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Weather and Financial Risk-Taking: Is Happiness the Channel?

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Is Happiness the Channel?

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Abstract

Weather variables, in particular sunshine, are found to be strongly correlated with financial variables. I consider self-reported happiness as a channel through which sunshine affects financial variables. I examine the influence of happiness on risk-taking behavior by instrumenting individual happiness with regional sunshine. I find that happy people appear to be more risk-averse in financial decisions and (accordingly) choose safer investments. Happy people take more time for making decisions and have more self-control. Happy people also expect a longer life and (accordingly) seem more concerned about the future than the present and expect less inflation.

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Keywords: happiness, risk-taking, behavioral finance, weather.

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Weather variables, in particular sunshine, are found to be strongly correlated with financial variables (Subrahmanyam (2007)). I consider self-reported happiness as a channel through which sunshine affects financial variables. Firstly, there are *mixed* results on the influence of weather on financial variables. Hirshleifer and Shumway (2003) show that there is a relationship between morning sunshine in the city of a country's leading stock exchange and daily market index returns across 26 countries from 1982 to 1997. They find that sunshine is significantly correlated with stock returns. Moreover, Keef and Roush (2005) show the influence of sunshine on on the interest rates of bank bills, government bonds, and the returns of stock indices in New Zealand. They (2007) find that sunshine and temperature are also significantly correlated with stock market returns in Australia. Floros (2008) finds the same relationship between temperature and stock market returns in Europe. On the other hand, Gerlach (2007) shows that market response to macroeconomic news, not psychological or institutional factors, is the main source of calendar and weather anomalies. Jacobsen and Marquering (2008) argue that the correlation between climate and stock returns might be spurious. Loughran and Schultz (2004) find little evidence that cloudy weather in the city in which a company is based affects its returns.

Secondly, besides these mixed evidences, the *channels* through which weather

might affect financial variables are also unclear. Based on their findings, Goetzmann and Zhu (2005) claim that behavior of market-makers, rather than individual investors, maybe responsible for the relation between returns and weather. In this respect, psychological factors, specifically happiness, can be investigated to inform people on policy issues (Frey and Stutzer (2002), Kahneman and Krueger (2006), Lyubomirsky, King, and Diener (2005)). Kamstra, Kramer, and Levi (2005) find that there is a connection between equity returns and sleep disruptions following daylight-savings time changes. Happiness also can explain various individual behavior (Camerer, Loewenstein, and Prelec (2005)). Recently, Huang and Goo (2008) document the relationship between investors' happy sentiment and overconfidence. Kamstra, Kramer, and Levi (2000) find that stock returns are significantly related to the amount of daylight through the fall and winter. This can be due to shortness of the days in fall and winter which leads to depression, in turn, causes heightened risk aversion. They argue that their findings show evidence of a link between seasonal depression and seasonal variation in stock returns. In addition, Garrett, Kamstra, and Kramer (2003) argue that the Seasonal Affective Disorder (SAD) effect arises due to the heightened risk aversion that comes with seasonal depression, reflected by a changing risk premium.

Thirdly, studies on the relationship between weather and financial variables

focus on macro data. *Individual level* data has not been exploited in these studies yet. The main focus of this paper is to show that *self-reported happiness* is one of the the channels through which weather, specifically sunshine, affects individual risk- taking behavior by using two panel surveys from Germany and the Netherlands. Establishing this relationship might explain the correlation between weather and financial variables reported in the literature. Understanding this relationship can also help determine the extent to which the findings from this research should be incorporated into policy analysis. The paper establishes a causal relationship going from happiness, instrumented with regional sunshine, to risk-taking behavior. I use regional sunshine as an exogenous instrument for current individual happiness. This study employs two sets of panel data. The first one is from the Dutch National Bank (DNB) Household Survey, which tracks about 4500 individuals from 1993 to 2006. The second one is from the German Socio-Economic Panel (SOEP), which is a panel of about 21000 individuals from 1984-2006. The above two surveys provide self-reported measures of well-being, such as responses to questions about how happy and satisfied individual respondents are with their lives and importantly, very detailed information on wealth and different measures of risky behavior.

This study makes a number of novel contributions in the literature. I develop an

instrumental variables estimation method that addresses the potential endogeneity of individual happiness. I find that exogenous increases in regional sunshine increase happiness. The paper uses two instruments for happiness. By matching the exact dates of individuals' answers to "happiness" questions in the surveys with weather data, the paper first uses the transitory sunshine changes as an instrument. The paper also uses yearly regional averages of sunshine as an instrument for current happiness. Then, I address the unexplored issue of whether subjective well-being helps determine individual risk-taking behavior. Establishing this direction of causality by instrumenting individual happiness by "regional sunshine," the paper finds that happy people appear to be more risk-averse in financial decisions and (accordingly) choose safer investments. The paper finds the following for happy people. First, they are more likely to have life insurance, savings accounts, and operating assets but less likely to own stocks and bonds. Second, they also have less desire to invest in shares because they find them too risky. The different behaviors of happy people may be due to taking more time for making decisions and having more self-control. They also expect a longer life and (accordingly) seem more concerned about the future than the present; they also seem to expect less inflation in the future. Secondary findings related to other forms of risk-taking behavior suggest that happy people are less likely to smoke and have less desire

to move within a country. They also use internet banking and phone banking less frequently, and prefer to use bank branches instead of ATMs. The secondary results imply that risk-taking in different aspects of life might not be independent from each other and future research can investigate the relationship between different forms of risky behavior and financial variables.

The rest of the paper is organized in the following way. Section 2 provides an overview of the related economic literature on correlates of well-being and the impact of well-being on risk-taking behavior. Section 3 summarizes the data. Section 4 gives details about the empirical strategies and the details about the identification strategy. Section 5 presents the descriptive statistics and the empirical results. Section 6 concludes.

I Related Literature

A Correlates of Happiness

Happiness has been studied extensively in psychology so far. However, it was not until 1974 that it was noticed by economists (Easterlin, 1974). There have been many studies on the relationship between *individual characteristics* and happiness. A U-shaped relationship between *age* and happiness has been identified (Oswald

1997, Blanchflower, and Oswald, 2004). Considering the *race* in the United States, it has been found that that blacks are less happy than whites. *Health* has been found as the strongest predictor for happiness. In a large number of studies to different countries and periods, *marriage* is found to be correlated with higher levels of happiness. There is little relationship between happiness and the level of *education*. Education may indirectly contribute to happiness 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) explain differences in self-reported levels of happiness by *weather* in a panel of 67 countries. They find that climate variables have powerful effect on self reported levels of happiness controlling for a range of other factors. Van Praag and Ferrer-i-Carbonell (2004) and Van Praag and Frijters (1998) also study the influence of climate on happiness. They show that climate variables such as rain, hours of sunshine, average temperature, and windiness are strongly correlated with household costs, financial satisfaction, and general satisfaction. Becchetti, Castriota, and Londono (2007) estimate the related gains and losses (in terms of happiness) arising from the climate changes when individuals move from one city to another (e.g. from Paris to Madrid). They show significant links between happiness and several climatic factors (rain, fog, temperature, wind).

II Data

The *DNB Household Survey* (formerly known as the CentER Savings Survey) is a panel survey that started in 1993. Data are collected annually with a panel of more than 2,000 households and is representative of the Dutch population. The *DNB Household Survey* (DHS) data are unique in the sense that they allow studies of both psychological and economic aspects of financial behavior. The DHS consists of six questionnaires. The topics covered by each of the questionnaires are: i) general information on the household which includes regions and provinces of 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 CentERpanel, of 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 a time that is convenient for them during a year, and all the documents (annual statements, bank account statements) required for answering the questions are within easy reach. However, once they

have begun one of the six parts they are required to finish entirely. Since the economics and psychology parts are given together, people answer the economic behavior questions on the same day 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, people answer the happiness question on different days and months during a year, which supplies extra variation within a year when happiness is instrumented with unexpected daily sunshine changes. Happiness is a categorical variable taking values 0-5. Dependent variables (measures of risky behavior) are available in different forms: i) binary variable such as whether a person expects prices to go down or ii) continuous variable such as perceived longevity. DHS also includes various subjective variables such as whether a person considers investing in shares or not 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 about 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 taking values 0-10. Dependent variables (measures of risky behavior) are available in different forms: i) binary variable such as whether a person owns stocks or bonds or not ii) subjective variable such as whether a person considers moving to another state or not based on a four point scale.

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 is measured four times at 00, 06, 12 and 18 in a day. *Mean daily cloud cover* is calculated as CC/4. This value in percent is converted to octa's by rounding ((cloud cover in percents/100)*8). Sunshine duration (SS) is measured four times 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*.

III Empirical Framework

Instrumental Variables Estimation:

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

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

The matrix of regressors X, which includes happiness as well, 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 $n \times n$. Say, happiness is endogenous in the regression and 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 :

$$Regressors \;\; X = [X_1 \;\; X_2] = [Endogenous \;\; Exogenous] \tag{2}$$

$$Instruments \;\; Z = [Z_1 \;\; Z_2] = [Excluded \;\; Included] \tag{3}$$

If there is only one excluded instrument, then the equation is "exactly identified"; if more than one, then the equation is "overidentified." The instrumental

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

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

If the covariance matrix Ω is homoscedastic, 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 to address this problem is GMM. In this case, if the equation is exactly identified then GMM estimator is the IV estimator. If the equation is overidentified, then the GMM estimator is:

$$\hat{\beta}_{GMM} = [X'ZWZ'X]^{-1}X'ZWZ'y \tag{5}$$

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 a valid instrument, 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 is reported which has been suggested by Stock and Yogo (2002) for testing the presence of weak instruments (i.e., that the equation is only weakly identified). See Stock and Yogo (2002) for a tabulation of critical values for the Cragg-Donald statistic. Since my model includes only one endogenous regressor, i.e. the 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 Happiness *Daily sunshine changes.* I find that daily expected sunshine changes do not affect risk-taking behavior. If it is already known that tomorrow is going to be sunny, it would not change individual behavior. What matters for the risk-taking behavior is the unexpected but not the expected sunshine. The first instrument for happiness is the unexpected daily sunshine changes as observed at the station level. I match the daily sunshine data with individual happiness data since I know exactly the date when the respondents answer the "happiness" question. First, I calculate the last ten day weighted average of regional sunshine [2] and calculate the average of this last 10 day average

[1] See Baum, Schaffer, and Stillman (2003) for more discussion of IV-GMM and its implementation in Stata.

[2] Closer date to survey date is given a higher weight.

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 is the 10th of October 2009, I calculate the weighted average sunshine from October 1, 2009 to October 10, 2009 for a region. Then, I find the average sunshine between October 1 and October 10 for that region between 1949 and 2009. Then, I subtract the latter from the former to find the unexpected sunshine. Three measures of 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 precisely match the weather data with an individual's residence because only state of residence information is available. Weather data are available for 61 stations in Germany, and there are several stations in a state. Since states are very large and within-state weather variation is very high, it is very likely that average sunshine in a state does not represent the weather in every part of a state. The major difference between cloud coverage and sunshine (hours) is the seasonality, because there are less sunshine hours in winter. In autumn and winter, there is quite often fog and low level stratus in the valleys, while up the

[3]This is the time period which people experiences weather changes in their life time. Average life expectancy is around 70 years.

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 the empirical analysis, which does not change much within a state and represents more people, I focus only on cloud cover as a measure of sunshine.

Yearly average sunshine. The second instrument is the regional yearly sunshine average. The regional yearly sunshine average is calculated as the average of sunshine measure for a state or province over 365 days in a year. Sunshine measure is very sensitive to altitude, angle of the sunshine rays, clouds, wind, and to environment. However, sunshine data from high altitude stations do not match places where people live. On the other hand, cloud cover does not vary from people's residence to the stations. As a result, cloud cover is used as the measure of sunshine in the empirical framework. See the figures 1 and 2 for the regional sunshine averages for Germany and the Netherlands. Both yearly sunshine averages and daily sunshine changes affect happiness. However, unexpected daily sunshine changes influence happiness only in the short-run. Hence, unexpected daily sunshine changes are expected to change consumption behavior temporarily. However, yearly sunshine changes can change consumption behavior permanently.

IV Empirical Results

A Descriptive Statistics:

Considering the first stage, Table VIII and Table IX show the relationship between labor force status, marital status, health status, gender, and happiness. Happiness is a categorical variable taking values 1-5 in order refers to "very unhappy," "unhappy," "neither happy nor unhappy," "happy," and "very happy" categories for the Netherlands. People in the Netherlands are on average happy. Approximately 90 percent of the people who answered the happiness question reported the highest three categories of happiness (neither happy nor unhappy, happy, and very happy). Consider labor force status: unemployed people seem to be relatively unhappy. Twenty seven percent of first time job seekers and 22 percent of second time job seekers report that they are neither happy nor unhappy. People in unpaid work are also very unhappy. Employed people (employed on contract, own business, and self-employed) report highest values of happiness. Students and disabled people are not very happy. Nearly one sixth of the total sample is retired. Retired people report high levels of happiness. This can be due to having more leisure, and more consumption. On the other hand, the paper shows that for non-retired people happiness increases savings and decreases consumption. Marital status is

an important factor for happiness. People living with a partner and married are happier while single, divorced, and widowed people report lower levels of happiness. Health is one of the strongest predictors for happiness. People reporting better health status also report higher values of happiness. Gender does not seem to affect happiness since females and males report similar values of happiness.

Happiness is a categorical variable 0-10 for Germany but recoded here into five categories. Consider labor force: Employed people are very happy. Among the category of non-working people, students and mothers on maternity leave are very happy. Unemployed people are the most unhappy people together with people in military service. Retired people are not very happy as expected. Nearly 34 percent of the retired people report low levels of happiness. Married people in Germany are not as happy as the married people in the Netherlands. Singles again report low levels of happiness. Individuals with a spouse in a native country and separated people report relatively low levels of happiness. Divorced and widowed people are less happy than married people. Health is a very strong predictor for happiness in Germany. People reporting better health status also report higher values of happiness. Table X shows summary statistics of happiness by education and gender. People who have higher levels of degrees earned report higher levels of happiness. As in the Netherlands, there does not seem to be any difference

between males and females in their happiness in Germany.

Table XI reports the averages of 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 a bigger household size in Germany and the Netherlands. In both countries, income and happiness are positively correlated. People with 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 survey by Clark, Frijters, and Shields (2008) and Graham and Felton (2005) for more discussion about the relationship between own income, relative income, and happiness. On the other hand, Guven and Sorensen (2007) show that perceptions about income also play a big role in explaining happiness together with relative income and own income. Differences in perceptions about income might explain differences in correlations. People with more children are happier in both countries. There does not seem to be a clear relationship between age and happiness. This may be due to a U-shape relationship between age and happiness mostly found in literature. I also show the importance of different aspects of life for people in Germany in Table XIV. The coefficients represent the correlations between total individual happiness and happiness with various aspects of life. The results suggest

that income and health are very important for people. Work is not as important as income and health. Leisure and dwelling have similar importance to people, but environment and housework do not seem to be very important for individuals in Germany. R-squared in the fixed effects regression is very low, suggesting that there are other important factors for individuals which can explain the within individual variation in happiness like *weather*. See the Appendix for the exact correlations between individual characteristics and happiness.

B Sunshine and Happiness: First Stage Results

Apart from the individual correlates of happiness as discussed above, I investigate the impact of sunshine on happiness. First, I study the impact of transitory (daily) changes in sunshine. I consider three measures of sunshine in Table I. The results suggest happiness increases with unexpected daily sunshine. The coefficient for the first row is 0.04 and t-statistic is 3.4 suggesting that one hour increase in unexpected sunshine increases individual happiness by 0.04 units. The F-statistic is 17.4 which is much higher than 10 rejecting the presence of weak instrument. This is the t-statistic for the hypothesis that unexpected sunshine equals 0. The null hypothesis is that the coefficient for happiness equals 0. Having an F-statistic 17.4 higher than 4 indicates the rejection of the null. The F-statistic is much higher

for maximum duration of sunshine with a value of 22.4 but smaller for average cloud cover with a value of 12.7. All measures of sunshine are very significant in explaining happiness, and presence of a weak instrument is not an issue considering the first stage.

C Impact of Happiness on Risky Behavior: Second Stage Results

Individuals face various economic choices during their lives. From the point of an economist, some of the important ones are asset allocation and investment behavior. First I consider unexpected transitory sunshine changes as an instrument for happiness which is expected to influence short frequency outcomes but not permanent ones. The dependent variables are recent short-run behavioral outcomes. Most of the choices we make in daily life are related to risk-taking, including investment, consumption, saving, moving, smoking, and driving. Table II investigates the relationship between happiness and risk-taking in the Netherlands. The first row considers the relationship between happiness and risk-taking behavior in financial decisions. OLS estimate suggests that happier people report that they do not want to risk their money when there is a chance to lose it. The IV result

shows us that happiness increases risk averseness in financial decisions. Happiness causes people to take less risk which may explain individual differences in asset allocations. I then study whether we observe the same cause and effect between happiness and other risky behavior. Cox and Source (1964) examine various determinants of telephone shopping and find that the degree of risk perceived by the consumers explains most of the individual behavior regarding telephone shopping. Considering the fact that using phone banking, internet banking, getting money from an ATM instead of a counter or smoking also include some risk [4], the IV results show that happier people use phone banking and internet banking less frequently, they are less likely to get money from an ATM, and smoke less frequently. The results also suggest that risk-taking behavior in different situations might not be independent from one another.

The findings above are quite interesting in the sense that happiness leads to less risky behavior. But why? Why do happy people not want risks? Tables III and IV investigate possible channels through which happiness might influence risk-taking behavior. Table III studies whether discount rates of happy people are different or do 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

[4]In the wording of the questions, individuals are told that phone banking, internet baking or getting money from an ATM are risky before answering these questions.

very likely to 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 into account the future 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 happiness might actually change the discount factor for individuals. The third, fourth, and fifth rows show that happiness increases self-control. Unhappy people find controlling their expenditures very difficult, and also they do not have 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 actions. The IV estimates of happiness are significant in all regressions.

In our current actions, expectations play a big role. Table IV 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 for the next year and also in five years. This may lead to less risky investment today for happy people because they believe that they might get higher profits in the future with lower prices. On the other hand, lower price expectations my lead to less consumption today for happy people. The optimism about future is observed also as higher life

expectancies for happy people. One category increase in happiness leads to 1.1 years higher life expectancy. Besides expectations, happiness also might influence cognitive ability. The fourth row shows that happy people think more before making decisions. Most of the time, thinking more about a decision with pros and cons might lead to different choices. Thinking more may enable individuals to have better understanding of the choices with better comparisons or to consider advantages and disadvantages better.

The second instrument I consider is the exogenous yearly regional sunshine changes. I report the estimates for the first stage in Table V for the Netherlands and Germany. The estimates are the coefficients on the yearly sunshine averages with controls. 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. However, considering that most of the sunshine variation is within a province but across provinces, might explain the low F-statistics. One percentage increase in yearly cloud cover decreases happiness by 0.11 units (out of 10). The F-statistic is 29.6 suggesting that yearly cloud cover is a strong predictor of happiness and presence of a weak instrument is rejected. The difference in the F-statistics between the Netherlands and Germany can be due to three factors: 1) 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 weather data is available only for nine provinces and 15,000 individual observations over 13 years. 2) In Germany, happiness is less persistent than the happiness in the Netherlands. Table XV shows the transition probabilities of happiness for both countries. The diagonals in 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 the previous year's happiness 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. 3) Total variation (within and across variation) in measures of sunshine in Germany is much more than in the Netherlands.

In Table VI, I investigate the impact of happiness on people's asset allocation and investment behavior. Asset allocation is a good indicator of risk-taking behavior. The results are quite promising. Happy people are less likely to own stocks and bonds (risky assets) while happy people are more likely to have operating assets, and private life insurance; all of which are less risky assets. Happy people also do not consider investing in shares which are risky assets. I also consider whether one can observe the similar influence of happiness on other risk related behavior.

I investigate the impact of happiness on smoking and moving behavior. Assuming that smoking indicates some risky behavior, I show in Table VII that happy people smoke less often. Although people do not migrate across states in Germany, the survey asks people whether they would imagine themselves moving to a different part of Germany. The results show that happy people do not desire to move to another state in Germany. The reason for this is probably they do not want to change their current happy situation.

Robustness and the Validity of Instruments:

Economists are generally skeptical of the use of survey data because answers to surveys may be subject to bias from factors such as respondents' mood at the time of the survey and minor changes in the phrasing of survey questions. Therefore, economic analysis generally focus on actual behavior, such as revealed preferences in consumption, savings, and labor market participation. This might be a concern if people misreport their actual behavior due to differences in their mood. However, respondents use documents to answer questions in the surveys which increase the reliability of the surveys. In the DNB Household Survey, the questionnaires are answered without the interference of an interviewer, the respondents can answer the questionnaires at a time that is convenient for them, and all the documents (annual statements, bank account statements) required for answering the questions

are within easy reach. Mood effect probably is not an issue since respondents answer questions by using documents. Using individuals' responses to questions about their intentions and desires, in addition to observed behavior, I implicitly assume that revealed behavior is similar compared to actual behavior. Current research finds that people's answers to questions about their behavior (desires and intentions) are very close to their actual behavior.

Fromme, Katz, and Rivet (1997) find that beliefs about potential benefits are more reliably associated with risk-taking than beliefs about potential negative consequences. Jaeger, Bonin, Dohmen, Falk, Huffman, and Sunde (2007) provide direct evidence that individuals' migration propensities depend on their attitudes towards risk. Using data from the 1989 Survey of Consumer Finances, Schooley and Worden (1996) find that portfolio allocations are reliable indicators of attitudes toward risk, demonstrating an understanding of their relative level of risk- taking. Using the SOEP, Dohmen, Falk, Huffman, Sunde, Schupp, and Wagner (2005) find that the general risk question predicts all risk-taking behaviors including traffic offenses, portfolio choice, smoking, occupational choice, participation in sports, migration, and coefficient of relative risk aversion from the lottery question.

The paper considers the impact of happiness on current and future economic behavior as well as *more recent* individual behavior. Although the happiness we

observe is current happiness, we can still make the argument for the influence of current happiness on observed recent behavior. Because, as shown in Table XV, individual happiness is relatively persistent over time (over yearly observations), and it will be very likely that happiness does not change much during a short period of time. Moreover, I show in Table XV that happiness is fairly consistent over time, suggesting 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 a combination of 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 more precisely.

In the identification strategy, I use regional sunshine as an instrument for happiness. The instrumental variables approach implicitly assumes that sunshine influences individual economic behavior only through happiness and is not correlated with any other independent variables. This assumption will not hold if happiness is a proxy for some personality characteristics that are found to be correlates of individual happiness in the psychology literature. Information on most psychological characteristics of people are available in the surveys and they are very persistent.

Since I am using 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. I also find no impact of happiness on actual or desired working hours in Table XVII, which suggests that sunshine does not affect economic behavior through individual productivity but through happiness. The presence of weak instruments is tested by the F-statistics after the first stage. As the results suggest in Table I, the F-statistics are all higher than 10. Since within a year variation of unexpected sunshine is very high but across variation is low. As shown in Table V, the F-statistics for the yearly sunshine instrument are close to 10.[5]

One of the concerns regarding the use of sunshine as an instrument can be such that individuals may migrate to the sunnier regions. However, in the Netherlands most people do not migrate during their lifetime. As shown in Table XVI, 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. [6] 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 living in the same state is about 87 percent. Also,

[5]Staiger and Stock (1997) show that in the IV regressions, the F-statistic higher than 10 rejects the presence of weak instruments.

[6]Transition matrix for the province residence in the Netherlands is not reported but the results are quite similar; probability of living in the same province is about 89 percent.

the IV results for the Netherlands about consumption, savings, and risk-taking are confirmed with the findings in Germany. This suggests that the results and the use of instruments are not peculiar to one country but applicable to other countries with different cultures and topological structures.

Another issue is that in Germany, some of the individuals received bad weather benefits which might directly affect individual behavior; however, only one percent of the whole sample had bad weather benefits. Also, the results are shown for the whole sample but consumption and savings results mainly represent the behavior of non-retired individuals. Although I do not report the results here, the impact of happiness on consumption and savings behavior 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 regional average of stations' latitude. There is also 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 to which will pick up the time trends.

V Conclusion

Many studies have confirmed a strong relationship between sunshine and financial variables. However, various channels through which sunshine affect financial variables are unknown. The paper shows that happiness is a channel through which sunshine influences individual risk-taking behavior. First, the paper verifies that exogenous variation in yearly and daily sunshine has a significant impact on individual happiness in Germany and the Netherlands. Secondly, by instrumenting individual happiness with regional sunshine, the paper investigates the impact of happiness on individual risk-taking behavior. Happy people are more risk-averse in financial decisions and they prefer safer investment tools. The results show that happy people are more likely to have life insurance, savings accounts, and operating assets but are less likely to own stocks or bonds. Happy people also have less desire to invest in shares because they find them too risky. There are significant differences in the risk-taking behavior of happy versus unhappy people. The different behaviors of happy people are found to be due to taking more time for making decisions, having more self-control, and expectations to live longer. Happy people are more concerned about the future than the present and they expect lower prices in the future. Secondary findings suggest that happy people are less

likely to smoke and have less desire to move within a country. Happy people also use internet banking and phone banking less frequently, and prefer to use bank branches instead of ATMs.

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Table I: **Unexpected Transitory Sunshine Changes and Happiness: The Netherlands**

Dependent Variable: Self-Reported Happiness

	coef.	t-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. Every row reports estimates for different measures of sunshine. Happiness is a categorical variable taking values from 1 to 5. Measures of sunshine are province level daily sunshine variables taken from weather stations. "The last ten day sunshine deviation" is the weighted average of the last 10 day sunshine measure minus the average of the last ten day sunshine measure in the last 60 years. Control variables for every regression: Labor force status, marital and health status, income, number of children, gender, household size, age, province and year fixed effects.

Table II: **Transitory Weather Shocks to Happiness and Risk-Taking Behavior: The Netherlands**

	OLS		IV	
	coef.	t-stat.	coef.	t-stat.
1) Prepared to take the risk when chance to gain money				
Happiness	−0.12	5.8	−0.99	2.1
Number of observations	19872		15456	
2) Do you use phone banking?				
Happiness	0.02	2.9	−2.71	3.7
Number of observations	11545		9023	
3) Do you use internet banking?				
Happiness	0.03	2.8	−3.09	2.6
Number of observations	5913		4549	
4) Prefer to go to ATM or counter of a bank?				
Happiness	0.03	0.9	−1.61	3.5
Number of observations	12512		10547	
5) How often do you smoke cigarettes now?				
Happiness	0.06	3.9	0.47	3.1
Number of observations	21567		16457	

Notes: Each row reports the estimates for various outcomes. The dependent variables are the answers to the following questions: 1) 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 "I am prepared to take the risk to lose money, when there is also a chance to gain money." 2) "Nowadays, a number of banks offer the possibility to arrange your banking affairs through the phone, without the mediation of a person. After entering your personal secret code you can obtain information about the balance of your accounts, and you can transfer money from one account to another. Do you use such a facility? 1. no 2. yes, very rarely 3. yes, every now and then 4. yes, often 5. yes, very often" 3) "Nowadays, a number of banks offer the possibility to arrange banking affairs through Internet without the mediation of a person. Examples of such a facility are: HomeNet, Internetbanking or Girotel. Do you use such a facility? 1. no 2. yes, very rarely 3. yes, every now and then 4. yes, often 5. yes, very often" 4) "Do you prefer to get your money from an ATM or do you prefer to go to the counter of a bank? 1. I prefer to use the ATM 2. I prefer to go into the bank 3. I have no particular preference" 5) "Do you smoke cigarettes at all? 1. yes, I smoke every now and then 2. yes, I smoke every day 3. no, I do not smoke." 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 treated as continuous variables here. Control variables: Health status, income, age, number of children, schooling, household size, gender, labor force status, marital status, province and year fixed effects.

Table III: **Why Happier People Do not Want Risks? Discounting and Self-Control: The Netherlands**

	OLS		IV	
	coef.	t-stat.	coef.	t-stat.
1) I work on things that will only pay off in 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) I have good control of my investments and their returns				
Happiness	0.17	7.5	2.64	2.5
Number of observations	13798		10365	
5) 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) "I have good control of my investments and their returns." 5) "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 treated as continuous variables here. Control variables: Health status, income, age, number of children, schooling, household size, gender, labor force status, marital status, province and year fixed effects.

Table IV: **Why Happier People Do not Want Risks? 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) Own life expectancy				
Happiness	2.02	4.1	11.12	2.9
Number of observations	12560		10075	
4) Slow or quick thinker 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 treated as continuous variables here. Control variables: Health status, income, age, number of children, schooling, household size, gender, labor force status, marital status, province and year fixed effects.

Table V: **Regional 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. Every row shows estimates from different regressions. Happiness is a categorical variable taking values from 1 to 5. Measures of sunshine are province level sunshine variables for the Netherlands and state level sunshine variables for Germany. "Yearly average sunshine" is the average sunshine over 365 days for a province or state in a year. Control variables for every regression: Labor force status, marital and health status, income, number of children, gender, household size, age, province and year fixed effects.

Table VI: **Can Happiness Explain Investment Behavior?**

	OLS		IV	
	coef.	t-stat.	coef.	t-stat.
Germany:				
1) Do you own stocks or bonds?				
Happiness	0.95	11.6	−11.05	4.1
2) Do you have savings accounts?				
Happiness	0.03	11.8	0.38	2.2
3) Do you have operating assets?				
Happiness	−0.11	2.6	10.36	3.2
4) Do you have private life insurance?				
Happiness	0.08	9.7	0.69	4.1
Number of observations	120408		110560	
The Netherlands:				
5) I would never consider investments in shares				
Happiness	0.02	1.5	4.47	2.2
Number of observations	19068		15842	

Notes: Each row reports the estimates for various outcomes. The first four rows are regressions for Germany and the last row is for the Netherlands. The dependent variables in order are as follows: 1) Binary variable taking the value 1 if the respondent does own stocks or bonds, 0 otherwise. 2) Binary variable taking the value 1 if the respondent does have savings accounts, 0 otherwise. 3) Binary variable taking the value 1 if the respondent does have operating assets, 0 otherwise. 4) Binary variable taking the value 1 if the respondent does have private life insurance, 0 otherwise. 5) 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 "I would never consider investments in shares because I find this too risky". Probit and logit regressions give similar results compared to OLS. The IV-GMM is used for the instrumental variable regressions. The instrument for happiness is regional yearly cloud cover average. Health and happiness are categorical variables taking values from 0 to 10 but treated as continuous variables here. All independent variables are scaled by 100. Control variables: Labor force status, marital and health status, income, number of children, number of household members, age, race, state and year fixed effects.

Table VII: **Does Happiness Affect Smoking Behavior and Moving Decisions In Germany?**

Dependent Variable:	Smoking Behavior		Desire to Move	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Happiness	−0.02	−1.72	−0.13	11.89
	(6.9)	(2.7)	(0.4)	(3.4)
Health	0.01	−0.04	−0.63	−47.81
	(0.4)	(2.6)	(2.3)	(3.3)
Income	0.71	0.01	0.09	−0.80
	(3.3)	(2.7)	(0.4)	(3.3)
Age	−0.07	−0.01	−0.03	−0.55
	(18.5)	(1.3)	(0.7)	(2.6)
Children	0.01	0.01	3.57	11.49
	(1.7)	(1.4)	(4.2)	(3.3)
Education	−0.02	−0.01	−5.45	−6.35
	(12.9)	(0.7)	(27.4)	(10.8)
Household size	−0.02	−0.14	−5.43	−1.84
	(3.5)	(2.5)	(7.8)	(0.9)
Female	−0.06	−0.19	17.2	0.80
	(6.6)	(1.8)	(16.1)	(0.4)
Number of observations	15752	12748	26560	24842

Notes: Each row reports the estimates for various outcomes. The dependent variable for columns 1 and 2 is a binary variable showing if the individual smokes or not. The dependent variable for columns 3 and 4 is a categorical variable 1-4 which is the answer to the question "Could you imagine yourself moving to another part of Germany? 1. very much 2. yes, depending on the situation 3. probably not 4. never." The instrument for happiness is regional yearly cloud cover average. Probit and logit regressions give similar results compared to OLS. The IV-GMM is used for the instrumental variable regressions. Health and happiness are categorical variables taking values from 0 to 10 but treated as continuous variables here. Income is in thousands and other variables are scaled by 100 to make coefficients understandable. Additional control variables: Labor force status, marital status, race, year and state fixed effects.

VI Supplementary Appendix

Table VIII: **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: This table shows summary statistics of happiness categories (very happy, happy, neither happy nor unhappy, unhappy, very unhappy) by labor force status, marital status, and health status. The numbers are row frequencies shown as percentages and rounded to the nearest integer.

Table IX: **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: This table shows summary statistics of happiness categories by labor force 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 X: **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: This table shows summary statistics of happiness categories by 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 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 XI: **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: This table shows summary statistics of household size, income, number of children, and age for Germany and the Netherlands by happiness categories (very happy, happy, neither happy nor unhappy, unhappy, very unhappy). The numbers are averages of the row variables by happiness categories and rounded to the nearest integer. 3 indicates that average household size of "happy" people is 3. 40 indicates that average age of "very unhappy" people is 40. Happiness takes values 1-5 for the Netherlands. 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 low, (3-4) low, (5-6) middle, (7-8) high, and (9-10) very high.

Figure 1: Average Sunshine in the Netherlands

Figure 2: Average Sunshine in Germany

Table XII: **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 and year fixed effects are included in the regression. Dummy for 1993 is excluded. Dummies for the provinces Flevoland and Overijssel are significantly positive but other province dummies are insignificant. All year dummies are insignificant except dummy for 2000 which is negative.

Table XIII: **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 and year fixed effects. Individual satisfaction is a categorical variable from 0 to 10 but used as a continuous variable here. The estimates are similar compared to ordered logit estimates. Health is a categorical variable from 1 to 5 and income is in thousands.

Table XIV: **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 used as continuous variables. R-squared from the between effects estimation is 0.56.

Transition Probability: I show transition probabilities for self-reported happiness and for the residence of individuals. Hence, time series behavior of happiness and the mobility of individuals can be observed. [7] The transition probability from state i (say, "very happy") to state j is calculated as the number of individuals who in year $t-1$ report the state of happiness i *and* in year t report the state of happiness j, 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:

$$p_{ij} = \sum_{it} N_{ij} / \sum_{it} N_i \ , \tag{6}$$

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* reports state j in year t. N_i is the individual who reports state i in year $t-1$.

[7] These information are very important for the validity of the instruments and the correct use of dependent variables which are discussed in the robustness part.

Table XV: **Transition Matrices of Happiness**

The Netherlands

Current happiness:		very low	low	middle	high	very high
Happiness :	very low	24	36	9	27	3
previous:	low	6	33	41	17	1
year:	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 :	very low	29	22	27	16	5
previous:	low	8	25	39	23	4
year:	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: This table shows probabilities of current happiness conditional on happiness in the previous year. Low, very low, middle, high, and very high are happiness categories. The sample for the Netherlands covers nearly 32000 panel observations. 17 indicates that the probability of having middle happiness conditional on having low happiness in the previous period is 17 percent or 40 indicates that the probability of having high happiness conditional on having very high happiness in the previous period is 40 percent. The original happiness variable for Germany is a categorical variable taking values from 0 to 10. Happiness is recoded here as follows: (0-1-2) very low, (3-4) low, (5-6) middle, (7-8) high, and (9-10) very high. 39 indicates that the probability of having middle happiness conditional on having low happiness in the previous period is 39 percent or 41 indicates that the probability of having high happiness conditional on having very high happiness in the previous period is 41 percent. All numbers are rounded to nearest integer in percentages.

Table XVI: **Mobility 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; three largest cities, South Holland, North Holland, East Holland, and West Holland. All numbers are rounded to nearest integer in percentages.

Table XVII: **Happiness and Labor Supply: 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 average. 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 treated as continuous variables here. Control variables: Health status, income, age, number of children, schooling, household size, gender, labor force status, marital status, state and year fixed effects.

VARIABLES USED IN THE PAPER: Independent Variables:

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

dren: Number of children. **Dependent Variables:**

1) On a scale from 1-7 to what extent you agree with the following statement, where 1 indicates totally disagree and 7 indicates totally agree "I am prepared to take the risk to lose money, when there is also a chance to gain money". **2)** Nowadays, a number of banks offer the possibility to arrange your banking affairs through the phone, without the mediation of a person. After entering your personal secret code you can obtain information about the balance of your accounts, and you can transfer money from one account to another. Do you use such a facility? 1. no 2. yes, very rarely 3. yes, every now and then 4. yes, often 5. yes, very often. **3)** Nowadays, a number of banks offer the possibility to arrange banking affairs through Internet without the mediation of a person. Examples of such a facility are: HomeNet, Internetbanking or Girotel. Do you use such a facility? 1. no 2. yes, very rarely 3. yes, every now and then 4. yes, often 5. yes, very often. **4)** Do you prefer to get your money from an ATM or do you prefer to go to the counter of a bank? 1. I prefer to use the ATM 2. I prefer to go into the bank 3. I have no particular preference. **5)** Do you smoke cigarettes at all? 1. yes, I smoke every now and then 2. yes, I smoke every day 3. no, I do not smoke. **6)** I often work on things that will only pay off in a couple of years. **7)** With

everything, I do, I am only concerned about the immediate consequences (say a period of a couple of days or weeks). **8)** Many people find it difficult to plan or control their expenditures. Do you find it difficult to control your expenditures? **9)** I have good control of my investments and their returns. **10)** Do you have little self-control or are you very disciplined? Where 1 indicates little self-control and 7 indicates very disciplined. **11)** 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. **12)** By what percentage do you expect prices in total to have risen after 5 years? **13)** How many years do you expect to live? **14)** While making your decisions are you a slow thinker or quick thinker? **15)** Binary variable taking the value 1 if the respondent does own stocks or bonds, 0 otherwise. **16)** Binary variable taking the value 1 if the respondent does have savings accounts, 0 otherwise. **17)** Binary variable taking the value 1 if the respondent does have operating assets, 0 otherwise. **18)** Binary variable taking the value 1 if the respondent does have private life insurance, 0 otherwise. **19)** On a scale from 1-7 to what extent you agree with the following statement, where 1 indicates totally disagree and 7 indicates totally agree "I would never consider investments in shares because I find this too risky".