable job (JobFind) is statistically significant and positively related to the likelihood of being unemployed in Germany, and knowing it will be difficult to find a job accounts for part of unemployment’s persistence (shown by the decline in the lagged unemployment relation from 0.39 to 0.30). Those who are more satisfied with their jobs (High Job Sat.) are also less likely to be unemployed in Germany during the next period.

The lagged-income – unemployment relation is also persistent in the DOLS results. Higher income is negatively associated with the likelihood of being unemployed; however, the results reverse in the U.S. fixed-effects regressions. It is not surprising that results depend on the specification. The fixed-effects results show the effects of receiving more income over time, as compared to the DOLS results that show the associations with

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12 If the true data generating process is dynamic, but fixed effects are used, then the estimates of a positive treatment effect will tend to be too big. If on the other hand, fixed effects is the correct specification, but DOLS is used, then the “estimates of a positive treatment effect will tend to be too small. You can therefore think of fixed effects and lagged dependent variables as bounding the causal effect you are after. (Angrist and Pischke 2009, 184)”

13 Expectations and satisfaction may be considered endogenous and the relationship should be thought of as an association only.
having higher income than someone else.\textsuperscript{14} Self-reported good health is negatively associated with unemployment, in both countries, though less so in the United States.

There are more statistically significant relationships in Germany (Table 4) largely because there are more people and periods for each individual. Tenure is negatively associated with unemployment. Someone who has been unemployed longer is more likely to unemployed again (Unempl. Hist.). People in school, temporarily not working, and belonging to the employment status “other” are also more likely to become unemployed, but the relationship reverses once expectations are included. It seems that the majority of people in those categories do not expect to find a suitable position, but excluding their expectations, they are actually less likely to become unemployed. Non-working people are presumably likely to stay nonworking and therefore avoid unemployment.

**Robustness Tests:**—The results persist when using a logit model or while controlling for social networks. A two-stage dynamic panel method is also introduced, but its full discussion is left for Appendix D. The first test replicated the main analysis using a conditional logit model to match the fixed-effects model and a logit model with lagged unemployment for the DOLS models. The results match the significance and direction in each model and country. The tables have been omitted for brevity but are available upon request. The non-linear logit model was warranted because the probability of being unemployed generally falls below ten percent, which limits the applicability of linear probability models (Source). The main analysis used OLS with fixed effects and dynamic

\textsuperscript{14} People adapt to changes in income and compare it with their peers (Dolan, Peasgood, and White 2008).(Clark et al. 2008)
OLS, because fixed effects cannot be run using probit and conditional logit eliminates a large number of observations.

The second test also replicates the main analysis but this time the analysis includes social network variables in both the first and second stages. Including social networks did not generally have a large impact on the SWB–unemployment relation. In the U.S., the magnitude was decreased by 0.1 percentage-points, but the relations are still statistically significant. In Germany, the DOLS results remain the same, but not fixed-effects. The fixed-effects relation is reduced in size and is no longer significant. This result means that social networks are part of what explains SWB’s effects on unemployment in Germany. Individuals who attend more activities have higher SWB and larger social networks, both of which could reduce unemployment. Social networks are in theory important omitted variables, but the observations were often missing in the U.S. and in Germany, the relevant questions were asked only intermittently.

In the U.S. social networks are measured using the frequency at which the participant met with friends, relatives, or visited with people in the community or at a bar. In Germany, networks are similarly measured, but there are additional categories, including: volunteering, religious or sports participation, and attending cultural and other entertainment events. In the first stage, attending an event once a month is generally associated with higher SWB, and in the second stage meeting with friends is associated with lower future unemployment (U.S.). In Germany, participating in sports or attending the cinema or concerts is also negatively associated with future unemployment.

In the U.S., a two-stage dynamic panel (2SDP) approach was also conducted. The results differ from the main analysis - lagged SWB is negatively associated with
unemployment for men only$^{15}$ and the significance level is reduced to ten percent. However, it is unclear how to interpret the results. The 2SDP approach could be superior because it accounts for both lagged unemployment as well as fixed effects, but it also relies on certain assumptions that are not always testable. One of which was violated in Germany, hence Germany’s exclusion from this analysis. For the same reason generalized methods of moments approaches like Arellano and Bond (1991) were not used.

The 2SDP method and results are discussed in Appendix D. Given the insignificant relation for women, readers may want to condition the results from the two-stage residual approach. It is reassuring, however, that the estimates from the two-stage residual approach for women alone were similar to the two-stage residual estimates for men, and thus the pooled sample (available upon request).

**V. Mechanisms – Character Skills in Germany**

Character skills are likely to be one of the mechanisms through which SWB affects future labor market outcomes, because character skills are significant determinants of residual SWB and they have been shown to affect labor market outcomes (discussed in Section VI). ‘Character skills’ is a broad term used to describe “soft skills, personality traits, non-cognitive skills, non-cognitive abilities, character, and socio-emotional skills (Heckman and Kautz 2013, 10).” They are usually measured using personality traits, especially the Big-Five personality measures: Openness to Experience, Conscientiousness,

$^{15}$ Consistent with Krause (2013).
Extraversion, Agreeableness, and Neuroticism.\textsuperscript{16} Other traits include optimism, locus of control, and reciprocity.

While personality traits are often thought to be relatively fixed over time, recent literature has shown that is not the case. Indeed one of the studies that is responsible for the former view does not say personality traits are unchangeable (Costa and McCrae 1994, 22). Among their conclusions they say, “People surely grow and change, but they do so on the foundation of enduring dispositions (Costa and McCrae 1994, 36).” Recent research suggests dispositions change too, at least as measured using the Big-Five personality traits, which were shown to change throughout adulthood. “The Big Five traits are complex phenomena subject to a variety of developmental influences (Srivastava et al. 2003, 1041).” Furthermore, (Heckman and Kautz 2013) summarize the evidence for lasting benefits of character skills interventions, both in early childhood and workplace based. “[T]he answer to the question of whether the change in personality is possible must be a definite yes. (Borghans et al. 2008, 1020)”

A. Support for Character Skills as a Mechanism

The literature offers initial support for character skills as a mechanism through which SWB affects labor market outcomes. For example, later life wages can be explained by “higher degrees of optimism and extraversion and less neuroticism (De Neve and Oswald 2012, 19957).” Likewise, (Mohanty 2009a) attributes optimism and positive attitude as channels. Krause (2013) uses “the concept of locus of control and the personality traits of neuroticism and extraversion” to explain happiness’ effect on reemployment. Roberts,

\textsuperscript{16} The Big-Five measures have become relatively well accepted, “[t]here are reliable ways to measure them, and there are proven ways to enhance them and to evaluate efforts to foster them. (Heckman and Kautz 2013, 5)” Theoretical foundations for the Big-Five measures (or the five-factor model) comes from McCrae and Costa (1996)."
Caspi, and Moffitt (2003) also describes personality measures similar to neuroticism and social closeness as the most important traits predicting work outcomes.

The result that character skills are interrelated with SWB is supported empirically. They are both determinants and outcomes (Roberts, Caspi, and Moffitt 2003; Mohanty 2009b; Specht, Egloff, and Schmukle 2012; and Soto 2015). One study states, “that personality traits and well-being aspects reciprocally influence each other over time. (Soto 2015, 45).” A similar statement is also found in Roberts et al. (2003, 590). The relationship between SWB and the Big-Five personality traits is further supported using the GSOEP data. Specht, Egloff, and Schmukle (2012) shows that changes in the Big-Five affect changes in life satisfaction, and also that the relationship holds in reverse - changes in life satisfaction affect the Big-Five.

B. SWB Residuals are Explained by Personality Traits

Residual SWB is partially explained by the Big-Five personality traits, optimism, reciprocity, and external locus of control. The results support the explanations that one of the proposed channels through which SWB affects labor market outcomes was increased extraversion and less neuroticism (De Neve and Oswald, 2012; Krause, 2013). Indeed in the present analysis, increasing extraversion or reducing neuroticism would increase an individual’s residual SWB, which would in turn reduces their likelihood of being unemployed.

Table 5 presents the fixed-effects results, which show changes in an individual’s personality explain corresponding changes in their residual SWB. Variable definitions are included in Appendix B. The column tests different variables because they are not all
available in the same years. The Big-Five results are consistent with expectations and past literature (Soto 2015). Neuroticism (or emotional instability) is negatively related with SWB residuals. The other Big-Five personality traits are positively and significantly related, excluding agreeableness. While optimism is not included among the Big-Five, it also shows the expected, highly significant and positive relationship with SWB.

Table 5, column 2, shows the results using reciprocity and locus of control. The results may again be expected. Reciprocity is broken into positive reciprocity, when a person wants to repay good deeds, and negative, when someone desires to get even following negative events. It was not clear beforehand what direction reciprocity would have with SWB, but it is not surprising that positive reciprocity is positively related to SWB, while negative has the opposite direction. Locus of control also has two dimensions that are treated separately. Greater external locus of control means the person believes outcomes are controlled more by more external factors. It is negatively related to residual SWB as expected. Internal locus of control relates more to personal control. It has been omitted because internal consistency was low (Heineck and Anger 2010).

VI. Determinants of Labor Market Outcomes: SWB or Cognitive Ability

A. SWB or Cognitive Ability

The positive effects of SWB on unemployment were established above, and character skills were offered as a potential mechanism. Separate from SWB, character skills have become the subject of growing research in economics. Formal economic theory is being developed to include character skills but is still in its infancy (Borghans et al. 2008). Intuitively from human capital theory, labor market outcomes depend on character skills

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17 To my knowledge there is little SWB research in economics that discusses reciprocity.
because personality contributes to individuals’ productive traits. Indeed performance and job sorting are partially explained by varying personality traits. For example, “[e]xtroversion was positively linked to job performance in management and sales occupations, (Mueller and Plug 2006, 6).”

Empirically, character skills predict a variety of outcomes even when traditional human capital measures, including IQ, have been controlled (Heckman and Kautz 2013, 4). Although economic theories of wage determination, for example, have traditionally focused on cognitive ability, “For many outcomes, the predictive power of character skills rivals that of measures of cognitive ability (Heckman and Kautz 2013, 23).” Another study concludes that, “…the effects of psychological capital variables in predicting wages are even stronger than the effects of traditional human capital variables (Mohanty 2009a, 357).”

Like character skills, SWB is comparable to cognitive ability for predicting wages. This result was not obvious based on the literature because few studies have compared cognitive ability with SWB to predict labor outcomes. De Neve et al. (2012) includes IQ, self esteem, and two different measures of SWB in their analyses to predict log income several years later. In general they found SWB was a more robust predictor than IQ. However, their purpose was not to compare SWB with cognitive ability, and the results could vary using different specifications. For example, they control for college, but doing so greatly mediates the effects of cognitive ability and SWB. A better test of the total effects would exclude mediating factors.

To obtain the unmediated relationships, regressions of the natural log of real wages were run separately on cognitive ability and residual life satisfaction, including
only strictly exogenous controls. Cognitive ability was measured using two tests with each representing different aspects of intelligence. The word fluency test measures crystalized intelligence, which changes as the individual attains more knowledge through experience or education. It is also affected by fluid intelligence, which is related to the speed of cognition and measured in this case using the symbol correspondence test. Further variable and test details are included in Appendix B.

Table 6 presents the results. Residual life satisfaction has more explanatory power than cognitive ability as measured by R-squareds and Akaike information criterion. Residual life satisfaction is statistically significant in each specification, except the fixed-effects, while the symbol test (fluid intelligence) is statistically significant in only the two OLS specifications and only at ten percent.\(^\text{18}\) Heckman’s two-step correction procedure was used to correct for sample selection (Heckman 1979) – wages are only observable for employed people. For this reason the inverse Mills ratio was included.\(^\text{19}\) Standard errors were bootstrapped to account to correct the standard errors from the two-step procedure.

**B. Implications for Future Research**

The results suggest traditional models of labor market performance should be expanded. Both character skills and SWB are important determinants of labor market outcomes and labor market equations should be adjusted accordingly. “Focusing on one dimension of

\(^{18}\) Results from the corresponding unemployment regressions are similar, but unreported for brevity. The income regressions were presented instead because the differences between the effects of cognitive ability and SWB are somewhat muted when determining unemployment. Changes in unemployment status occur at a low frequency and the power to identify effects is limited compared income.

\(^{19}\) Inclusion of the inverse Mills ratio in the second stage regression accounts for selection into employment. The ratio is obtained from parameter estimates from a first stage probit regression of employment on a host of socioeconomic variables including: year, state, age, month of interview, gender, cognitive ability, and residual life satisfaction. The following variables are also included in the first stage but excluded from the second: self-reported health, education, potential experience and its square, marital status, parent dummy, and presence of a child less than five.
human skills to the exclusion of other dimensions misses fundamental aspects of human performance and development. (Heckman and Kautz, 2013, 5).”

The literature supporting character skills as determinants of performance is greater than for SWB, but when measures of character skills are absent, SWB may suffice as a proxy. Obtaining personality measures in general surveys can be time-prohibitive, and many surveys do not include them. In such an instance, Guven (2011) suggests SWB residuals as a proxy. Guven (2011) shows SWB residuals are the strongest predictors of optimism and suggests this finding as an “invaluable opportunity” to researchers. “… [O]ne can easily calculate residual happiness in these datasets and can use them as a variable that is highly correlated with optimism (Guven 2011, 180).” Guven (2011)’s observation is supported here. Table 7 shows correlations among residual life satisfaction and each of the personality traits. Residual life satisfaction is closely related to optimism (at 37 percent) and more so than any of the other traits. Neuroticism is another important trait that is nearly equally related to optimism and residual life satisfaction (at approximately 25 percent).

While residual SWB may serve as a reasonable proxy for character skills, it is important to remember they are distinct. Self-esteem serves as an example. It is another trait that may be considered a character skill, and conceptually, is closely enough related to happiness to warrant direct comparison. In a theoretical and empirical investigation of the similarities between happiness and self-esteem the authors determine that while they are strongly correlated, they represent separate psychological constructs (Lyubomirsky, Tkach, and DiMatteo 2006). Also remember that the effects of SWB are not mediated
solely by character skills, SWB affects additional channels too (e.g. positive affect’s effect on productivity, Oswald et al. 2015).

VII. Conclusions

The likelihood of unemployment can be predicted using measures of subjective well-being (SWB), and the association is sizable. SWB is a meaningful measure, not only as an outcome variable, but also as a determinant of labor market outcomes. A one standard deviation improvement in lagged SWB residuals is associated with more than a one-percentage point decrease in the likelihood of being unemployed in the United States and 0.3-percentage points in Germany. Policy-makers should encourage educational and occupation structures that emphasize and support character skill development. Doing so would increase economic performance and well-being.

To my knowledge this is the only paper that uses SWB to predict the likelihood of unemployment in the United States during the Great Recession, with supporting results in Germany, and to use certain empirical techniques. Most of the literature uses dynamic regressions, some use residuals, but there is limited use of fixed effects. The results are based on longitudinal data from the General Social Survey in the U.S. during the period 2006-2014, and the German Socio-Economic Panel (1996-2013).

This study identifies the direct effects of SWB net of interrelationships with traditional human capital variables. SWB both determines and is caused by numerous variables including: income, health, education, and social capital. These channels are purged when using SWB residuals. Residuals are generated from a first stage regression of SWB on a host of variables including traditional labor market determinants, macro
effects, and fixed effects. The resulting SWB residuals are then used in both dynamic and fixed-effects regressions of unemployment. While the results may not be causal, it is difficult to conceive of any omitted channels or alternative sources of bias. Among the channels controlled include individuals’ job satisfaction, expectations, unemployment history, family income, industry and occupational category, social network, and self-reported health.

Character skills are among the remaining channels operating through residual SWB. SWB is interrelated with character skills, and character skills predict labor market outcomes, both in theory and empirically. The interrelationship between character skills, measured especially with the Big-Five personality traits, was demonstrated in a fixed-effects regression. Improvements in an individual’s character skills, such as reduced neuroticism, are associated with improvements in their residual SWB.

Future research should include measures such as residual SWB to capture important dimensions of labor market productivity. The results show that residual SWB and cognitive abilities are of comparable importance for predicting wages. Because character skills have limited availability, their advocates may want to consider SWB as a proxy or consider the effects of SWB directly.

There are some qualifications to the results. First, the results may not be significant for women. An additional method (two-stage dynamic panel) was used with the United States data that showed comparable results for men, but an insignificant lagged SWB-unemployment relation for women. An insignificant relationship for women is consistent with Krause (2013) and could be expected because women were less likely to become unemployed and reported a smaller variation in SWB during the period.
Second, in Germany, SWB’s effects are partially explained by social networks. Third, the effects of SWB on the likelihood of being unemployed may differ for entry into and exit from unemployment. Past evidence is unclear if SWB’s effects are positively related to reemployment. However, past studies and the results presented here show higher SWB is associated with a lower likelihood of being unemployed (whether due to persistence or entry into unemployment).
References


Stevenson, Betsey, and Justin Wolfers. 2008. “Economic Growth and Subjective Well-


Figure 3. Proportion Unemployed (of Total Population) by Reported Level of Happiness in the Previous Period. United States 2006 – 2014.

Unempl. (Not Very Happy, Last Period)

Unempl. (Pretty Happy)

Unempl. (Very Happy)

2006 is omitted because happiness in 2004 was unobserved.
Author Calculations.
Source: General Social Survey Panel
Table 1 First Stage Happiness Fixed-Effects Regression. 
Dependent Variable Happiness (ST) U.S. 2006-2014

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployed</td>
<td>-0.366***</td>
<td>[-4.928]</td>
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<tr>
<td>Working Part Time</td>
<td>-0.059</td>
<td>[-1.366]</td>
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<td>Out of Workforce</td>
<td>-0.093</td>
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<tr>
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<tr>
<td>Job V. Sat.</td>
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<td>Parent</td>
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<td>Nev_Married</td>
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<td>Ages 25-34</td>
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</tr>
<tr>
<td>Ages 35-44</td>
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<td>[1.753]</td>
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<td>Ages 45-54</td>
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<td>[1.240]</td>
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<tr>
<td>Ages 55-64</td>
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<td>[-0.034]</td>
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<tr>
<td>Ages 65-74</td>
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<tr>
<td>Ages 75+</td>
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<tr>
<td>Constant</td>
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<td>[1.153]</td>
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</tbody>
</table>

Notes: 2,542 people observed three times. Additional controls: month, year by division, and industry and occupation categories. Dummies for missing income, health, marital status, and job satisfaction/expectations are also included. Reference groups are Working Full Time, Finished High School, Ages 18-24, and Married. 
t-statistics in brackets. Standard errors clustered by individual. 
Significance: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001
Table 2 First Stage Life Satisfaction Fixed Effects Regressions.  
Dependent Variable Life Satisfaction (ST) Germany 1996-2013  

(1)

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
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<tr>
<td>Unemployed</td>
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<td>Retired</td>
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<td>[10.407]</td>
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<tr>
<td>NonWorking</td>
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<td>Temp. NonWork</td>
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<tr>
<td>Other Status</td>
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<td>Tenure (yrs)</td>
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<td>High Job Sat.</td>
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<td>Separated</td>
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<td>Parent</td>
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<td>Ages 25-34</td>
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<td>Ages 35-44</td>
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<td>Ages 65-74</td>
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<td>Ages 75+</td>
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<td>R Sq. Between</td>
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</table>

Notes: Additional controls: month, year by state, and industry and occupation categories. Dummies for missing income, health, marital status, and job satisfaction/expectations are also included. Reference groups are Working, Elementary and Inadequate, Ages 18-24, and Married.  
t-statistics in brackets. Standard errors clustered by individual.  
Significance: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001
Table 3. U.S. Unemployment and Happiness (Resid) Regressions.
Dependent Variable: Unemployed.
All independent variables are lagged one period (two years).\(^a\) Period 2006-2014.

<table>
<thead>
<tr>
<th></th>
<th>(1) FE</th>
<th>(2) DOLS</th>
<th>(3) DOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happy Resid</td>
<td>-0.017**</td>
<td>-0.010**</td>
<td>-0.010**</td>
</tr>
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<td></td>
<td>[-3.238]</td>
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<td>[-2.640]</td>
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<td>ln(Eqv. Inc.)</td>
<td>0.020*</td>
<td>-0.009+</td>
<td>-0.009+</td>
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<td>Health Good</td>
<td>-0.044*</td>
<td>-0.022+</td>
<td>-0.020</td>
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<td>Unemployed</td>
<td>0.152**</td>
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<tr>
<td></td>
<td>[3.100]</td>
<td>[2.711]</td>
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<tr>
<td>Working Part Time</td>
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<td>0.015</td>
<td></td>
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<tr>
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<td>[1.578]</td>
<td>[1.594]</td>
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<td>Out of Workforce</td>
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<td>[1.140]</td>
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<td>[-1.954]</td>
<td></td>
</tr>
<tr>
<td>Unemp'ed Last 10yrs</td>
<td>0.012</td>
<td>0.019+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[1.240]</td>
<td>[1.759]</td>
<td></td>
</tr>
<tr>
<td>JobLose Likely</td>
<td>-0.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[-0.595]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>JobFind Not Easy</td>
<td>0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.161]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job V. Sat.</td>
<td>-0.007</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[-1.033]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.058</td>
<td>0.143*</td>
<td>0.159*</td>
</tr>
<tr>
<td></td>
<td>[-0.283]</td>
<td>[1.988]</td>
<td>[2.200]</td>
</tr>
<tr>
<td>Observations</td>
<td>5084</td>
<td>5084</td>
<td>5084</td>
</tr>
<tr>
<td>Adj. R Sq.</td>
<td>0.033</td>
<td>0.055</td>
<td>0.056</td>
</tr>
</tbody>
</table>

\(a\) Year, year by division, age, potential experience and its square, and month of interview not lagged.

Notes: 2,542 people observed two times. Additional Controls: (All columns) Year by census division, age, month of interview, potential experience and its square, marital status, parent dummy, and presence of a child less than six; (3 & 4) union or government job, and industry and occupation categories. Dummies for missing observations associated with income, health, and job satisfaction /expectations were also included when those variables were included.

\(t\) statistics in brackets using bootstrapped standard errors.
Significance: \(\pm p<0.10 \ * p<0.05 \ ** p<0.01 \ *** p<0.001\)
Table 4. German Unemployment and Life Satisfaction (Resid) Regressions.
Dependent Variable: Unemployed.
All independent variables are lagged one year.\textsuperscript{a} Period 1996-2013.

\begin{tabular}{lccc}
& (1) & (2) & (3) \\
\hline
Resid. Life Sat. & -0.003*** & -0.004*** & -0.003*** \\
ln(Eqv. Inc.) & -0.004+ & -0.026*** & -0.024*** \\
Health Good & -0.007*** & -0.007*** & -0.005*** \\
Unemployed & 0.388*** & 0.300*** & \\
& [73.066] & [35.844] & \\
Retired & 0.002 & -0.049*** & \\
& [0.532] & [-6.525] & \\
In School & 0.020*** & -0.052*** & \\
NonWorking & -0.013*** & -0.069*** & \\
Temp. NonWork & 0.027*** & -0.039*** & \\
Other Status & 0.016*** & -0.013** & \\
Tenure (yrs) & -0.001*** & -0.001*** & \\
Unmpl. Hist & 0.017*** & 0.016*** & \\
JobFind & 0.073*** & \\
& [22.128] & \\
High Job Sat. & 0.018*** & 0.018*** & \\
& [22.128] & \\
Constant & 0.287*** & 0.205*** & 0.218*** \\
Observations & 233574 & 233574 & 233574 \\
# of People & 35078 & 35078 & 35078 \\
Adj. R Sq. & 0.014 & 0.274 & 0.278 \\
\hline
\end{tabular}

\textsuperscript{a} Year, year by state, age, potential experience and its square, and month of interview not lagged.

Notes: 36,463 people. Additional Controls: (All columns) Year by state, age, month of interview, education, potential experience and its square, marital status, parent dummy, and presence of a child less than five; (2 & 3) industry and occupation categories. Dummies for missing observations associated with income, health, and job satisfaction/expectations were also included when those variables were included.

t statistics in brackets using clustered standard errors. Bootstrapped results not ready for this draft, but the standard errors did not change much in past iterations. Significance: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001
Table 5. Life Satisfaction and Personality Traits  
Fixed-Effects Regressions; Dependent Variable: Life Satisfaction Residuals  
Germany: Various Years \(^a\)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreeable</td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[1.185]</td>
<td></td>
</tr>
<tr>
<td>Conscientious</td>
<td>0.028*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[2.529]</td>
<td></td>
</tr>
<tr>
<td>Neuroticism</td>
<td>-0.089***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[-10.276]</td>
<td></td>
</tr>
<tr>
<td>Extraversion</td>
<td>0.034***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[3.403]</td>
<td></td>
</tr>
<tr>
<td>Openness</td>
<td>0.024**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[2.630]</td>
<td></td>
</tr>
<tr>
<td>Optimism</td>
<td>0.177***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[14.813]</td>
<td></td>
</tr>
<tr>
<td>Reciprocity (pos.)</td>
<td>0.087***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[6.734]</td>
<td></td>
</tr>
<tr>
<td>Reciprocity (neg.)</td>
<td>-0.018+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[-1.940]</td>
<td></td>
</tr>
<tr>
<td>Ext. Locus of Control</td>
<td>-0.102***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[-7.393]</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.481**</td>
<td>0.171</td>
</tr>
<tr>
<td></td>
<td>[-2.859]</td>
<td>[1.026]</td>
</tr>
<tr>
<td>Observations</td>
<td>22452</td>
<td>14168</td>
</tr>
<tr>
<td>Adj. R Sq.</td>
<td>0.049</td>
<td>0.022</td>
</tr>
</tbody>
</table>

\(^a\) Column 1: 2005 and 2009; and (2) 2005 and 2010.  
Notes: Additional Controls: Year, state, age, and month of interview.  
t statistics in brackets using clustered standard errors.  
Significance: + \(p<0.10\) * \(p<0.05\) ** \(p<0.01\) *** \(p<0.001\)
Table 6. Importance of Residual Life Satisaction and Cognitive Ability for Income. Germany 2006 and 2012
Dependent Variable: Natural Log of Wage Income.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
<td>FE</td>
<td>DOLS</td>
</tr>
<tr>
<td>Symbol Test</td>
<td>0.008*</td>
<td>0.008*</td>
<td>0.004</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[2.519]</td>
<td>[2.319]</td>
<td>[1.224]</td>
<td>[1.305]</td>
<td></td>
</tr>
<tr>
<td>Word Fluency Test</td>
<td>0.005</td>
<td>0.005+</td>
<td>-0.003</td>
<td>0.006*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[1.588]</td>
<td>[1.789]</td>
<td>[-0.921]</td>
<td>[2.204]</td>
<td></td>
</tr>
<tr>
<td>Resid. Life Sat.</td>
<td>0.212***</td>
<td>0.210***</td>
<td>-0.021</td>
<td>0.154***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[3.316]</td>
<td>[3.760]</td>
<td>[-0.438]</td>
<td>[3.420]</td>
<td></td>
</tr>
<tr>
<td>Lag Ln(Wage Earnings)</td>
<td></td>
<td></td>
<td></td>
<td>0.267***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[9.965]</td>
<td></td>
</tr>
<tr>
<td>Mills Ratio</td>
<td>-1.530***</td>
<td>-1.262***</td>
<td>-1.109***</td>
<td>-0.807**</td>
<td>-0.588*</td>
</tr>
<tr>
<td>Constant</td>
<td>8.991***</td>
<td>8.806***</td>
<td>8.341***</td>
<td>10.845***</td>
<td>5.965***</td>
</tr>
<tr>
<td></td>
<td>[22.936]</td>
<td>[16.408]</td>
<td>[17.324]</td>
<td>[15.712]</td>
<td>[14.829]</td>
</tr>
<tr>
<td>Observations</td>
<td>1317</td>
<td>1317</td>
<td>1317</td>
<td>1317</td>
<td>1317</td>
</tr>
<tr>
<td>R-sq</td>
<td>0.327</td>
<td>0.337</td>
<td>0.344</td>
<td>0.116</td>
<td>0.558</td>
</tr>
<tr>
<td>Adj. R Sq.</td>
<td>0.303</td>
<td>0.314</td>
<td>0.320</td>
<td>0.088</td>
<td>0.541</td>
</tr>
<tr>
<td>Akaike Info. Crit.</td>
<td>3643.136</td>
<td>3620.785</td>
<td>3611.597</td>
<td>1057.417</td>
<td>3094.216</td>
</tr>
</tbody>
</table>

Notes: Additional Controls: Male, year, state, age, and month of interview. 
$ t $ statistics in brackets using bootstrapped standard errors. 
Significance: + $ p<0.10 $ * $ p<0.05 ** $ $ p<0.01 *** $ $ p<0.001 $
Table 7. Correlations among Residual Life Satisfaction and Personality. Various years.

<table>
<thead>
<tr>
<th></th>
<th>Resid. Life Sat.</th>
<th>Optimism</th>
<th>Reciprocity (pos.)</th>
<th>Reciprocity (neg.)</th>
<th>Ext. Locus of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resid. Life Sat.</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimism</td>
<td>0.37</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reciprocity (pos.)</td>
<td>0.09</td>
<td>0.03</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reciprocity (neg.)</td>
<td>-0.08</td>
<td>-0.10</td>
<td>0.08</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Ext. Locus of Control</td>
<td>-0.25</td>
<td>-0.20</td>
<td>0.00</td>
<td>0.23</td>
<td>1.00</td>
</tr>
<tr>
<td>Agreeable</td>
<td>0.13</td>
<td>0.11</td>
<td>0.19</td>
<td>-0.27</td>
<td>-0.07</td>
</tr>
<tr>
<td>Conscientious</td>
<td>0.10</td>
<td>0.05</td>
<td>0.26</td>
<td>-0.07</td>
<td>-0.08</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>-0.24</td>
<td>-0.27</td>
<td>-0.03</td>
<td>0.09</td>
<td>0.21</td>
</tr>
<tr>
<td>Extraversion</td>
<td>0.15</td>
<td>0.15</td>
<td>0.16</td>
<td>-0.02</td>
<td>-0.08</td>
</tr>
<tr>
<td>Openness</td>
<td>0.13</td>
<td>0.14</td>
<td>0.21</td>
<td>-0.03</td>
<td>0.01</td>
</tr>
</tbody>
</table>

*Notes*: Observations are for the years: Big-Five and optimism, 2005 and 2009; Reciprocity and External Locus of Control, 2005 and 2010. All correlations in bold are significant at one percent. Correlation between Extraversion and Reciprocity (neg.) is significant at five percent; External Locus of Control and Reciprocity (pos) is not significant, and External Locus of Control and Openness is not significant.
Appendix A. Why Measure SWB and Responses to Subjective Well-Being Measure Limitations

**Why Measure SWB:**—SWB measures account for individuals’ feelings about their lives as a whole, including both economic and non-economic factors that are otherwise difficult to measure. They are easy to obtain, broadly available, and provide information complementary to more objective indicators of well-being (Fleurbaey 2009) and (Stiglitz, Sen, and Fitoussi 2009). They capture important dimensions of labor-market performance that are not captured by traditional human capital measures, and at the macro level, SWB measures are necessary for establishing correct policy goals. For example, GDP per capita has become the default measure of well-being and policy makers target economic growth because they implicitly (or explicitly) believe that growth improves well-being. Yet, GDP per capita growth rates are not positively correlated with changes in SWB in the long-run (Easterlin 1974). While this finding has been contested (e.g. Stevenson and Wolfers 2008), recent work suggests the result still holds (Easterlin et al. 2010; Easterlin 2016), or at least the relationship is not of economic significance (Beja 2014).

There other examples that challenge the singular focus on ‘objective’ measures. Lucas (1987) argued that business cycles are not very important when considering their effects on aggregate consumption. However, if one uses SWB to evaluate the effects, macroeconomic volatility was found to have ‘moderate but important’ effects on well-being (Wolfers 2003). Unemployment serves as another example. The non-pecuniary effects of being unemployed are larger than the effects from the loss of income alone (Winkelmann and Winkelmann 1998). In addition, while there has been an improvement in a host of objective characteristics for women in the U.S., they have reported declining happiness since the 1970s (Stevenson and Wolfers 2009; O’Connor 2017).

The above examples show that subjective as well as objective measures are necessary to understand well-being. It is clear that if the goal of economic policy is to improve well-being, then we need a more comprehensive understanding, and corresponding goals should be developed. To that end there is now an ongoing debate concerning government’s role in maximizing SWB (Frey and Stutzer 2010; Frey and Stutzer 2012; NEF 2012; Booth 2012; Frey and Gallus 2013; Easterlin 2013).

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20 And the author purposely contrasts the two results to highlight SWB benefits.
Challenges to Subjective Well-Being Measures:—Skeptics raise challenges about the reported nature of the data. It was briefly discussed that SWB measures are reliable and valid, but do they mean the same thing for different people? To address this question, it is first important to decide its relevance. Conceptually, the components of SWB need not be the same across people, because we are not interested in some latent objective variable. We want to know how people feel about their lives. Are they able to meet their own aspirations, however they chose to conceive them. This aspect is one of the advantages of SWB. SWB measures are absent of paternalistically defined objectives.

One of the challenges raised by skeptics of SWB as an outcome variable is that the scales are ordinal, especially in the U.S. GSS context. However the results do not vary much when treating the scales as ordinal or cardinal (Ferrer-i-Carbonell and Frijters 2004). If skepticism persists, then ordered discrete choice specifications are also available when using SWB as an outcome variable. For example, ordered probit models are frequently used (e.g. Stevenson and Wolfers 2009; Ifcher and Zarghamee 2014). And when using SWB as a predictor, it can be treated as a categorical variable.

Unobserved cultural effects can be accounted for when using data with a time dimension. One such effect is related to responses biases. For example, people in Latin America are more likely to exhibit a response pattern that deviates from typical patterns around the world. They report more 10s than 9s when evaluating their life on a 0-10 scale (Brulé and Veenhoven 2016). This phenomenon, referred to as 10-excess, is however relatively stable over time and can be overcome using country fixed effects. Many such cultural effects can be accounted for in this way. Likewise individual fixed-effects analysis focuses on comparisons within-person, not between people.
Appendix B.

U.S. General Social Survey Variables

Health Good
Would you say your own health, in general, is excellent, good, fair, or poor?
Coded 1 if response is “excellent” or “good”, and 0 otherwise.

Industry and Occupation Categories – were coded by the General Social Survey based on the U.S. Census Industry and Occupational codes. For purposes of this study, the occupation categories were compressed to six, and the industry categories were compressed to 17.

JobLose Likely
Thinking about the next 12 months, how likely do you think it is that you will lose your job or be laidoff--very likely, fairly likely, not too likely, or not at all likely?
Coded 1 if respondent reports “very likely”, “fairly likely”, “not too likely”, and 0 if “not at all likely.” “Not at all likely” is approximately 80% of the sample.

JobFind Not Easy
About how easy would it be for you to find a job with another employer with approximately the same income and fringe benefits you now have? Would you say very easy, somewhat easy, or not easy at all?
Coded 1 if respondent reports “not easy at all”, and 0 otherwise.

Job V.Sat.
On the whole, how satisfied are you with the work you do--would you say you are very satisfied, moderately satisfied, a little dissatisfied, or very dissatisfied?
Job VSat. Coded 1 if “very satisfied”, and 0 otherwise.

Ln(Eqv. Inc)
The natural log of total family income, per equivalent household size. Family income is from all sources, before taxes, not conditional on employment, and adjusted for inflation (GSS variable coninc), which is then divided by equivalent household size (GSS household composition and OECD-modified equivalence scale, OECD 2015).

Pot. Exp.
Potential Experience equals: age – years of education – five.

Unemp'ed Last 10yrs
Coded a 1 if unemployed for a least one month in the past ten years, and 0 otherwise.

Note dummies were created for missing values associated with income, health, marital status, and job satisfaction/expectations. If income was missing for example, then Ln(Eqv. Inc) would be set to zero and Inc. Missing would equal one.
**Additional German Socio-Economic Panel Variables**

Tenure (yrs) – “Length of time with Firm”

Unmpl. Hist
Total length of time a person has been unemployed (in years).

JobFind
If you were currently looking for a new job: Is it or would it be easy, difficult or almost impossible to find an appropriate position? Equal to one if response was “Difficult” or “Almost Impossible”, zero if “Easy” or the observation was missing.

High Job Sat.
How satisfied are you today with the following areas of your life? Job
Equal to one if response equal to the median (six) or higher (scale 0-10).

**Personality Traits**

Optimism
When you think about the future, are you – optimistic, more optimistic than pessimistic, more pessimistic than optimisitc, or pessimistic? (scored 1- 4 with 4 representing optimistic).

Questions are answered on 7-point Likert-type scales (1 – “disagree completely” to 7 – “agree completely”), and then averaged within a construct to obtain a single construct score. Variable definitions are from (Heineck and Anger 2010).

<table>
<thead>
<tr>
<th>Big-Five Traits</th>
<th>I see myself as someone who…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Openness to experience</td>
<td>is original, comes up with new ideas</td>
</tr>
<tr>
<td></td>
<td>values artistic experiences</td>
</tr>
<tr>
<td></td>
<td>has an active imagination</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>does a thorough job</td>
</tr>
<tr>
<td></td>
<td>does things effectively and efficiently</td>
</tr>
<tr>
<td></td>
<td>tends to be lazy (reversed)</td>
</tr>
<tr>
<td>Extraversion</td>
<td>is communicative, talkative</td>
</tr>
<tr>
<td></td>
<td>is outgoing, sociable</td>
</tr>
<tr>
<td></td>
<td>is reserved (reversed)</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>is sometimes somewhat rude to others (reversed)</td>
</tr>
<tr>
<td></td>
<td>has a forgiving nature</td>
</tr>
<tr>
<td></td>
<td>is considerate and kind to others</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>worries a lot</td>
</tr>
<tr>
<td></td>
<td>gets nervous easily</td>
</tr>
<tr>
<td></td>
<td>is relaxed, handles stress well (reversed)</td>
</tr>
</tbody>
</table>
**Additional Traits**

**Locus of Control** (External)
1. Compared to other people, I have not achieved what I deserve.
2. What a person achieves in life is above all a question of fate or luck.
3. I frequently have the experience that other people have a controlling influence over my life.
4. The opportunities that I have in life are determined by the social conditions.
5. Inborn abilities are more important than any efforts one can make.
6. I have little control over the things that happen in my life.

**Reciprocity** (Positive)
1. If someone does me a favor, I am prepared to return it.
2. I go out of my way to help somebody who has been kind to me before.
3. I am ready to undergo personal costs to help somebody who helped me before.

**Reciprocity** (Negative)
1. If I suffer a serious wrong, I will take revenge as soon as possible, no matter what the cost.
2. If somebody puts me in a difficult position, I will do the same to him/her.
3. If somebody offends me, I will offend him/her back.

**Cognitive Ability** (description repeated from SOEPpapers: Anger and Schnitzlein, 2016)

- **Symbol Corespondence Test** (fluid intelligence)
  Coded as the correct number of entries in 90 seconds. (GSOEP Var: f99x90r).
  Description: “The symbol correspondence test is conceptually related to the mechanics of cognition or fluid intelligence and encompasses general abilities. It was developed after the symbol digit modalities test (Smith, 1995) and involves asking respondents within 90 seconds to assign with a keyboard as many correct numbers as possible to symbols, which are consecutively displayed on a screen, while the correspondence list is permanently visible to them (Anger and Schnitzlein 2016, 8).”

- **Word Fluency Test** (crystallized intelligence)
  Coded as the total number of animals mentioned in 90 seconds (GSOEP Var: f96t90g).
  Description: “The word fluency test is conceptually related to the pragmatics of cognition or crystallized intelligence. This test involves the fulfillment of specific tasks that improve in accordance with previously acquired knowledge and skills. The word fluency test implemented in the SOEP is based on the animal-naming task (Lindenberger and Baltes, 1995): respondents name as many different animals as possible within 90 seconds. Whereas verbal fluency is based on learning, speed of cognition is related to an individual’s innate abilities (Cattell, 1987) (Anger and Schnitzlein 2016, 9).”
Appendix C. Sample Attrition

The regression estimates are consistent even in the presence of attrition. This conclusion is based on the results from a test discussed below.

**Background and Theory:**—In general, sample attrition is a concern when exploiting the panel dimension of a data set. If people who leave the panel have different characteristics (e.g. more likely to become unemployed), then attrition is considered selective, and the relationship between happiness and unemployment could be biased. This problem could be an issue in the GSS Panel. Only about 64 percent of the sample remains in the third round of each panel. In the GSOEP, a large number of people also attrit. Less than 50 percent of the original 1984 sample remains after 2007 (Kroh 2011). However, that does not mean attrition is selective. To test for selection bias caused by attrition, I used a test suggested by Wooldridge (2010).

Wooldridge (2010) shows that sample selection (e.g. from attrition) is only a problem in a fixed-effects context when selection is related to the idiosyncratic errors. More precisely, in reference to equation (1) \( U_{it} = \gamma'X_{it} + \eta_{i} + \nu_{it} \), let selection be represented by the indicator \( s_{it} \), where \( s_{it} = 1 \) if \( (X_{it}, U_{it}) \) is observed. For selection to not be a problem, \( \nu_{it} \) needs to be mean independent of \( s_{it} \), given \( (X_{i}, \eta_{i}) \) for all possible \( t \). If this condition is met, fixed-effects estimation “on the unbalanced panel is consistent and asymptotically normal. (Wooldridge 2010, 830).”

Although the “assumption [above] may be a reasonable approximation, especially for short panels (Wooldridge 2010, 830),” there is a simple test. Add \( s_{it+1} \) to equation 1, estimate the new equation using fixed effects on the unbalanced panel, and do a t test for the significance of \( s_{it+1} \). Under the null hypotheses, \( \nu_{it} \) is uncorrelated with \( s_{it} \) for all periods, and so selection in the future period should not be significant in the equation at time \( t \). This test is similar to what was originally suggested by Nijman and Verbeek (1992), and the description is paraphrased from Wooldridge (2010, 832).

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21 Sample selection due to attrition in the GSOEP data is not generally a concern. For example, the 2008 *Economic Journal* and 2014 *Economica* papers, which also uses GSOEP data, do not address attrition (Clark et al. 2008; Gielen and van Ours 2014).
**Results:**—The results presented in Appendix Tables A3 and A4 suggest selection is not a problem in the U.S. GSSP or GSOEP contexts. The above condition appears to be met – being present in the sample one period ahead, “Lead Selection” ($s_{t+1}$), is not correlated with being unemployed, conditional on the covariates and fixed effects. The first column includes the full set of variables as suggested by the test above, while column 2 includes only strictly exogenous variables. Excluding the additional variables should strengthen the test because selection might be related to the observable characteristics, and their inclusion controls for these channels. In either case, however, Lead Selection is not related to unemployment.

The analyses differ slightly for each country because the number of periods limit the analysis in the U.S. The U.S. analysis uses concurrent covariates because three periods are not enough to estimate equation (2), including fixed effects, while also including a lead for selection. In Germany, however, there are enough periods and lagged variables were used as specified by equation (2) with the addition of the selection lead. DOLS, equation (3), was likewise estimated to completeness.

Note that the test suggests sample selection is not a problem for the unbalanced panel, yet under a slightly stronger assumption, “it is also valid to use a standard fixed effects analysis on any balanced subset of the unbalanced panel… (Wooldridge 2010, 831).” Given this result and the need for at least three periods (for fixed-effects and lagged variables), the main analysis in the U.S. uses a balanced panel that excludes all attrits. In Germany and unbalanced panel is used including everyone that is observed for at least three consecutive periods.
Appendix D. Dynamic-Panel Methods and Results in the U.S.

The results from the dynamic-panel methods confirm SWB is an important predictor of the likelihood of being unemployed in the U.S. for men, but not for women. The results follow the methods discussion below. In contrast to SWB residuals, the analysis uses predicted values of lagged unemployment and SWB, and is performed in first differences to account for unobserved-fixed characteristics. The analysis is confined to the U.S. because it was not suitable in the German data, which is discussed further below.

A. Dynamic-Panel Methods

Unemployment is assumed to be determined by the same process as in equation 3, with the exception that fixed effects are included and SWB values are used directly, not their residuals. The data generating process is listed below as equation (4).

\[
U_{it} = \rho U_{it-1} + \delta SWB_{it-1} + \beta_0' X_{it}^1 + \beta_1' X_{it-1}^2 + \alpha_i + \epsilon_{it} \quad (4)
\]

As before, \(U_{it}\) is a dummy variable that takes the value of one if person \(i\) is unemployed at time \(t\). Likewise, \(SWB_{it}\) is SWB for person \(i\) at time \(t\). It and characteristics affected by the individual’s choices, included in \(X_{it}^2\), have been lagged one period. \(X_{it}^1\) is a vector of exogenous controls.

Equation (4) has the benefit of including lagged unemployment and fixed effects, but it cannot be directly estimated without a serious source of bias. Nickell Bias (Nickell 1981) arises when including fixed effects in a dynamic panel. Fixed-effects models are typically estimated by subtracting from each variable its mean value over time, and in the case of a dynamic panel, the mean of the lagged dependent variable is correlated with the mean error term. In other words, de-meaning introduces a source of endogeneity.

However, Nickell Bias can be avoided using a simple process. Apply first differences to equation 4 to sweep out the fixed effect, and then use an instrumental variable to predict the lagged change in unemployment (Blundell and Bond 1998). Equation 5 presents the two-stage least squares (2SLS) specification:

\[
\Delta U_{it} = \gamma \Delta \bar{Y}_{it-1} + \beta_0' \Delta X_{it}^1 + \beta_1' \Delta X_{it-1}^2 + \Delta \epsilon_{it} \quad (5)
\]

Where \(\Delta U_{it} = U_{it} - U_{it-1}\) and \(\bar{Y}_{it}\) is a vector of variables that are allowed to be endogenous, including: unemployment, SWB, income, and self-reported health. \(\Delta \bar{Y}_{it-1}\)
are the predicted variables. They were predicted using an instrumental variable approach, using the twice-lagged levels as excluded instruments. One of the necessary assumptions for a valid instrument is that it is excludable in the second stage (i.e. equation 5). In the German data, the twice-lagged values were invalid instruments because they were not excludable. The applicability of generalized methods of moments (e.g. Arellano and Bond 1991) analysis was also tested, and again, the lagged values were not excludable. Consequently, the dynamic-panel analysis was limited to the U.S. The dynamic-panel method and necessary assumptions are discussed further at the end of this section.

B. Two-Stage Dynamic-Panel Results

The 2SDP results are not as strong as the results using SWB residuals, a significant relationship (at ten percent) holds for men only. The results are presented in Table A3. For men, a one standard deviation improvement in predicted happiness is associated with approximately a two percentage-point decline in the likelihood of becoming unemployed, which is comparable with the previous fixed-effects results.\(^{22}\) However, the relationships for the pooled sample and female sample were statistically insignificant. It is reasonable to expect a better identified relationship for men because they were more likely to be unemployed and they showed a greater variation in reported happiness during the sample period. This is also consistent with the results of (Krause 2013).

The 2SDP results differ somewhat for the other variables too, but not in unreasonable ways. Consistent with the previous results using residuals, self-reported health is negative, statistically significant, and sizable across genders.\(^{23}\) However, predicted-lagged income is positive and significant in the pooled sample (at ten percent), consistent with the previous fixed-effects but not the DOLS results. This difference with the DOLS results is not surprising because the 2SPD analysis accounts for fixed effects, thus changing the interpretation of the relationship. As described in Section V, fixed effects are within person over time, whereas the DOLS relations are for comparisons across people at a point in time. Unemployment is now also insignificant when it was

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\(^{22}\) The standard deviation of predicted-lagged happiness is 0.62. The coefficient on predicted-lagged happiness is 0.30, and 0.62 \( \times \) 0.30 = 0.19.

\(^{23}\) In the pooled sample, a one standard deviation improvement in predicted-lagged health is associated with approximately a 2.3 percentage-point decline in the likelihood of becoming unemployed (the standard deviation of predicted-lagged health is approximately 0.11).
previously significant and positively associated. If the assumptions hold, discussed below, then the 2SDP relation is preferred. Given the small number of sample periods, fixed effects should capture a substantial amount of omitted heterogeneity that could not be accounted for using DOLS.

The first stage results are presented in Appendix Table A4. The twice-lagged observations are as expected strongly significant. Column 5 shows the results when regressing the residuals from the 2SLS estimates on the excluded instrumental variables. The excluded instruments are statistically insignificant. Although not conclusive, the results suggest the instrumental variables are indeed excludable from the second stage, and 2SLS is reasonable.

Adding job satisfaction and expectations or industry and occupational categories is not possible unless they were also predicted because they are conditional on employment. However, given the instrumental variable framework, for the lagged-happiness – unemployment relation to be biased, job expectations (for example) would have to affect happiness during the twice-lagged period, and the effect would have to carry through to unemployment during the current period. Such a persistent effect would likely be captured by first differencing the variables.

**Illustration of Dynamic Panel in First differences**

To illustrate how 2SDP accounts includes lagged unemployment and fixed characteristics without bias, see a simplified version of equation (3).

\[ U_{it} = \rho U_{it-1} + \alpha_i + \epsilon_{it} \quad (6) \]

First differences accounts for fixed effects without causing Nickell Bias:

\[ \Delta U_{it} = \rho \Delta U_{it-1} + \Delta \epsilon_{it} \quad (7) \]

However, endogeneity is still present, i.e. \( \text{cov}(\Delta U_{it-1}, \Delta \epsilon_{it}) \neq 0 \). To overcome this problem, \( U_{it-2} \) can be used as an instrument to predict \( \Delta U_{it-1} \). Yielding the second stage:

\[ \Delta U_{it} = \rho \Delta U_{it-1} + \Delta \epsilon_{it} \quad (8) \]

The assumptions necessary for \( U_{it-2} \) to be a valid instrument are:

---

24 First stage regressions include only strictly exogenous variables and the twice-lagged level of the endogenous variable being predicted. They exclude the other twice-lagged endogenous variables because they are not always significant in the first stage, which could cause a weak instruments problem.
1) \( \text{cov}(U_{lt-2}, \Delta U_{lt-1}) \neq 0 \); and

2) \( \text{cov}(U_{lt-2}, \Delta \epsilon_{lt} | X_{lt}) = 0 \)

The first condition is clearly met and shown in the first stage regressions (Appendix Table A4). The second condition is met assuming \((\epsilon_{lt}, \epsilon_{lt-1}) = 0\) for all \(t\).\(^{25}\)

Condition 2 cannot be tested directly, because the system is just identified, i.e. the number of instruments equals the number of endogenous variables. However, a suggestive test is implemented by regressing the estimates of \(\Delta \epsilon_{lt}\) from equation (5) on each of the excluded instruments (twice-lagged values for: unemployed status, happiness, income, and self-reported health). If the instruments are not statistically different from zero, then they are excludable conditional on the other covariates. The problem with this test is that it assumes each covariate is exogenous, including the other instruments.

\(^{25}\) A similar illustration is included in Mostly Harmless Econometrics (Angrist and Pischke 2009, 183).
Unemployment Regressed on Concurrent Determinants and Future Selection

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection Lead</td>
<td>0.002</td>
<td>-0.039</td>
</tr>
<tr>
<td></td>
<td>[0.039]</td>
<td>[-0.993]</td>
</tr>
<tr>
<td>Not Happy</td>
<td>0.069***</td>
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</tr>
<tr>
<td></td>
<td>[3.462]</td>
<td></td>
</tr>
<tr>
<td>Pretty Happy</td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>ln(Eqv. Inc.)</td>
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</tr>
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<td>[1.554]</td>
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<td>5988</td>
</tr>
<tr>
<td>Adj. R Sq.</td>
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<td>0.014</td>
</tr>
</tbody>
</table>

Notes: Selection lead = 1 if the employment status and determinants are observed in period t+1. Reference group: “Very Happy”. Additional controls include: (All Columns) year by division, age, and month of interview; (Column 1) unemployment history, self-employed dummy, education, potential experience, union or government job, industry and occupation categories, religious, marital status, parent dummy, child under 6, job satisfaction and expectations, and a rural dummy. t-statistics in brackets. Standard errors clustered by individual. Significance: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001
Table A2. Selective Attrition Regressions. Germany 1996-2013
Unemployment Regressed on Lagged determinants\(^a\) and Future Selection

<table>
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<td></td>
<td>FE</td>
<td>FE</td>
<td>DOLS</td>
</tr>
<tr>
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<td>0.001</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
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<tr>
<td>Life Satisfaction</td>
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<td>-0.002***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[-10.608]</td>
<td>[-5.536]</td>
<td></td>
</tr>
<tr>
<td>ln(Eqv. Inc.)</td>
<td>-0.003</td>
<td>-0.024***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[-1.319]</td>
<td>[-19.774]</td>
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</tr>
<tr>
<td>Health Good</td>
<td>-0.004**</td>
<td>-0.004***</td>
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</tr>
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<td>[-3.250]</td>
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<td>Unemployed</td>
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<tr>
<td></td>
<td></td>
<td>[36.892]</td>
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<td>Constant</td>
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<td>0.228***</td>
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<td>[2.890]</td>
<td>[7.049]</td>
<td>[15.537]</td>
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<tr>
<td>Adj. R Sq.</td>
<td>0.011</td>
<td>0.014</td>
<td>0.278</td>
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</tbody>
</table>

a. Year by state, age, and month of interview not lagged.

Notes: Selection lead = 1 if the employment status and determinants are observed in period t+1. Additional controls include: (all columns): year by state, age, and month of interview; (columns 2 and 3) education, marital status, parent dummy, child less than 5, potential experience and its square; (column 3) employment status, unemployment history, job tenure, industry and occupation categories, and job satisfaction and expectations.

Significance: + \(p<0.10\) * \(p<0.05\) ** \(p<0.01\) *** \(p<0.001\)

t-statistics in brackets. Standard errors clustered by individual.
Dependent Variable: Change in Unemployed Status.

<table>
<thead>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Pred. LΔ Happy (ST)</td>
<td>-0.011</td>
<td>-0.012</td>
<td>-0.031*</td>
<td>-0.030+</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>[-1.027]</td>
<td>[-1.145]</td>
<td>[-1.896]</td>
<td>[-1.798]</td>
<td>[0.389]</td>
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<td>Pred. LΔ Unempl.</td>
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<td>0.014</td>
<td>0.040</td>
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<tr>
<td></td>
<td>[0.715]</td>
<td>[0.242]</td>
<td>[0.609]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pred. LΔ ln(Eqv.Inc)</td>
<td>0.062*</td>
<td>0.099+</td>
<td>0.041</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[2.174]</td>
<td>[1.663]</td>
<td>[1.156]</td>
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<td></td>
</tr>
<tr>
<td>Pred. LΔ Health</td>
<td>-0.205***</td>
<td>-0.384**</td>
<td>-0.107+</td>
<td></td>
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<tr>
<td></td>
<td>[-3.306]</td>
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<td>Constant</td>
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<td>0.169</td>
<td>0.061+</td>
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<td>[1.759]</td>
<td>[1.164]</td>
<td>[0.569]</td>
<td>[1.376]</td>
<td>[1.780]</td>
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<tr>
<td>Adj. R Sq.</td>
<td>0.004</td>
<td>0.013</td>
<td>0.003</td>
<td>0.020</td>
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</table>

Notes: Additional controls include: (All columns) age, month and year of interview; (Columns 2, 4, and 6) census division by year, and lagged changes in education. See Table A2 for first stage regressions. Each endogenous variable is predicted using its own first stage. Excluded instruments are the twice lagged values of the variable of interest (i.e. LL(Happy) for LΔ(Happy)). t statistics in brackets using bootstrapped standard errors. Significance: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001
Table A4. U.S. Instrumental Variable Regressions Support
Period 2006-2014.

<table>
<thead>
<tr>
<th>Panel A - Joint</th>
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<th>(2)</th>
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<th>(5)</th>
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<td>L2 Happy (ST)</td>
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<td></td>
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<td>2 Lag Unempl.</td>
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<td></td>
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</tr>
<tr>
<td>2 Lag ln(Eqv.Inc)</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>2 Lag HealthGood</td>
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</tr>
<tr>
<td>Constant</td>
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<td>0.077***</td>
<td>3.245***</td>
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<td>2279</td>
<td>2279</td>
<td>2279</td>
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<tr>
<td>Adj. R Sq.</td>
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<td>0.455</td>
<td>0.176</td>
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<tr>
<td>AIC</td>
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<td>-344.208</td>
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<td>70.583</td>
<td>127.820</td>
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<td>Pred. LΔ Happy (ST)</td>
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<td>3.032***</td>
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</tr>
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<td>2 Lag ln(Eqv.Inc)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Lag HealthGood</td>
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<td>Constant</td>
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<tr>
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<tr>
<td>F-Stat.</td>
<td>37.834</td>
<td>77.528</td>
<td>20.520</td>
<td>12.628</td>
<td>1.802</td>
</tr>
</tbody>
</table>

Residuals in Column 5 are from Table A3 Columns 2, 4, and 6.
Additional controls (Columns 1-4): age, month and year of interview.
t-statistics in brackets. Standard errors clustered by individual. Column 5 standard errors are bootstrapped.
Significance: + p<0.10 * p<0.05 ** p<0.01 *** p<0.001