

Güven, Cahit

Working Paper

Reversing the Question: Does Happiness Affect Consumption and Savings Behavior?

SOEPpapers on Multidisciplinary Panel Data Research, No. 219

Provided in Cooperation with:

German Institute for Economic Research (DIW Berlin)

Suggested Citation: Güven, Cahit (2009) : Reversing the Question: Does Happiness Affect Consumption and Savings Behavior?, SOEPpapers on Multidisciplinary Panel Data Research, No. 219, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin

This Version is available at:

<https://hdl.handle.net/10419/150766>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

SOEPpapers

on Multidisciplinary Panel Data Research

219

Cahit Guven

**Reversing the Question: Does Happiness
Affect Consumption and Savings Behavior?**

Berlin, August 2009

SOEPpapers on Multidisciplinary Panel Data Research at DIW Berlin

This series presents research findings based either directly on data from the German Socio-Economic Panel Study (SOEP) or using SOEP data as part of an internationally comparable data set (e.g. CNEF, ECHP, LIS, LWS, CHER/PACO). SOEP is a truly multidisciplinary household panel study covering a wide range of social and behavioral sciences: economics, sociology, psychology, survey methodology, econometrics and applied statistics, educational science, political science, public health, behavioral genetics, demography, geography, and sport science.

The decision to publish a submission in SOEPpapers is made by a board of editors chosen by the DIW Berlin to represent the wide range of disciplines covered by SOEP. There is no external referee process and papers are either accepted or rejected without revision. Papers appear in this series as works in progress and may also appear elsewhere. They often represent preliminary studies and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be requested from the author directly.

Any opinions expressed in this series are those of the author(s) and not those of DIW Berlin. Research disseminated by DIW Berlin may include views on public policy issues, but the institute itself takes no institutional policy positions.

The SOEPpapers are available at
<http://www.diw.de/soeppapers>

Editors:

Georg **Meran** (Dean DIW Graduate Center)
Gert G. **Wagner** (Social Sciences)
Joachim R. **Frick** (Empirical Economics)
Jürgen **Schupp** (Sociology)

Conchita **D'Ambrosio** (Public Economics)
Christoph **Breuer** (Sport Science, DIW Research Professor)
Anita I. **Drever** (Geography)
Elke **Holst** (Gender Studies)
Frieder R. **Lang** (Psychology, DIW Research Professor)
Jörg-Peter **Schräpler** (Survey Methodology)
C. Katharina **Spieß** (Educational Science)
Martin **Spieß** (Survey Methodology, DIW Research Professor)
Alan S. **Zuckerman** (Political Science, DIW Research Professor)

ISSN: 1864-6689 (online)

German Socio-Economic Panel Study (SOEP)
DIW Berlin
Mohrenstrasse 58
10117 Berlin, Germany

Contact: Uta Rahmann | urahmann@diw.de

Reversing the Question. Does Happiness Affect Consumption and Savings Behavior?

Cahit Guven *

August 2009

Abstract

I examine the impact of happiness on consumption and savings behavior using data from the DNB Household Survey from the Netherlands and the German Socio-Economic Panel. Instrumenting individual happiness with regional sunshine, the results suggest that happier people save more, spend less, and have a lower marginal propensity to consume. Happier people take more time for making decisions and have more control over expenditures; they expect a longer life and (accordingly) seem more concerned about the future than the present; they also expect less inflation in the future.

JEL Classification: D03, D12, Q54

Keywords: happiness, savings, consumption, weather.

*School of Accounting, Economics, and Finance, Deakin University. 221 Burwood Highway, Burwood, Victoria, 3125 Australia. Tel: +61 03 924 45087, Fax: +61 03 924 46283, E-mail: cahit@deakin.edu.au. Comments and suggestions from Daniel Kahneman, Richard Easterlin, Ed Diener, Bruno Frey, Bernard Van Praag, Alan Krueger, Nader Tavassoli, Sonja Lyubomirsky, Claudia Senik, Bent E. Sorensen, Nathaniel Wilcox, Dietrich Vollrath, Mehmet Ulubasoglu, and Robin Sickles are gratefully acknowledged. I would like to thank Carol Graham, Rainer Winkelmann, Rafael Di Tella, Alois Stutzer, John Helliwell, and George Loewenstein for encouraging me to work on this topic. I would also like to thank Andrew Clark and Andrew Oswald for reading the paper and providing very detailed written comments and suggestions. I would like to thank the participants at the 6th Tilburg Psychology and Economics Conference, the 77th Southern Economic Association Meetings, the University of Houston Spring 2007 workshop, and the Deakin University Spring 2008 workshop. I also thank climatologists Barry Lefer, Bernhard Mayer, and Hermann Manstein for their comments and suggestions.

1 Introduction

“Success is not the key to happiness. Happiness is the key to success. If you love what you are doing, you will be successful.” Albert Schweitzer (1875-1965) 1952 Nobel Peace Prize Winner.

Given their background as moral philosophers, classical economists were interested in affect and the emotions which govern human nature (Smith, 1759). This interest maintained its pace for many years, until the marginal revolution. The aim of developing a formal theory based on mechanical laws resulted in the adoption of a concept of utility which excluded emotions and affect. Modern mainstream economics is characterized by rational decision makers maximizing a given utility function under constraints, where utility is simply a labeling that represents a weak ordering of commodity bundles. In conventional micro- and macro-economics, emotions are regularly treated as a factor which can be neglected (in the context of ideal markets or rational decision making). On the other hand, recent contributions from neurological and psychological studies have provided strong support for the idea that emotions, and in particular happiness, play a key role in decision-making. These contributions suggest that happiness, also known as “subjective well-being,” is critical for decision-making and can be researched empirically.

To date, economists have mainly focused on the effects of macroeconomic variables and individual characteristics on subjective well-being. The question asked has been, whether variables such as unemployment, inflation, income, marital status, health status, and gender influence happiness. The reverse effect has so far received scant attention (Kahneman and Krueger, 2006; Lyubomirsky et al., 2005). Recent work by economists and psychologists on subjective well-being suggests that

there may very well be reverse causality. Charles Kenny (1999) was one of the first scholars to deal with reverse causation. Using time series evidence from happiness polls in ten wealthy countries, he finds no support for a causal link from growth to happiness, weak support for reverse causation, and further (weak) support for links between national equality and happiness and leisure time and happiness. Freeman (1978) shows that job satisfaction is a major determinant of labor market mobility because it reflects aspects of the work-place which are not captured by standard objective variables. Mastekaasa (1992) and Frey and Stutzer (2006) verify that well-being at one point in time is positively related to subsequent probability of marrying. Psychological experiments suggest that the behavior of happier people tends to be different from that of people who are less happy, but the direction of causality remains unclear. For example, are people with higher levels of consumption happier, or does happiness lead to greater consumption? Does smoking cause depression, or are depressed people more likely to smoke? Does risk-taking behavior lead to greater happiness, or do happier people take more risks? Similar questions can be posed in a number of areas, including the relationships between health, social capital, productivity, and happiness.

The primary objective of this paper is to establish a causal relationship running from happiness to consumption and savings behavior. Establishing this causal relationship can help to determine the extent to which the findings from this research should be incorporated into policy analysis. First, understanding this causal link can help in the design of economic policies such as tax and retirement policies. Second, it can also help regulate the timing of macroeconomic announcements (i.e., announcements of unemployment, inflation, and tax levels). Third, the results of

the paper might help to explain the low correlation between income and happiness, which is finding common to all happiness studies (where income is endogenous). This work might help to explain why instrumenting income in a happiness equation appears to raise the coefficient of income, as was found by Oswald and Powdthavee (2007). The primary difficulty in establishing the direction of causality is related to finding an exogenous instrument for happiness, as well as the lack of adequate data (longitudinal data with measures of happiness). As a solution to the first problem, I use exogenous regional sunshine as an instrument for current individual happiness. The second problem is solved by using two panel surveys from Germany and the Netherlands which provide large samples. The paper employs data from the Dutch National Bank (DNB) Household Survey, which is a panel of 4500 individuals available for the period 1993 to 2006, and the German Socio-Economic Panel (SOEP), which is a panel of 21 000 individuals over the period 1984-2006. The surveys provide self-reported measures of well-being, such as responses about how happy and satisfied individual respondents are with their lives, as well as, importantly, very detailed information about individual consumption and savings.

I investigate the impact of self-reported happiness on economic choices, specifically, savings and consumption behavior. This study makes a number of novel contributions to the literature. I employ an instrumental variables estimation method that addresses the potential endogeneity of individual happiness. I find that exogenous increases in regional sunshine cause increases in happiness. The paper employs this instrument in two different ways. Firstly, it uses the daily transitory sunshine changes as an instrument, by matching the exact dates of individuals' answers to "happiness" questions in the surveys with weather data. Secondly, the

paper uses yearly averages of sunshine as an instrument for current happiness. Next, I address the previously unexplored issue of whether subjective well-being helps to determine individual economic choices regarding consumption and savings behavior. Establishing this direction of causality using "regional sunshine" as an instrument for individual happiness, the paper finds that happier people save more, spend less, and are less likely to be in debt. The different behaviors of happier people may be due to taking more time for making decisions and having more control over expenditures. Having more control over expenditures is closely related to the concept of "self-control", which may explain over-consumption, wealth accumulation, savings and financial behavior. Happy people also expect to live longer, and (accordingly) seem more concerned about the future than the present; they also seem to expect less inflation in the future.

The remainder of the paper is organised as follows. Section 2 provides an overview of the related economic literature on the correlates of well-being and the impact of well-being on economic behavior. Section 3 summarizes the data while Section 4 gives details of the empirical strategies and the identification strategy. Section 5 presents the descriptive statistics and the empirical results, and Section 6 concludes.

2 Related Literature

2.1 Correlates of Happiness

The concept of happiness has been a major research area in psychology for a long time. However, it was not until 1974 that it was noticed by economists (East-

erlin, 1974), since which time they have been studying the relationship between *individual characteristics* and happiness. For a start, economists have identified a U-shaped relationship between *age* and happiness (Oswald, 1997; Blanchflower and Oswald, 2004), while in psychological and sociological studies on the topic of *race* in the United States, blacks have been shown to be less happy than whites. When people are asked to evaluate the importance of various aspects of their own lives, good *health* receives the highest ratings. *Marriage* is also related to higher levels of happiness, as has been found in a large number of studies in different countries and time periods. Levels of *education* bears little relationship to happiness. Education may contribute to happiness indirectly by allowing a better adaptation to changing environments, but it also tends to raise aspiration levels. See the survey by Frey and Stutzer (2002) for more discussion on these issues.

Rehdanza and Maddison (2005) analyze a panel of 67 countries in an attempt to explain differences in self-reported levels of happiness using *weather*. Using a panel-corrected least squares approach, the paper demonstrates that, even controlling for a range of other factors, climate variables have a powerful effect on self reported levels of happiness. Van Praag and Ferrer-i-Carbonell (2004) and Frijters and Van Praag (1998) investigate the impact of climate on happiness. They find that climate variables such as rain, hours of sunshine, average temperature, and windiness have a significant impact on household costs, financial satisfaction, and general satisfaction. Becchetti et al. (2007) test the impact of climate on happiness and estimate the relative gains and losses (in terms of happiness) arising as a result of the climatic met changes when individuals move from one city to another (e.g. from Rome to London). They merge individual data on happiness from the World

Values Survey (third and fourth waves) with the climatic conditions of the respondents' cities obtained from the National Oceanic and Atmospheric Administration of the US Department of Commerce database. They document the existence of significant links between several climatic factors (rain, fog, temperature, wind) and happiness.

Consumption, Savings, and Other Individual Behavior. Psychological experiments have shown that happier people tend to behave differently from people who are less happy. Happy people, for instance, smile more often during social interactions, are more prepared to initiate social contacts, are more inclined to respond to requests for help, are absent from work less often, and are less likely to get involved in work disputes (Frank, 1999). Happy people tend to save and spend different proportions of their income, distribute it differently over time, and acquire different combinations of particular goods and services relative to people who are less happy (Frey and Stutzer, 2002). Happy people may also be more prepared to exhibit an environmental morale (Frank, 1999). Using panel data from Russia, Graham et al. (2004) find that happiness affects income and health. They report that people who had a higher level of "residual happiness" in 1995 had more money and were in better health five years later. They claim that this could be due to self-esteem and optimism. Khwaja et al. (2006) find that general measures of time preference and self-control are closely related to the decision to smoke. Self-control can also explain over-consumption, wealth accumulation, savings and financial behavior. (Ozdenoren et al., 2006; Hoch and Loewenstein, 1991; Ameriks et al., 2004; Rabin, 1998)

3 Data

The *DNB Household Survey* (formerly known as the CentER Savings Survey) is a panel survey that started in 1993. The data are collected annually, with a panel of more than 2,000 households, and are representative of the Dutch population. The *DNB Household Survey* (DHS) data are unique in the sense that they allow studies of both the psychological and economic aspects of financial behavior. The DHS consists of six questionnaires. The topics covered by the questionnaires are: i) general information on the household, which includes the regions and provinces of the residents; ii) household and work; iii) accommodation and mortgages; iv) health and income; v) assets and liabilities; vi) economic and psychological concepts. There are 12 provinces: Groningen, Friesland, Drenthe, Overijssel, Flevoland, Gelderland, Utrecht, Noord-Holland, Zuid-Holland, Zeeland, Noord-Brabant and Limburg. All questionnaires are presented to the CentER-panel, in which 2,000 households have participated. Within each household, all persons aged 16 or over are interviewed. The questionnaires are answered without the interference of an interviewer, the respondents can answer the questionnaires at any time that is convenient for them during the year, and all of the documents (annual statements, bank account statements) which are required for answering the questions are within easy reach. However, once they have begun one of the six parts they are required to finish it completely. Since the economics and psychology parts are given together, people answer the economic behavior questions on the same day that they answer the happiness question. This enables me to use daily changes in sunshine as an instrument for happiness to investigate its impact on economic behavior. Besides this, people answer the happiness question on different days and months during

each year, which supplies extra variation within years when I instrument happiness with unexpected daily sunshine changes. Happiness is a categorical variable which takes values from 0-5. Dependent variables (measures of consumption and savings behaviors) are available in two different forms: i) binary variables such as whether a person has saved money in the last two weeks or not; ii) continuous variables such as the amount of monthly expenditures. DHS also includes various subjective variables, such as whether or not a person finds it difficult to control expenditure, based on a seven point scale.

The *German Socio-Economic Panel Study* (SOEP) is a wide-ranging representative longitudinal study of private households in Germany. The same private households, persons, and families have been surveyed annually since 1984. The SOEP includes information on objective living conditions, values, willingness to take risks, changes currently being undergone in various areas of life, and the relationships and dependencies among these areas and the changes. The SOEP also includes state indicators of individuals. There are 16 states in Germany: Berlin, Schleswig-Holstein, Hamburg, Lower Saxony, Bremen, North Rhine-Westphalia, Hesse, Rhineland-Palatinate, Saarland, Baden-Wuerttemberg, Bavaria, Mecklenburg-West Pomerania, Brandenburg, Saxony-Anhalt, Thuringia, and Saxony. Happiness is a categorical variable which takes values from 0-10. The dependent variables (measures of consumption and savings behavior) are available in two different forms: i) binary variables such as whether or not a person is in debt; ii) continuous variables, such as the amount of weekly expenditures.

The *European Climate Assessment Dataset* consists of long-term daily resolution climatic time series from meteorological stations throughout Europe and the

Mediterranean for over 40 countries. Most series cover at least the period from 1946 to the present. These series include temperature, precipitation, humidity, sunshine, cloudiness, sea level pressure, and snow depth. Three different measures of sunshine are available in the dataset. i) Cloud cover (CC) data are measured four times a day at 00, 06, 12 and 18 in a day. *Mean daily cloud cover* is calculated as $CC/4$. This percentage value is converted to octa's by rounding ($((\text{cloud cover in percentage}/100)*8)$). Sunshine duration (SS) is measured four times a day (in minutes), at 00, 06, 12 and 18 in a day ii) *daily average sunshine duration* is calculated as $SS/4$. iii) The maximum of these four values is the *maximum duration of daily sunshine*.

3.1 Descriptive Statistics:

Considering the first stage, Table 8 and Table 9 show the relationship between happiness and labor force status, marital status, health status, and gender. Happiness is a categorical variable which takes values 1-5, which refers to the “very unhappy,” “unhappy,” “neither happy nor unhappy,” “happy,” and “very happy” categories, respectively, for the Netherlands. People in the Netherlands are happy on average. Approximately 90 percent of the people who answered the happiness question reported the one of highest three categories of happiness (neither happy nor unhappy, happy, and very happy). Consider labor force status: Unemployed people seem to be relatively unhappy. 27 percent of first time job seekers and 22 percent of second time job seekers report that they are neither happy nor unhappy. Only 12 percent of people in unpaid work report that they are “very happy”. Employed people (employed on contract, own business, and self-employed) report the

highest values of happiness. Students and disabled people are not “very happy” compared to other categories of the labor force. Nearly one sixth of the total sample is retired. Retired people report high levels of happiness, which could be due to having more leisure. Marital status is also an important factor for happiness. Married people and people living with a partner are relatively happier, while single, divorced, and widowed people report lower levels of happiness. Health is one of the strongest predictors of happiness: people reporting better health states also report higher levels of happiness. Gender does not seem to affect happiness, however, since females and males report similar values of happiness.

Happiness is a categorical variable for Germany, taking values between 0-10, but recoded here into five categories to make it comparable to the happiness levels in the Netherlands. Consider the labor force: employed people are very happy. Within the category of non-working people, students and mothers on maternity leave are very happy, while unemployed people are the most unhappy people, together with people in military service. Retired people are not very happy. Nearly 34 percent of retired people report low levels of happiness. Married people in Germany are less happy than married people in the Netherlands. Singles again report low levels of happiness. Individuals whose spouse are currently away and separated people report relatively low levels of happiness. Divorced and widowed people are also less happy than married people. Health is a very strong predictor of happiness. People reporting a better health status also report higher levels of happiness. Table 10 shows summary statistics of happiness by education and gender. People who have higher levels of education generally report higher levels of happiness, but there does not seem to be any difference between the happiness

levels of males and females in Germany.

Table 11 reports the averages of the number of children, income, household size, and age by happiness categories in Germany and the Netherlands. Household size is not very different across happiness categories, but happy and very happy people have bigger household sizes in Germany and the Netherlands. In both countries, income and happiness are positively correlated. People with a higher income on average report higher values of happiness, but the correlation seems to be stronger for Germany. This may be due to differences in income inequality. See the surveys by Clark et al. (2008) and Graham and Felton (2005) for more discussion on the relationship between own income, relative income, and happiness. On the other hand, Guven and Sorensen (2007) show that perceptions of income also play a big role in explaining happiness, together with relative income and own income. Differences in perceptions of income might explain the differences in the correlations. People with more children are happier in both countries, but there does not seem to be any clear relationship between age and happiness. This may be due to the U-shaped relationship between age and happiness mostly found in the literature. The coefficients in Table 15 represent the correlations between total individual happiness and happiness with various aspects of life. The results suggest that income and health are very important to people. Work is not as important as income and health. Leisure's importance for happiness is similar to dwelling's, but environment and housework do not seem to be very important for individuals in Germany. The R-squared values in the fixed effects regression are very low, suggesting that there are other important factors for individuals which can explain the within individual variation in happiness, such as the *weather*. See the Appendix

for the exact correlations between individual characteristics and happiness.

4 Empirical Framework

Instrumental Variables Estimation:

In the context of a linear regression model, if the residual's distribution cannot be considered as independent of the regressors's distribution, instrumental variables are needed.

$$y = X\beta + u, \quad E(uu') = \Omega \quad (1)$$

The matrix of regressors X , which also includes happiness, is $n \times K$, where n is the number of observations. The error term u is distributed with mean zero, and the covariance matrix Ω is $n \times n$. Assume that, happiness is endogenous in the regression and that the rest of the regressors are assumed to be exogenous. So, $E(X_i u_i) \neq 0$. The set of instruments are $Z = [Z_1 \ Z_2]$, where Z_1 is the set of excluded instruments and Z_2 is the set of included or exogenous regressors. That is :

$$\text{Regressors } X = [X_1 \ X_2] = [\text{Endogenous} \ \text{Exogenous}] \quad (2)$$

$$\text{Instruments } Z = [Z_1 \ Z_2] = [\text{Excluded} \ \text{Included}] \quad (3)$$

If there is only one excluded instrument, then the equation is “exactly identified”; if there is more than one, then the equation is “overidentified.” The instru-

mental variable (IV) or two-stage least squares (2SLS) estimator of β is then:

$$\hat{\beta}_{IV} = [X'Z(Z'Z)^{-1}Z'X]^{-1}X'Z(Z'Z)^{-1}Z'y. \quad (4)$$

If the covariance matrix Ω is homoscedastic, then the IV estimate is both efficient and consistent. However, if the covariance matrix is heteroscedastic, then the IV estimate is still consistent but the standard errors are inconsistent, leading to invalid inference. The contemporary method of addressing this problem is GMM. In this case, if the equation is exactly identified then the GMM estimator is the IV estimator. If the equation is overidentified, then the GMM estimator is:

$$\hat{\beta}_{GMM} = [X'ZWZ'X]^{-1}X'ZWZ'y. \quad (5)$$

W is the optimal weighting matrix minimizing the asymptotic variance of the estimator. In the IV regressions, the Anderson canonical correlations likelihood-ratio test statistic and its close relative, the Cragg-Donald chi-squared test statistic, are used to test whether the equation is suitably identified or not. The alternative hypothesis for the test is that the instrument is valid, i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation. Under the null, the test statistic is distributed with chi-squared distribution. In the paper, the F-statistic form of the Cragg-Donald statistic which was suggested by Stock and Yogo (2002) for testing for the presence of weak instruments (i.e., that the equation is only weakly identified) is reported. See Stock and Yogo (2002) for a tabulation of critical values for the Cragg-Donald statistic. Since the model of this paper includes only one endogenous regressor, i.e. happiness, the

F-statistic form of the Cragg-Donald statistic coincides with the first-stage F test-statistic of the excluded instrument.¹

Sunshine as an Instrument for Solving Reverse Causality: *Daily sunshine changes.*

Daily expected sunshine does not affect consumption and savings behaviors. If it is already known that tomorrow is going to be sunny, it would not change consumption behavior. What matters for the economic behavior is not the expected but the unexpected sunshine. The first instrument is the unexpected daily sunshine changes as observed at the station level. I can match the daily sunshine data with individual happiness data since I know the exact date on which the respondents answered the “happiness” question. First, I calculate the last ten day weighted average of regional sunshine² and calculate the average of this last 10 day average over the last 60 years. The instrument, last 10 day regional sunshine deviation, is computed as the difference between the last ten days weighted average of regional sunshine and the average of this last 10 day average over the last 60 years.³ For instance, if today were the 10th of November 2006, I would calculate the weighted average sunshine from November 1, 2006 to November 10, 2006 for a given region. Then, I find the average sunshine between November 1 and November 10 for that region over the period 1946-2006. Then, I subtract the latter from the former to find the unexpected sunshine. Three measures of

¹See Baum et al. (2003) for more discussion of IV-GMM and its implementation in Stata.

²Dates closer to the survey date are given a higher weight.

³This is the time period which people experiences weather changes in their life-time, since the average life expectancy is around 70 years.

changes in sunshine are all significant in explaining individual happiness (average duration of sunshine, maximum duration of sunshine, and cloud cover). Although the exact dates when people answer the happiness question are known, I cannot match the weather data with an individual's residence precisely because only state of residence information is available. Weather data are available for 61 stations in Germany, and there are several stations in each state. Since states are very large and the within-state weather variation is very high, it is very likely that the average sunshine in a state will not represent the weather in every part of the state. The major difference between cloud coverage and sunshine (hours) is the seasonality, because there are less hours of sunshine in winter. In autumn and winter, there is quite often fog and low level stratus in the valleys, while up on the hills and mountains there is fine weather. Most cities and villages are down at the rivers, while some of the measurement stations might be on hill tops. As a result, since cloud cover is a better measure of sunshine for my empirical analysis, as it does not change much within a state and represents more people, I focus only on cloud cover as a measure of sunshine.

Yearly sunshine averages. The second instrument is the yearly regional sunshine average. Using daily sunshine data, I calculate the yearly regional average of cloud cover. The sunshine measure is very sensitive to altitude, the angle of the sun rays, clouds, wind, and environment. However, sunshine data from high altitude stations do not match the places where people live. On the other hand, cloud cover does not vary between people's residences and the stations. As a result, cloud cover is used as the measure of sunshine in the empirical framework. See Figures 1

and 2 for the regional sunshine averages for Germany and the Netherlands. Both the yearly sunshine averages and daily sunshine changes affect happiness. However, unexpected daily sunshine changes only influence happiness in the short-run. Hence, unexpected daily sunshine changes are expected to change consumption behavior temporarily, but yearly sunshine changes can change consumption behavior permanently.

5 Empirical Results

5.1 Does Sunshine Affect Happiness? First Stage Results

First, I investigate the impact of transitory (daily) changes in sunshine on happiness. I consider three measures of sunshine in Table 1. The results suggest that happiness increases with unexpected daily sunshine. The coefficient for the first row is 0.04 and the t-statistic is 3.4, suggesting that a one hour increase in unexpected sunshine increases individual happiness by 0.04 units. Happiness is a categorical variable, but it is treated as a continuous variable in the empirical analysis. In the first stage, the results for OLS, ordered logit, and ordered probit are nearly the same. In the second stage, ivprobit and IV-GMM regressions again give very close estimates. The F-statistic is 17.4, which is much higher than 10, thus rejecting the presence of weak instrument. This is the t-statistic for the hypothesis that unexpected sunshine equals 0. The F-statistic is much higher for the maximum duration of sunshine, with a value of 22.4, but is smaller for average cloud cover, with a value of 12.7. All measures of sunshine are very significant in explaining happiness, and the presence of a weak instrument is not an issue,

considering the first stage.

5.2 Impact of Happiness on Economic Behavior: Second Stage Results

Individuals face various economic choices during their lives. From the point view of an economist, some of the important ones are savings and consumption decisions. First, I consider unexpected transitory changes in sunshine as an instrument for happiness which is expected to influence short frequency outcomes but not permanent ones. The first set of results concerning short-run decisions about savings and consumption are shown in Table 2 for the Netherlands. The dependent variables are recent short-run behavioral outcomes. The OLS regression only indicates a positive correlation between happiness and propensity to save. However, the IV regression shows the causal effect of happiness on savings and consumption behaviors. The first row shows that happiness increases the probability to save: it reports a t-statistic of 1.9, which is nearly significant, indicating that happier people are more likely to be savers. The second row relates the amount of savings to happiness. The coefficient is significant, indicating that a one unit increase in happiness (out of five categories) increases the amount of real savings by 0.11 units. The third row shows how people think once they get happier. Happier people think that saving makes sense, considering the general economic situation. The results with regard to savings and consumption might help to explain why instrumenting income in a happiness equation appears to raise the coefficient on income. Oswald and Powdthavee (2007) find that instrumenting income in the happiness equation appears to reduce the coefficient on income. If happy people have a lower marginal

utility of purchasing things, then happy people will work less, which may account for the observed low coefficient on income in any happiness equation that does not instrument income.

The above findings are quite interesting in the sense that happiness leads to more savings and less spending. But why is this? Why do happier people spend less? Tables 3 and 4 investigate possible channels through which happiness might influence consumption and savings behaviors. Table 3 studies whether the discount rates of happy people are different or whether happy people have more self-control. Since all dependent variables are short-run outcomes and are answered on the same day as the happiness question, they are very likely to also be affected by high frequency changes in sunshine. Instrumenting happiness with transitory sunshine changes, the first row shows that unhappy people are less forward looking. Happiness causes people to take the future into account more than the present in their actions. The estimates in the second row confirm this, with a t-statistic of 2.8. Unhappy people are more concerned about the immediate consequences of their actions. These results suggest that happier people might have discount rates different from those of less happy people. The third and fourth rows show that happiness increases self-control. Unhappy people find controlling their expenditures very difficult, and they also have less control over their investments. The fifth row shows us the impact of happiness on self-control: happiness causes people to be more disciplined in their consumption expenditures. The IV estimates of happiness are significant in all of the regressions.

Expectations play a big role in determining current actions. Table 4 shows that happy people's expectations about the future are different from unhappy people's.

First of all, happy people expect lower prices than unhappy people do for the next year and also in five years' time. On the other hand, lower price expectations may lead to lower consumption levels today for happy people. Happy people might want to transfer wealth from the bad state (now) to the good state (future); that is, to consume more in the future because of lower prices. More optimism about the future is observed for happy people in the form of higher life expectancies. A one category increase in happiness leads to a 1.1 year increase in perceived life expectancy. Besides expectations, happiness might also influence cognitive ability. The fourth row shows that happy people take more time before making decisions. Taking more time may enable individuals to have a better understanding of the choices and to consider the advantages and disadvantages better.

The second instrument is the yearly regional sunshine changes. I report the estimates for the first stage in Table 5 for both the Netherlands and Germany. The estimates are the coefficients of the yearly sunshine averages with control variables. The yearly averages of three measures of sunshine are all significant in explaining happiness with the expected signs. However, the F-statistics are less than 10, suggesting that we might have a weak instrument problem. A high level of sunshine variation within a province but not across provinces might explain the low F-statistics. A one percentage increase in yearly cloud cover decreases happiness by 0.11 units (out of 10). The F-statistic is 29.6, suggesting that the yearly cloud cover is a strong predictor of happiness, and the presence of a weak instrument is rejected. The difference in the F-statistics between the Netherlands and Germany could be due to any of three factors: i) The sample size is much bigger for Germany. I have weather data for 13 states and 108,000 individual observations over 20 years.

However, for the Netherlands, the weather data is only available for nine provinces and 15,000 individual observations over 13 years. ii) Happiness is less persistent in Germany than in the Netherlands. Table 12 shows the transition probabilities of happiness for both countries, and the diagonals of the matrices indicate the persistence of happiness. The average persistence of happiness (average of the diagonals) in the Netherlands is 51.4 percent. This indicates that for an average person the probability of having the same level of happiness as in the previous year is 51.4 percent. On the other hand, this is just 41.8 in Germany, suggesting that happiness is less persistent in Germany than in the Netherlands. iii) The total variation (both within and across variation) in measures of sunshine in Germany is higher than than in the Netherlands.

After showing that yearly sunshine averages can be used as instruments for happiness, I then show the second stage results. Table 6 studies the impact of happiness, instrumented with the yearly sunshine average, on permanent characteristics. The results concerning savings and consumption confirm the findings in Table 2. Happy people are much more likely to be savers. In fact, a one point increase in happiness (out of 10) increases the marginal propensity to save by 0.83 units (out of 7). The results from daily sunshine and yearly sunshine could give us some clue about the nature of individual behavior. One may define various economic behaviors as the sum of a permanent and a transitory component. Obtaining similar results with transitory and permanent weather shocks shows us that this might be true for consumption and savings behaviors.

As is shown in Table 5, the yearly average sunshine is a strong instrument for happiness in Germany. The results indicate that happy people are more likely to

be savers in the survey month and to save more in the survey year. Considering consumption, Table 7 shows that happiness decreases monthly and weekly expenditures. Happy people are also less likely to have debts indicating that they do not spend more than they have. The results with respect to consumption and savings in Germany are in line with the findings for the Netherlands.

6 Further Issues

Validity of Instruments

The instrumental variables approach implicitly assumes that sunshine only influences individual economic behavior through happiness, and is not correlated with any other independent variable. This assumption will not hold if happiness is a proxy for some personality characteristics that are found to be correlates of individual happiness. In this context, one may argue that although weather can shift happiness, which in turn shifts consumption and savings behavior, weather can also potentially shift beliefs (optimism versus pessimism), which in turn affects economic behavior. Several considerations suggest that this is not a problem. On theoretical grounds, most of people's psychological characteristics are available in the surveys and are very persistent. Further, psychological studies argue that weather-induced happiness primarily affects economic behavior rather than optimism. Psychological research measures optimism as a combination of behaviors, including happiness. Hence, weather affects optimism through happiness which confirms the validity of the IV approach. On statistical grounds, since I use very short-run changes in sunshine as an instrument for happiness, it is unlikely that

sort-run changes in sunshine will affect permanent psychological characteristics. In fact, Hansen’s J-statistics for excludability suggest that there is no problem in this case. Further support for this point comes from the F-statistics after the first stage. Table 1 shows that the F-statistics are all higher than 10, rejecting the presence of weak instruments.⁴

One concern regarding the use of sunshine as an instrument can be that individuals may migrate to the sunnier regions. However, in the Netherlands most people do not migrate during their lifetime. As is shown in Table 16, the probability of living in a region, say “South Holland,” conditional on living in the same region in the previous period is nearly 99 percent, confirming that people do not move much.⁵ Since I only use the West Germany panel from the SOEP, it does not include the migration from East to West, and again, most people do not move in West Germany; probability of staying in the same state is about 87 percent. Also, the IV results for the Netherlands with respect to consumption, savings, and risk-taking are confirmed by the findings for Germany. This suggests that the results and the use of instruments are not peculiar to one country but are applicable to other countries with different cultures and topological structures.

Another concern could be that sunshine is not excludable from the main regression. For instance, people go to parks more when it is sunny, and therefore we observe a decline in consumption on sunnier days. If this argument holds, one

⁴Staiger and Stock (1997) show that in the IV regressions, an F-statistic higher than 10 rejects the presence of weak instruments. I also find no impact of happiness on actual or desired working hours in Table 17. This suggests that sunshine does not affect economic behavior through individual productivity, but through happiness.

⁵The transition matrix for the province of residence in the Netherlands is not reported, but the results are quite similar; the probability of living in the same province is about 89 percent.

would expect the “number of hours of sunshine in a day” to have an impact on economic behavior. However, the results suggest that this is not the case. Daily hours of sunshine and expected hours of sunshine do not influence consumption and savings behavior, but “unexpected sunshine changes” can change economic behavior.

Issues on Survey Data

Researchers may be skeptical of the use of survey data because the answers to surveys may be subject to bias from factors such as respondents’ moods at the time of the survey and minor changes in the phrasing of survey questions. This might be a concern if people misreport their actual behavior due to differences in their mood. However, in this case respondents use documents to answer the questions in the surveys, which increases the reliability of the surveys. In the DNB Household Survey, there is no interference from the interviewer, the respondents can answer the questionnaires at any time that is convenient for them, and all of the documents (annual statements, bank account statements) required for answering the questions are within easy reach. Mood effect probably is not an issue here. Using individuals’ responses to questions about their intentions and desires, in addition to their observed behavior, I, along with a huge body of literature, assume that the revealed behavior is similar to the actual behavior. Current research finds that people’s answers to questions about their behavior (desires and intentions) are very close to their actual behavior.

The paper considers the impact of happiness on current and future economic behavior, as well as on *more recent* individual behavior. Although the happiness we observe here is current happiness, we can still make the argument for the

influence of current happiness on observed recent behavior, since as is shown in Table 12, individual happiness is relatively persistent over time (over yearly observations), and it is very likely that happiness does not change much over short periods of time. Moreover, I show in Table 12 that happiness is fairly consistent over time, suggesting that people might differ in some *given* characteristics, gained most probably at birth, but not through experience. Moreover, current happiness is not just a function of current variables, such as current income and current environmental factors, but is a combination of the influences of past, current, and future events. Tversky and Kahneman (1973, 1974) have suggested that the ideas that come to mind first or most easily may influence judgment, and that people remember recent experiences most precisely.

Happiness and Optimism

From a psychological perspective, many researchers have noted that optimism in one domain of activity does not necessarily translate into optimism about other domains. In other words, optimism is often thought to be event, or domain based, and while individuals may display optimism about a certain event, this does not necessarily translate into optimism about other events. Prior research in psychology indicates that optimism in the weather domain need not necessarily apply to other areas such as optimism about economic outcomes.

Other Issues

In Germany some of the individuals received bad weather benefits during the sample period, which might directly affect individual behaviors. However, it appears that only one percent of the whole sample had bad weather benefits. Also, the results are shown for the whole sample, but the consumption and savings re-

sults mainly represent the behavior of non-retired individuals. Although I do not report the results here, the impact of happiness on consumption and savings behaviors is stronger for the sample of non-retired people. Approximately one sixth of the sample consists of retired people. Concerning the econometric methodology, the results are robust to clustering standard errors by states and provinces (see Moulton, 1990, for more discussion on clustering), and also to the use of time and region fixed effects and to the control of the regional average of stations' latitudes. There is also the danger of picking up a time trend if countries are systematically getting sunnier. This is only an issue for annual sunshine averages, since in the short-run I use the unexpected sunshine changes. The results are robust to the use of year dummies which will pick up the time trends.

Moreover, I do not attempt in the paper to have a sharp distinction linguistically between happiness and mood. However, happiness is influenced by sunshine in the paper, and hence it might be better to think of it as a transient mood instead of a personality trait. Also, the “mood-as-information” model, proposed by Schwarz and Clore (1983) suggests that mood effects are eliminated when people misattribute their mood to an irrelevant source, such as the weather. I can not assess exactly how long-lasting the effects of happiness on consumption and savings behavior through sunshine are. One needs to have monthly happiness data (as a panel) in order to make this distinction.

7 Conclusion

The paper shows that individual happiness has a significant impact on economic decisions. Firstly, the paper verifies that exogenous variation in yearly and daily sunshine levels have significant impact on individual happiness in Germany and the Netherlands. Secondly, it is verified that individual happiness is strongly autocorrelated over time. Thirdly, by instrumenting individual happiness with the exogenous variation in yearly and daily regional sunshine, the paper investigates the impact of happiness on savings and consumption behavior. The results suggest that happy people save more and spend less. The desire to spend is lower among happy people, and they are less likely to have debts. There are significant differences in the economic behaviors of happy versus unhappy people. The different behaviors of happy people are found to be due to taking more time before making decisions, having more control over expenditures, which is closely related to the concept of “self-control,” and expectations of living longer. Happy people are more concerned about the future than the present and expect lower prices in the future. The findings of the paper imply that a better understanding of the relationship between happiness and individual economic behavior may help to explain individual differences in consumption and savings, as well as, helping design of particular economic policies such as tax and retirement policies, and the regulation of the timing of macroeconomic announcements.

References

- [1] Ameriks, J., Caplin, A., Leahy, J., Tyler, T. (2004). ‘Measuring self-control’, NBER Working Paper 10514.
- [2] Becchetti, L., Castriota, S., Andres Londono Bedoya, D. (2007). ‘Climate, happiness, and the Kyoto protocol: Someone does not like it hot anymore’, Centre for Economic and International Studies Working Paper 247.
- [3] Blanchflower, D.G., Oswald, A.J. (2004). ‘Well-being over time in Britain and the United States’, *Journal of Public Economics*, vol. 88 (7-8), pp. 1359-1386.
- [4] Baum, C.F., Schaffer, M.E., Stillman, S. (2003). ‘Instrumental variables and GMM: Estimation and testing’, Boston College Working Paper 545.
- [5] Clark, A.E., Frijters, P., Shields, M. (2008). ‘Relative income, happiness and utility: an explanation for the Easterlin paradox and other puzzles’, *Journal of Economic Literature*, vol. 46 (1), pp. 95-144.
- [6] Easterlin, R.A. (1974). ‘Does economic growth improve the human a lot? Some empirical evidence’, in (P.A., David, and M.W. Reder, eds.), *Nations and Households in Economic Growth: Essays in Honour of Moses Abramovitz*, New York and London: Academic Press.
- [7] Frank, R.H. (1999). *Luxury Fever: Why Money Fails to Satisfy in an Era of Excess*, New York: Free Press.
- [8] Freeman, R.B. (1978). ‘Job satisfaction as an economic variable’, *American Economic Review*, vol. 68 (2), pp. 135-141.

- [9] Frey, B.S., Stutzer, A. (2002). ‘What can economists learn from happiness research?’, *Journal of Economic Literature*, vol. 40 (2), pp. 402-435.
- [10] Frey, B.S., Stutzer, A. (2006). ‘Does marriage make people happy, or do happy people get married?’, *Journal of Socio-Economics*, vol. 35 (2), pp. 326-347.
- [11] Frijters, P., Van Praag, B.M.S. (1998). ‘The effects of climate on welfare and well-being in Russia’, *Climatic Change*, vol. 39 (1), pp. 61-81.
- [12] Graham, C., Felton, A. (2005). ‘Does inequality matter to individual welfare? An initial exploration based on happiness surveys from Latin America’, Center on Social and Economic Dynamics Working Paper 38.
- [13] Graham, C., Eggers, A., Sukhtankar, S. (2004). ‘Does happiness pay? An exploration based on panel data from Russia’, *Journal of Economic Behavior and Organization*, vol. 55 (3), pp. 319-342.
- [14] Guven, C., Sorensen, B.E. (2007). ‘Keeping up with the perceptions of the Joneses’, University of Houston Working Paper.
- [15] Hoch, S.J., Loewenstein, G.F. (1991). ‘Time-inconsistent preferences and consumer self-control’, *Journal of Consumer Research*, vol. 17 (4), pp. 492-507.
- [16] Kahneman, D., Krueger, A. (2006). ‘Developments in the measurement of subjective well-being’, *Journal of Economic Perspectives*, vol. 20 (1), pp. 3-24.
- [17] Kenny, C. (1999). ‘Does growth cause happiness, or does happiness cause growth?’, *Kyklos*, vol. 52 (1), pp. 3-23.

- [18] Khwaja, A., Silverman, D., Sloan, F. (2006). ‘Time preference, time discounting, and smoking decisions’, NBER Working Paper 12615.
- [19] Lyubomirsky, S., King, L., Diener, E. (2005). ‘The benefits of frequent positive affect: does happiness lead to success?’, *Psychological Bulletin*, vol. 131 (6), pp. 803-855.
- [20] Mastekaasa, A. (1992). ‘Marriage and psychological well-being: Some evidence on selection into marriage’, *Journal of Marriage and the Family*, vol. 54 (4), pp. 901-911.
- [21] Moulton, B.R. (1990). ‘An illustration of a pitfall in estimating the effects of aggregate variables on micro units’, *Review of Economics and Statistics*, vol. 72 (2), pp. 334-338.
- [22] Oswald, A.J., Powdthavee, N. (2007). ‘Death and the calculation of hedonic damages’, University of Warwick Working Paper.
- [23] Oswald, A.J. (1997). ‘Happiness and economic performance’, *Economic Journal*, vol. 107 (445), pp. 1815-1831.
- [24] Ozdenoren, E., Salant, S., Silverman, D. (2006). ‘Willpower and the optimal control of visceral urges’, NBER Working Paper 12278.
- [25] Rabin, M. (1998). ‘Psychology and economics’, *Journal of Economic Literature*, vol. 36 (1), pp. 11-46.
- [26] Rehdanz, K., Maddison, D. (2005). ‘Climate and happiness’, *Ecological Economics*, vol. 52 (1), pp. 111-125.

- [27] Schwarz, N., Clore, G.L. (1983). ‘Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states’, *Journal of Personality and Social Psychology*, vol. 45 (3), pp. 513-523.
- [28] Smith, A. (1759). *The Theory of Moral Sentiments*. New York: Prometheus Publishing.
- [29] Staiger, D., Stock, J.H. (1997). ‘Instrumental variables regression with weak instruments’, *Econometrica*, vol. 65 (3), pp. 557-586.
- [30] Stock, J.H., Yogo, M. (2002). ‘Testing for weak instruments in linear IV regression’, NBER Working Paper 284.
- [31] Tversky, A., Kahneman, D. (1973). ‘Availability: A heuristic for judging frequency and probability’, *Cognitive Psychology*, vol. 5 (2), pp. 207-232.
- [32] Tversky, A., Kahneman, D. (1974). ‘Judgment under uncertainty: Heuristics and biases’, *Science*, vol. 185 (4157), pp. 1124-1131.
- [33] Van Praag, B.M.S. and Ferrer-i-Carbonell, A. (2004). *Happiness Quantified. A Satisfaction Calculus Approach*. Oxford: Oxford University Press.
- [34] Wagner, G.G., Frick, J.R., Schupp, J. (2007). The German Socio-Economic Panel Study (SOEP)- scope, evolution and enhancements. *Schmollers Jahrbuch* 127, 139-169.

Table 1: **Transitory Sunshine Changes and Happiness: The Netherlands**

Dependent Variable: Self-Reported Happiness		
	coef.	<i>t</i> -stat.
1) Average duration of daily sunshine:		
Last 10 day deviation	0.04	3.4
F-statistic	17.3	
Number of observations	17654	
R-squared	0.09	
2) Maximum duration of daily sunshine:		
Last 10 day deviation	0.06	4.7
F-statistic	22.4	
Number of observations	17654	
R-squared	0.09	
3) Daily cloud cover:		
Last 10 day deviation	−0.04	3.6
F-statistic	12.7	
Number of observations	15562	
R-squared	0.09	

Notes: Ordered logit regressions of self-reported happiness on measures of sunshine and control variables. Each row reports estimates for different measures of sunshine. Happiness is a categorical variable taking values between 1 and 5. Measures of sunshine are province level daily sunshine variables taken from weather stations. The “last 10 day deviation” is the weighted average of the last 10 days of sunshine measures minus the average of the last 10 days of sunshine measures over the last 60 years. The controls for the regressions are: labor force status, marital and health status, income, number of children, gender, household size, age, province fixed effects, and year fixed effects.

Table 2: **Transitory Weather Shocks to Happiness and Savings Behaviors: The Netherlands**

	OLS		IV	
	coef.	<i>t</i> -stat.	coef.	<i>t</i> -stat.
1) Recently, have you saved any money?				
Happiness	0.05	9.3	0.45	1.9
Number of observations	21123		16574	
2) Recently, how much money have you saved?				
Happiness	0.04	3.3	1.10	2.1
Number of observations	16109		11084	
3) Do you think it makes sense to save money?				
Happiness	-0.09	9.3	-1.01	2.1
Number of observations	21261		16843	

Notes: Each row reports the estimates for various outcomes. The dependent variables are the answers to the following questions: 1) “Did your household recently put any money aside, yes or no?” 2) “About how much money has your household put aside recently? 1. > 1.500; 2. 1.500-5.000; 3. 5.000-12.500; 4. 12.500-20.000; 5. 20.000-37.500; 6. 37.500-75.000; 7. ≥ 75000.” 3) “Do you think it makes sense to save money, considering the current general economic situation? 1. yes, certainly; 2. yes, perhaps; 3. probably not; 4. certainly not.” IV-GMM is used for the instrumental variable regressions. The instrument for happiness is the the last ten day cloud cover deviation. The F-statistic after the first stage tests the validity of the instrument. Health and happiness are categorical variables taking values from 0 to 5, but are treated as continuous variables here. Controls: Health status, income, age, number of children, schooling, household size, gender, work status, marital status, province and year fixed effects.

Table 3: **Why Do Happier People Save More? Discounting and Self-Control: The Netherlands**

	OLS		IV	
	coef.	t-stat.	coef.	t-stat.
1) I work on things that will pay off in only a couple of years				
Happiness	-0.11	4.2	-1.87	2.6
Number of observations	21426		10854	
2) I am only concerned about the immediate consequences				
Happiness	-0.05	2.1	-1.86	2.8
Number of observations	13456		9787	
3) Do you find it difficult to control your expenditures?				
Happiness	-0.29	14.7	-1.71	2.1
Number of observations	17506		12318	
4) Little self-control or disciplined?				
Happiness	0.03	1.7	9.82	3.1
Number of observations	16056		13620	

Notes: Each row reports the estimates for various outcomes. The dependent variables are the answers to the following questions: Please indicate on a scale from 1 to 7 to what extent you agree with the following statement, where 1 indicates totally disagree and 7 indicates totally agree 1) "I often work on things that will only pay off in a couple of years." 2) "With everything I do, I am only concerned about the immediate consequences (say a period of a couple of days or weeks)." 3) "Many people find it difficult to plan or control their expenditures. Do you find it difficult to control your expenditures?" " 4) "Do you have little self-control or are you very disciplined? Where 1 indicates little self-control and 7 indicates very disciplined." The IV-GMM is used for the instrumental variable regressions. The instrument for happiness is the last ten day cloud cover deviation. The F-statistic after the first stage tests the validity of the instrument. Health and happiness are categorical variables taking values from 0 to 5, but are treated as continuous variables here. Controls: Health status, income, age, number of children, schooling, household size, gender, work status, marital status, province and year fixed effects.

Table 4: **Why Do Happier People Save More? The Role of Expectations: The Netherlands**

	OLS		IV	
	coef.	t-stat.	coef.	t-stat.
1) Do you expect prices to go down, stay same, or rise next year?				
Happiness	−0.03	4.2	−0.61	2.1
Number of observations	17456		13560	
2) How much do you expect prices to rise after 5 years?				
Happiness	−0.54	5.4	−9.98	2.1
Number of observations	15942		12362	
3) Subjective life expectancy				
Happiness	2.02	4.1	11.12	2.9
Number of observations	12560		10075	
4) Slow or quick while making decisions?				
Happiness	0.13	7.2	4.64	2.9
Number of observations	16864		13962	

Notes: Each row reports the estimates for various outcomes. The dependent variables are the answers to the following questions: 1) “Do you expect prices in general to rise, to remain the same, or to go down, in the next 12 months? 1. go down 2. remain the same 3. rise” 2) “By what percentage do you expect prices in total to have risen after 5 years?” 3) “How many years do you expect to live?” 4) “While making your decisions are you a slow thinker or quick thinker?” The IV-GMM is used for the instrumental variable regressions. The instrument for happiness is the last ten day cloud cover deviation. The F-statistic after the first stage tests the validity of the instrument. Health and happiness are categorical variables taking values from 0 to 5, but are treated as continuous variables here. Controls: Health status, income, age, number of children, schooling, household size, gender, work status, marital status, province and year fixed effects.

Table 5: **Yearly Average Sunshine and Happiness: The Netherlands and Germany**

Dependent Variable: Self-Reported Happiness		
	coef.	t-stat.
Netherlands		
1) Daily cloud cover: Yearly average	−0.16	2.5
F-statistic	6.7	
Number of observations	15570	
R-squared	0.10	
2) Average duration of daily sunshine: Yearly average	0.05	2.0
F-statistic	5.3	
Number of observations	17540	
R-squared	0.10	
3) Maximum duration of daily sunshine: Yearly average	0.06	2.1
F-statistic	6.1	
Number of observations	17540	
R-squared	0.10	
Germany		
4) Daily cloud cover: Yearly average	−0.11	5.5
F-statistic	29.6	
Number of observations	118916	
R-squared	0.26	

Notes: Ordered logit regressions of self-reported happiness on measures of sunshine and control variables. Each row shows estimates from different regressions. Happiness is a categorical variable taking values from 1 to 5. Measures of sunshine are province-level yearly sunshine variables for the Netherlands and state-level yearly sunshine variables for Germany. “Yearly average” is the average sunshine over 365 days for each province or state in a year. The controls for the regressions are: labor force status, marital and health status, income, number of children, gender, household size, age, province fixed effects, and year fixed effects.

Table 6: **Permanent Weather Shocks to Happiness and Economic Behavior: The Netherlands**

	OLS		IV	
	coef.	t-stat.	coef.	t-stat.
1) Have you saved any money this year?				
Happiness	0.05	9.3	0.83	1.9
Number of observations	21062		17408	
2) Marginal propensity to save				
Happiness	0.07	4.9	0.83	2.3
Number of observations	20802		15652	

Notes: Each row reports the estimates for various outcomes. The dependent variables are the answers to the following questions: 1) “Has your household put aside any money in the last 12 months, yes or no?” 2) “Some people spend all their income immediately. Others save some money in order to have something to fall back on. Please indicate what you do with money that is left over after having paid for food, rent, and other necessities, on a scale from 1 to 7, where 1 means ‘I like to spend all my money immediately’ and 7 means ‘I want to save as much as possible.’ The IV-GMM is used for the instrumental variable regressions. The instrument for happiness is the regional yearly average cloud cover. The F-statistic after the first stage tests the validity of the instrument. Health and happiness are categorical variables taking values from 0 to 5, but are treated as continuous variables here. Controls: Health status, income, age, number of children, schooling, household size, gender, work status, marital status, province and year fixed effects.

Table 7: **The Impact of Happiness on Savings and Consumption Decisions in Germany**

	OLS		IV	
	coef.	t-stat.	coef.	t-stat.
1) Do you save monthly this year?				
Happiness	0.95	11.6	−1.15	4.1
2) Average monthly savings this year				
Happiness	0.03	11.8	0.38	2.2
3) Average monthly expenditures this year				
Happiness	−0.11	2.6	10.36	3.2
4) Average weekly expenditures this year				
Happiness	0.08	9.7	0.69	4.1
5) Do you have debt?				
Happiness	0.08	9.7	0.69	4.1
6) Amount of monthly debt				
Happiness	0.08	9.7	0.69	4.1
Number of observations	12456		11624	

Notes: Each row reports the estimates for various outcomes. The dependent variables, in order, are as follows: 1) Binary variable taking the value 1 if an individual saves money monthly, 0 otherwise. 2) Amount of real monthly savings. 3) Amount of real monthly expenditures. 4) Amount of real weekly expenditures. 5) Binary variable which is the answer to the question “Last month did you use a certain amount of money to pay back loans that was used to finance purchases? (excluding interest payment of mortgages and loans from a building society).” 6) Amount of real monthly credit debt which is the answer to the question “Last month how much money did you use to pay back loans that was used to finance purchases? (excluding interest payment of mortgages and loans from a building society).” The IV-GMM is used for the instrumental variable regressions. The instrument for happiness is the regional yearly average cloud cover. Health and happiness are categorical variables taking values from 0 to 10, but are treated as continuous variables here. All independent variables are scaled by 100. Controls: Labor force status, marital and health status, income, number of children, number of household members, age, race, state and year fixed effects.

8 Appendix: NOT FOR PUBLICATION

Transition Probability: The paper shows simple transition probabilities for self-reported happiness and for the regional residence of individuals. They allow us to observe the time series behavior of happiness and the mobility of individuals.⁶ The transition probability from state i (say, “very happy”) to state j is calculated as the number of individuals who report the state of happiness i in year $t - 1$ *and* report the state of happiness j in year t , divided by the total number of individuals who report the state of happiness i in year $t - 1$. The transition probability is computed as follows:

$$p_{ij} = \sum_{it} N_{ij} / \sum_{it} N_i , \quad (6)$$

where p_{ij} is the transition probability from state i to state j . N_{ij} is the individual N who reports state i in year $t - 1$ *and* state j in year t . N_i is the individual who reports state i in year $t - 1$.

⁶This information is very important for the validity of the instruments and the correct use of the dependent variables which are discussed in the robustness part.

Table 8: **Descriptive Statistics: Individual Characteristics and Happiness: The Netherlands**

Happiness:	very unhappy	unhappy	happy nor unhappy	happy	very happy	Total
Labor force status:						
employed on contract	0	0	10	62	28	60
own business	0	1	13	67	19	15668
free profession, self-employed	0	0	13	65	22	585
looking for work after lost job	0	1	13	64	22	356
looking for first-time work	1	2	27	56	13	464
student	1	4	22	65	8	114
own household	0	1	15	70	14	1682
retired	0	1	13	67	19	5012
disabled	0	0	14	68	18	4321
unpaid work	0	3	25	60	12	1392
volunteer	0	1	17	62	20	415
other	0	1	19	60	20	733
Marital status:						
married (community of property)	0	0	11	68	21	16990
married (marriage settlement)	0	0	10	64	26	2384
divorced	0	3	34	58	5	1240
living with partner (not married)	0	1	11	66	22	2325
widowed.	0	2	31	61	6	872
never married	0	2	22	66	10	4645
Health status:						
poor	7	11	34	40	8	152
not so good	0	6	36	48	10	843
fair	0	2	28	60	10	4207
good	0	0	12	71	17	15886
excellent	0	0	6	60	34	5415
Gender:						
male	0	1	15	66	18	15793
female	0	0	15	66	19	13223

Notes: The table shows summary statistics of happiness categories (very happy, happy, neither happy nor unhappy, unhappy, very unhappy) by work status, marital status, and health status. The numbers are row frequencies shown as percentages and rounded to the nearest integer. Total is the total number of people in the corresponding row category

Table 9: **Descriptive Statistics: Individual Characteristics and Happiness: Germany**

Happiness:	very unhappy	unhappy	happy nor unhappy	happy	very happy	Total
Labor force status:						
non-working	2	6	23	47	22	18918
non-working:						
age 65 and older	4	6	24	44	23	20131
in education-training	2	4	17	53	24	5210
maternity leave	1	5	15	54	24	1454
military-community service	3	7	20	53	16	456
unemployed	9	14	31	34	11	3907
sometimes secondary job	2	5	20	53	21	2034
work past 7 days	5	6	20	54	16	266
regular secondary job	2	6	24	49	20	1885
working	1	5	20	55	20	74104
working:						
non-working past 7 days	1	3	20	57	18	145
Marital status:						
married	2	5	20	52	21	79028
single	2	6	19	53	20	30341
widowed	4	7	27	43	20	10269
divorced	4	8	29	47	13	7120
separated	5	11	28	42	13	1741
spouse in native country	0	20	20	60	9	5
Health status:						
very good	0	1	7	48	43	5844
good	1	2	13	63	21	25388
satisfactory	1	5	28	55	11	21325
poor	3	14	38	39	6	8669
bad	24	26	32	15	3	2422

Notes: The table shows summary statistics of happiness categories by work status, marital status, and health status. The numbers are row frequencies shown as percentages and rounded to the nearest integer. The original happiness variable for Germany is a categorical variable taking values from 0 to 10 (where 0 is totally unhappy and 10 is totally happy) but recoded here as follows: (0,1,2) very unhappy, (3,4) unhappy, (5,6) neither happy nor unhappy, (7,8) happy, (9,10) very happy.

Table 10: **Descriptive Statistics: Individual Characteristics and Happiness: Germany**

Happiness:	very unhappy	unhappy	happy nor unhappy	happy	very happy	Total
Education:						
secondary school	3	6	24	48	20	68737
intermediate school	1	5	19	54	22	29748
technical school	2	6	18	56	19	5863
upper secondary	1	5	16	58	20	17360
dropout, no degree yet	3	6	21	46	24	3469
no degree yet	1	4	14	53	28	804
Gender:						
male	2	5	20	53	20	61472
female	2	6	22	49	21	67038

Notes: The table shows summary statistics of happiness categories by the highest degree earned and gender. The numbers are row frequencies shown as percentages and rounded to the nearest integer. The original happiness variable for Germany is a categorical variable taking values from 0 to 10 (where 0 is totally unhappy and 10 is totally happy), but is recoded here as follows: (0,1,2) very unhappy, (3,4) unhappy, (5,6) neither happy nor unhappy, (7,8) happy, (9,10) very happy.

Table 11: **Descriptive Statistics: Individual Characteristics and Happiness**

Happiness:	very unhappy	unhappy	happy nor unhappy	happy	very happy
The Netherlands					
Household size	2	2	2	3	3
Income	327	353	343	414	447
Number of children	1	1	1	1	1
Age	40	45	48	47	46
Germany					
Household size	3	3	3	3	3
Income	416	465	478	558	572
Number of children	0	1	1	1	1
Age	50	46	47	44	45

Notes: The table shows summary statistics of household size, income, number of children, and age for Germany and the Netherlands by happiness categories. The numbers are averages of the row variables by happiness categories and rounded to the nearest integer. Happiness takes values 1-5 for the Netherlands. The original happiness variable for Germany is a categorical variable taking values from 0 to 10, but is recoded here as follows: (0,1,2) very unhappy, (3,4) unhappy, (5,6) neither happy nor unhappy, (7,8) happy, (9,10) very happy.

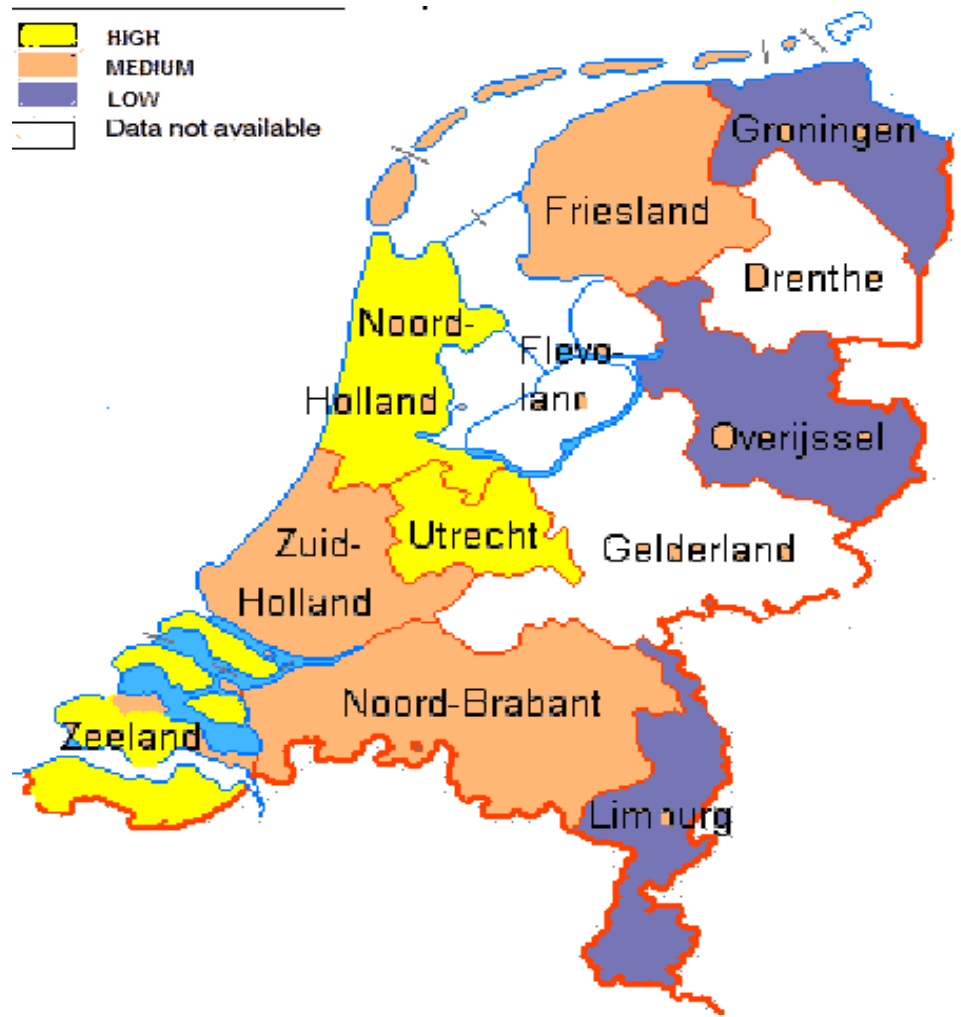


Figure 1: Average Sunshine in the Netherlands



Figure 2: Average Sunshine in Germany

Table 12: **Transition Matrices of Happiness**

The Netherlands						
Current happiness:		very low	low	middle	high	very high
Happiness : previous: year:	very low	24	36	9	27	3
	low	6	33	41	17	1
	middle	1	3	60	36	1
	high	0	0	8	81	11
	very high	0	0	1	40	59
Total		0	1	14	66	18
Germany						
Current happiness:		very low	low	middle	high	very high
Happiness : previous: year:	very low	29	22	27	16	5
	low	8	25	39	23	4
	middle	3	10	43	39	5
	high	0	3	17	66	14
	very high	0	1	7	41	51
Total		2	6	21	52	19

Notes: The table shows probabilities of current happiness conditional on happiness in the previous year. The sample for the Netherlands covers nearly 32000 panel observations. The original happiness variable for Germany is a categorical variable taking values from 0 to 10, but is recoded here as follows: (0-1-2) very low, (3-4) low, (5-6) middle, (7-8) high, and (9-10) very high. All numbers are rounded to the nearest integer in percentages.

Table 13: **Individual Correlates of Happiness: The Netherlands**

Dependent Variable: Self-Reported Happiness		
	Coef.	t-stat.
Labor force status:		
employed on contract	−0.33	0.9
own business	−0.19	0.5
free profession, self-employed	−0.35	0.9
looking for work after lost job	−0.82	2.1
looking for first-time work	−1.03	2.1
student	−0.16	0.4
own household	−0.45	1.2
disabled	−0.43	1.1
unpaid work	−0.91	2.1
volunteer	−0.36	1.1
Health status:		
not so good	0.96	4.5
fair	1.39	6.9
good	2.37	11.8
excellent	3.30	16.2
Marital status:		
married (marriage settlement)	0.15	2.9
divorced	−1.05	10.8
living with partner (not married)	−0.15	2.4
widowed	−0.95	8.8
never married	−1.04	12.0
Household size	0.33	4.6
Children	−0.40	5.4
Income	0.21	6.8
Male	−0.25	7.1
Age	−0.01	4.5
R-squared	0.09	
Number of observations	20644	

Notes: Ordered logit regression of self-reported happiness on individual characteristics. Province fixed effects and year fixed effects are included in the regression. The dummy for 1993 is excluded. Dummies for the provinces Flevoland and Overijssel are significantly positive, but the other province dummies are insignificant. All of the year dummies are insignificant except the dummy for 2000, which is negative.

Table 14: **Individual Correlates of Happiness: Germany**

Dependent Variable: Self-Reported Happiness

	Coef.	t-stat.
Labor force status :		
part-time working	−0.08	5.2
not working	−0.03	3.1
Marital status:		
single	−0.21	13.6
widowed	−0.31	16.2
divorced	−0.55	26.6
separated	−0.85	21.4
not with partner	−1.22	1.7
Health	0.42	82.9
Children	−0.03	4.1
Household size	−0.05	8.4
Education	0.04	2.4
Income	0.47	26.1
Female	0.12	11.9
Age	0.01	34.3
R-squared	0.28	
Number of observations	120102	

Notes: OLS regression of life satisfaction on individual characteristics controlling for state fixed effects and year fixed effects. Individual Satisfaction is a categorical variable from 0 to 10, but is used as a continuous variable here. The estimates are similar to ordered logit estimates. Health is a categorical variable from 1 to 5 and income is in thousands.

Table 15: **Importance of Different Aspects of Life: Germany**

Dependent Variable: Total Life Satisfaction

	OLS		Fixed Effects	
	Coef.	t-stat.	Coef.	t-stat.
Satisfaction with:				
work	0.13	27.7	0.10	18.6
leisure	0.09	22.2	0.07	13.0
housework	0.02	5.1	0.02	3.8
income	0.18	38.0	0.13	21.5
health	0.22	46.7	0.15	25.1
environment	0.04	8.4	0.03	5.2
dwelling	0.09	18.9	0.06	10.4
R-squared	0.44		0.18	
No. of obs.	22778		22778	

Notes: Regression of total life satisfaction on different aspects of life satisfaction. All variables in the regression are categorical variables from 0 to 10, but is used as continuous variables. The R-squared from the between effects estimation is 0.56.

Table 16: Do People Move Across Regions? Transition Matrix of Residence: The Netherlands

Current residence:		three largest cities	west	north	east	south
Residence:	three largest cities	99	0	0	0	0
previous:	west	0	99	0	0	0
year:	north	0	0	100	0	0
	east	0	0	0	100	0
	south	0	0	0	0	100
Total		16	29	11	20	24

Notes: This table shows the probabilities of current regional residence conditional on regional residence in the previous year. The sample covers 70000 panel observations and there are 5 regions in the Netherlands: the three largest cities, South Holland, North Holland, East Holland, and West Holland. All numbers are rounded to the nearest integer in percentages.

Table 17: **Happiness and Working Hours: The Netherlands**

	OLS		IV	
	coef.	t-stat.	coef.	t-stat.
Average working hours in a week				
Happiness	-0.03	0.3	2.03	0.4
Average working hours in a week at current job				
Happiness	-0.11	4.2	8.59	0.9
Number of hours would like to work in a week				
Happiness	0.04	0.2	9.01	1.3
Number of observations	13750		13526	

Notes: Each row reports the estimates for different measures of working hours. The IV-GMM is used for the instrumental variable regressions. The instrument for happiness is regional yearly cloud cover. The F-statistic after the first stage tests the validity of the instrument. Health and happiness are categorical variables taking values from 0 to 10, but are treated as continuous variables here. Controls: Health status, income, age, number of children, schooling, household size, gender, work status, marital status, state and year fixed effects.

VARIABLES USED IN THE PAPER:

Independent Variables: **Health status:** Excellent, good, fair, and poor. **Marital Status:** Married, widowed, divorced, separated, and never married. **Labor force status:** Working full-time, working part-time, temporarily not working, unemployed, retired, school, keeping house, and others. **Gender:** Male and female. **Age:** Survey year minus year of birth. **Household size:** Number of people living in the household. **Education:** Number of years of schooling. **Children:** Number of children.

Dependent Variables:

1) Did your household recently put any money aside, yes or no? 2) About how

much money has your household put aside recently? 1. > 1500; 2. 1500-5000; 3. 5000-12 500; 4. 12 500-20 000; 5. 20 000-37 500; 6. 37 500-75 000; 7. >75 000. **3)** Do you think it makes sense to save money, considering the current general economic situation? 1. yes, certainly; 2. yes, perhaps; 3. probably not; 4. certainly not. **4)** I often work on things that will only pay off in a couple of years. **5)** With everything I do, I am only concerned about the immediate consequences (say a period of a couple of days or weeks). **6)** Many people find it difficult to plan or control their expenditures. Do you find it difficult to control your expenditures? **7)** Do you have little self-control or are you very disciplined? Where 1 indicates little self-control and 7 indicates very disciplined. **8)** Do you expect prices in general to rise, to remain the same, or to go down, in the next 12 months? 1. go down; 2. remain the same; 3. rise **9)** By what percentage do you expect prices in total to have risen after 5 years? **10)** How many years do you expect to live? **11)** While making your decisions are you a slow thinker or quick thinker? **12)** Has your household put aside any money in the last 12 months, yes or no? **13)** Some people spend all their income immediately. Others save some money in order to have something to fall back on. Please indicate what you do with money that is left over after having paid for food, rent, and other necessities on a scale from 1 to 7, where 1 means “I like to spend all my money immediately” and 7 means “I want to save as much as possible.” **14)** Binary variable taking the value 1 if an individual saves money monthly, and 0 otherwise. **15)** Amount of real monthly savings. **16)** Amount of real monthly expenditures. **17)** Amount of real weekly expenditures. **18)** Binary variable which is the answer to the question “Last month did you use a certain amount of money to pay back loans that was used to finance purchases?”

(excluding interest payment of mortgages and loans from a building society).” **19)**

Amount of real monthly credit debt which is the answer to the question “Last month how much money did you use to pay back loans that was used to finance purchases? (excluding interest payment of mortgages and loans from a building society.)”