Split Personalities? Behavioral Effects of Temperature on Financial Decision-making

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Abstract

How do environmental factors affect financial decision-making? Using plausibly exogenous variation in exposure to fluctuations in temperature over a sample of individuals between 2004 and 2018 across 28 European countries and Israel, we estimate the causal effect of a marginal change in temperature on financial investments and its interaction with individual personality characteristics. We find that a 10% increase in temperature is associated with a 0.1 percentage point (pp) rise in the probability that an optimist invests in bonds, a 0.12 pp decline in the probability for stocks, and a 0.11 pp rise in mutual funds. However, among pessimists, we find null effects. We find similar results when we focus on the intensive margin of investment as well. Our results are identified of within-person variation after controlling for all shocks that are common within a country and year, thereby purging variation in time-varying country policies and macroeconomic conditions. These results are unique to optimists versus pessimists, rather than general happiness or interest. Furthermore, the variation in optimism is largely driven by attitudes about risk, rather than attitudes about trust. Our results are consistent with behavioral finance models where expectations moderate the transmission of shocks onto financial decision-making.

Keywords: Behavioral Finance; Expectations; Financial Decision-making; Optimism; Stocks; Temperature

JEL Codes: D87, D91, G11, G41, G51

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1 Introduction

There is currently a plethora of empirical evidence pointing towards the role of behavioral factors in financial decision-making (Beshears et al., 2018).[1] Salience behaves as a mediating force (Bordalo et al., 2013). Expectations have emerged as a leading explanation for why and how individuals undertake different financial investments (Bordalo et al., 2018), such as whether to participate in the stock market (Barber and Odean, 2001) or whether to allocate more of their portfolio to stocks over bonds (Grinblatt and Keloharju, 2000). However, much less emphasis has been placed on the interplay between personality characteristics and environmental factors—that is, exploring how shocks interact with behavioral factors to influence financial decision-making.

Empirically, understanding the role of environmental factors and their interaction with personality characteristics is challenging. For example, since individuals sort into different labor market arrangements based on their underlying preferences and abilities, fluctuations in income are endogenously related with their underlying characteristics and financial decision-making. Similarly, macroeconomic conditions might influence risk taking and financial decision-making, but these conditions are potentially related with other unobserved factors that affect financial behavior.

To address this challenge, our paper exploits plausibly exogenous variation among individual financial investment decision in response to fluctuations in temperature across 28 European countries and Israel between 2004 and 2018. By controlling for country and year fixed effects, we purge time-invariant differences, such as the quality of institutions or culture, that could be related with both climate and financial investments. Furthermore, since we observe the same individual over

[1] Leading theories of behavioral finance have emphasized the role of attention for asset prices (DellaVigna and Pollet, 2009; Bordalo et al., 2012) and financial decision-making (Stango and Zinman, 2009, 2014).

time, we exploit within-person variation, controlling for country × year fixed effects, allowing us to trace out an individual's investment behavior in response to regional fluctuations in temperature after controlling for all shocks that are common to individuals in the same country and year.

We hypothesize that optimism, or the degree of hopes expressed for the future, may behave as an important moderating force in response to environmental stimuli. Contributions from psychology suggest that optimistic individuals process and respond to information differently than their more pessimistic counterparts. We specifically posit that optimists will be more attentive to external stimuli, thereby adjusting their financial investments more, whereas pessimists simply tune out many stimuli. Our focus on optimism stems from the recognition that expectations are a major determinant of investment and saving Therefore, as a benchmark in our analysis, each of our specifications allows for heterogeneity in the individual's degree of optimism versus pessimism.

When we exploit within-person heterogeneity, we find that a 10% rise in temperature is associated with a 0.1 pp rise in the probability an optimist invests in bonds, a 0.12 pp decline in the probability an optimist invests in stocks, and a 0.11 pp rise in the probability an optimist invests in mutual funds. We find null effects for pessimists. We also find suggestive evidence that temperature is associated with a heightened probability of investing in retirement accounts. Put together, these results suggest that higher temperatures lead to a reallocation towards (away from) safer (risky) assets for optimists, but no effect for pessimists. In this sense, we provide new microeconomic evidence on how idiosyncratic factors not only affect financial behavior, but also interact with personality characteristics to generate movements in asset prices.

Furthermore, we investigate these same phenomena on the intensive margin as well and find similar results. We show that a 10% rise in temperature is associated with a 0.095% rise in investment in bonds, a 0.13% rise in mutual funds, and a 0.12% decline in investment in stocks for

optimism. However, there are no such effects for pessimists. Given that optimism is a function of beliefs about people and risk, among other factors, we subsequently decompose the determinants to understand more about the mechanism underlying these results. In particular, we find that variation in optimism are driven more heavily by attitudes about taking risk (as in Coval and Shumway (2005)), rather than attitudes about trust. This result is important since it helps us disentangle between different types behavioral biases that moderate the effects of shocks on financial decision-making (Hirshleifer, 2020).

Our paper is related to a large behavioral finance literature on the relationship between personality characteristics and financial decision-making, including stock market participation. For example, Grinblatt et al. (2011) show that stock market participation is monotonically related with IQ even after controlling for a wide array of demographic and income characteristics. Barber and Odean (2001) shows similar results for males. We focus primarily on the role of optimism as a mediator for attention.[2] In the presence of a lot of noise, optimists might be more likely to pay attention to their surroundings since they have greater expectations and hope for the future, whereas pessimists might "accept their fate" and tune out external stimuli. Other personality traits, particularly across different cultures, also matter. For example, Hirshleifer et al. (2016) show how superstitious attitudes about "lucky numbers" plays a role in explaining abnormally high returns about firms that undergo an initial public offering with a "lucky" listing code. Besides time-invariant personality characteristics, investor moods also shape the fluctuations and growth in stock returns (Hirshleifer et al., 2020), which can also be influenced by environmental factors, like weather (Makridis, 2020), in addition to seasonal patterns.

Our paper also contributes to a literature on climate and financial decision-making. Moti-

[2]See Caplan (2016) for a review of the literature on attention in behavioral finance.

vated by a large literature in macroeconomics on the determinants of cross-country growth rate, geography, and the corresponding climate, has emerged as one potential factor (Bloom and Sachs, 1998). Although there is generally a recognition that climate does not affect economic growth directly, it can impact the evolution of institutions and culture (Rodrik et al., 2004; Robinson and Acemoglu, 2012). We provide such a mechanism: hotter climates can discourage risk taking (e.g., participation in the stock market), particularly among those most likely to become entrepreneurs (e.g., optimists). These results also build on research within psychology, including Sanders and Brizzolara (1982) who show that weather has a direct effect on human behavior, health, emotion and mood. Others have explored the effect of sunshine on returns (Hirshleifer and Shumway, 2003; Goetzmann and Zhu, 2005; Goetzmann et al., 2014) and the effect of temperature on mood and economic sentiment (Baylis, 2020; Makridis, 2020). Moreover, our paper complements research that finds a close connection between personality and stock market investment. Some research showed that investors' personality is correlated to stock market investment (Durand et al., 2008; Donnelly et al., 2012). Others have found a similar relationship between economic behavior and personality traits (Becker et al., 2011; Maggiori et al., 2021).

The structure of the paper is organized as follows. Section 2 introduces the data and measurement strategy. Section 3 lays out the empirical specification and identification strategy. Section 4 presents the main results. Section 5 examines heterogeneity and robustness. Section 6 concludes.

2 Data and Measurement

2.1 Individual Investment Data

Our primary data comes from six waves (i.e., wave combination 1-2-4-5-6-7) of the Survey of Health, Aging and Retirement in Europe (2004-2018), an individual panel across 28 European countries and Israel. SHARE gathers detailed information on important areas of respondents' lives, ranging from partners and children over housing and employment history to more detailed questions on economic decisions, social attitudes, expectations, demographic and health status. The SHARE sample comprises individual-level micro data, including 140,000 individuals aged 50 or older who currently reside in 28 European countries, including: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Germany, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia, Spain, Switzerland, and Israel. SHARE data collection is based on computer-assisted personal interviewing (CAPI) and provides a common generic questionnaire that is translated into the national language of each country.

We use four alternative dependent variables, i.e., investments in i) bonds, ii) stocks iii) mutual funds and iv) retirement accounts. Respondents are given the question "Do you currently have invested in bonds/stocks/mutual funds or retirement accounts? Yes or No". The value 1 predicts that individual has invested and 0 means he or she has no investments. Moreover, SHARE provides us with information about the respondent's gender and age, which we use as control variables, together with the country of residence and the year that the interview took place.

In order to capture the personality of each individual and examine how it moderates the effects of environmental shocks on financial decision-making, we focus on the role of optimism. Individuals respond to the question "What are your hopes for the future? Please note only whether hopes are

mentioned or not." We classify an individual as an optimist if he/she replies with hopes about the future, zero otherwise. We focus on optimism due to its role in fluctuations in asset prices (Coval and Shumway, 2005; Frazzini, 2006; Goetzmann et al., 2014)

SHARE also provides us with additional personality variables, including: depression, enjoyment and general interest. Depression is measured in response to: "In the last month have you been sad or depressed?" Enjoyment is measured in response to: "Have you feel enjoyment recently?" General interest is measured based on whether the respondent mentions any interest. We use these additional personality traits in robustness section.

2.2 Country Data

We extract the data for weather from the ERA5 climatic reanalysis data. ERA5 contains time-series that have hourly, daily, and monthly frequency that are aggregated following all the Nuts levels of classification. This dataset belongs to the European Centre for Medium-Range Weather Forecasts (ECMWF) which is an independent intergovernmental organization supported by 34 states. ECMWF produces global numerical weather predictions and offers one of the largest meteorological data archives in the world. ERA5 climatic reanalysis data covers the majority of European countries from 1950 to present. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset, using the laws of physics and produces data that goes several decades back in time, providing an accurate description of climate of the past. Additionally, ERA5 combines vast amounts of historical observations into global estimates using advanced modelling and data assimilation systems.

We restrict the geographical sample from 2004 to 2018, covering the same European countries

according to SHARE dataset. Weather data come from reanalysis, which offers some improvements in regions with sparse data. Our approach follows that frequently used by economists in constructing and using weather data (Dell et al., 2014). We use the mean annual temperature measured in Celsius, constructed as the average of mean monthly temperature. We do so at the NUTS1 regional level, providing variation within the same country. We also measure mean annual precipitation, calculated as the sum of the mean monthly precipitation, measured in millimeters, from the ERA5 dataset too. Finally, we control for additional time-varying country characteristics from the World Bank, including: logged GDP per capita, annual population growth, value of services and agriculture as percentages of GDP.

One of the main reasons for using SHARE is precisely that it allows us to do our analysis at NUTS1 level of disaggregation and adopt such a strict specification compared to the rest of the associated literature. Another advantage is the fact that SHARE is considered the largest pan-European social science panel study providing internationally comparable longitudinal micro data which allow insights in the fields of public health and socio-economic living conditions of European individuals. Furthermore, for a panel study like SHARE, its value is strongly determined by the long-term participation of panel members over waves.

Only if persons can be observed multiple times as time passes by, is it possible to understand their individual aging processes and learn how respondents adapt to the changing environment over time. Through SHARE, this is achieved quite well considering the difficulties SHARE is facing with respect to the sample structure of people aged 50 years and older, where natural mortality is a bigger issue than in most other surveys (Bergmann et al., 2017).

We merge our data and use the whole sample from 2004 to 2018, ending up now with 23 European countries including Austria, Germany, Sweden, the Netherlands, Spain, Italy, France,

Denmark, Belgium, Czech Republic, Poland, Luxembourg, Hungary, Portugal, Slovenia, Estonia, Croatia, Lithuania, Bulgaria, Cyprus, Finland, Latvia and Romania. The panel consists of 55,556 individuals, following them on a wave/year basis. We find each individual in more than 2 and less than 6 rounds of answers. All the interviews are conducted in several dates, without giving to individuals the opportunity to choose when they would like to answer. The cross section part contains 90,937 individuals who participate in only 1 or in more rounds of interviews.

2.3 Descriptive Statistics

Table 1 documents the descriptive statistics. We see that only 2.8% of individuals invest in bonds, 6.8% invest in stocks, 6.2% invest in mutual funds, and 12.1% invest in retirement accounts. The fact that investment in retirement accounts is much higher than the rest reflects the fact that many companies offer generous retirement plans. We also see substantial differences in investment behavior among optimists versus pessimists. For example, whereas the share who invest in stocks is 8% among optimists, it is 2.2% among pessimists. Likewise, 7.3% of optimistic individuals invest in mutual funds, but only 1.7% of pessimists do.

Turning towards the remaining variables, we see that the average temperature is 10 degrees Celsius. Roughly 44% of the sample is male and the average age is 67, showing that our sample skews towards those in retirement. Optimists tend to be slightly younger at age 66 on average, whereas pessimists are nearly 70. Finally, we see notable differences in country-level characteristics among pessimists and optimists, reflecting the correlation between happiness and income per capita (Deaton, 2008). For example, per capita GDP is $37,462 among optimists and $28,058—a difference of nearly $10,000. We also see that optimists reside in countries with higher population

growth, a higher services employment share, and a lower agricultural employment share.

[INSERT TABLE 1 HERE]

3 Empirical Strategy

To understand how environmental factors influence financial decision-making and interact with behavioral characteristics, we begin by relating measures of financial behavior with regional annual temperature and measures of personality through regressions of the form:

$$y_{ijt} = \gamma TEMP_{jt} + \phi c_{ijt} + \xi(TEMP_{jt} \times c_{ijt}) + \eta_c + \lambda_t + \epsilon_{ijt} \tag{1}$$

where y_{ijt} denotes four different measures of investments are employed: i) investment in bonds, ii) stocks, iii) mutual funds and iv) retirement accounts for each individual i residing in region j at year t, $TEMP$ denotes the logged temperature, c denotes the personality characteristic indicator (e.g., optimist versus pessimist), and *eta* and *lambda* denote fixed effects on country and year, respectively. We estimate robust standard errors, clustered at the individual level to allow for autocorrelation in the error across individuals over time.

To identify a causal effect of temperature on investment activity in Equation 1, we exploit plausibly exogenous variation in the exposure of observationally equivalent individuals in the same country to different temperatures over time. The inclusion of country fixed effects purges variation in country-specific factors, such as geographic and institutions, that are correlated with both financial decision-making and environmental factors. The inclusion of year fixed effects purges aggregate fluctuations in financial decision-making, such as general trends towards greater

financial literacy and and business cycle patterns.

One concern, however, is that there are omitted variables that are correlated with both personality and financial decision-making. Although we are controlling for age, education, and other standard demographic characteristics, we may have an upwards biased estimate on our indicator for optimism (and consequently the interaction). In particular, more optimistic individuals also take more risks, thereby leading to a higher probability of investing in the stock market and lower probability of investing in bonds. To address this concern, We further restrict our identifying variation by also introducing person fixed effects, which exploits the exposure of the same person to fluctuations in temperature in the same country over time.

Another concern is that the temperature alters an individual's mood. For example, using variation in individuals' exposure to different daily temperatures, Makridis (2020) shows that individuals become more pessimistic about the state of the national economy and their expectations over the future state at very cold and hot temperatures. To the extent that an individual's pessimism or optimism is a function of temperature, then we will have additional variation in our right-hand-side variable that is more reflective of the environmental conditions than their underlying personality characteristics, producing attenuation bias.

While we are controlling for the direct effect of temperature on financial behavior, we also conduct robustness where we take the average of the personality characteristic as our right-hand-side variable and interact it with logged temperature. This reduces measurement error and the potential contemporaneous relationship between temperature and mood that could influence a respondent's answer on personality-related questions.

A final concern is that there are other time-varying unobserved country-specific characteristics, like macroeconomic shocks, that are correlated with both temperature and financial behavior. For

example, Dell et al. (2012) show how economic growth is correlated with temperature. While Makridis and Ransom (2020) show that temperature is uncorrelated with real wages, income, and GDP over the short and medium run, we nonetheless introduce country × year fixed effects to focus on changes in financial behavior for a given individual after controlling for all shocks that are common within the same country and year. This exploits variation at the regional level within each country for each individual, thereby purging macroeconomic conditions or other country-specific policy factors that also influence financial decision-making.

4 Main Results

Table 2 documents the results associated with Equation 1 when the outcome variable is the indicator for whether an individual invests in bonds. Starting with the conditional correlation in column 1, we see that a 10% rise in temperature is associated with a 0.182 percentage point (pp) decline in the probability that a pessimistic individual invests in bonds, but a nearly null response among optimists. The interaction effect fully offsets the direct effect of temperature on investment, suggesting that optimism is an important dimension of heterogeneity. We also see that optimists are 4.4pp less likely to invest in bonds (and more likely to invest in stocks).

However, one concern with these conditional correlations is that they reflect differences in unobserved heterogeneity across individuals who live in countries that also have better macroeconomic conditions and institutions. While we have already controlled for several time-varying country-specific factors, such as real GDP per capita and the employment composition, column 2 now introduces country and year fixed effects. The coefficients remain qualitatively similar, but lower in economic significance: a 10% rise in temperature is now associated with a 0.091pp decline

in the probability of investing in bonds among pessimists, but a 0.023pp decline for optimists, although it is not statistically different from zero for optimists.

Yet another concern is that there are time-varying shocks to a country's macroeconomic or policy conditions that correlate with financial decision-making. Column 3 controls for country × year fixed effects. While the direct effect of temperature becomes statistically insignificant, the coefficient on the interaction remains positive and significant. Now, a 10% rise in temperature is associated with a 0.133pp *rise* in the probability that an optimist invests in bonds, but a null effect for pessimists, showing that omitted variables is an unlikely culprit for our results.

To address concerns about unobserved individual-specific heterogeneity, column 4 subsequently introduces person and year fixed effects, reducing the statistical significance. Column 5 introduces both person and country × year fixed effects. Now, we find that a 10% rise in temperature is associated with a 0.1pp rise in the probability of investing in bonds for optimists, but a null effect for pessimists. Given that the share of individuals who invest in bonds is only 0.03pp, this marginal effect is economically meaningful.

We turn towards other outcomes, focusing on our preferred specification that contains both person and country × year fixed effects. We also identify other noteworthy patterns. We find that a 10% rise in temperature is associated with a 0.121pp decline in the probability that an optimist invests in stocks, but a null effect for pessimists. However, we find that a rise in temperature is associated with a 0.108pp rise in the probability that an optimist invests in mutual funds, but a null effect for pessimists. Finally, although we find a null effect for investment in retirement accounts under our strictest specification, at least in part because there is so little within-person variation for these older individuals in retirement accounts, our cross-sectional specification in column 18 indicates that a 10% rise in temperature is associated with a 0.171pp decline in the

probability of investing in retirement for pessimists and a 0.148pp rise for optimists.

[INSERT TABLE 2 HERE]

Next, we examine the intensive margin effects of temperature on financial investments, moderated by optimism. We replace our outcome variable with the logged amount of investment in each category, treating individuals who do not invest as having zero expenditures. Table 3 documents these results. We find similar results. Under our strictest specification with person fixed effects, a 10% rise in temperature is now associated with a 0.095% rise in investment in bonds, a 0.13% rise in mutual funds, and a 0.12% decline in investment in stocks for optimism. However, we find null effects again for pessimists. We also find a muted response on retirement accounts when we control for person fixed effects, which again is intuitive since there is too little within-person variation for retirement account investments.

[INSERT TABLE 3 HERE]

These results point to an important moderating effect of personality, especially the degree of optimism, on financial market participation. However, are these differences in optimism driven more by underlying levels of trust, risk aversion, or some other determinant, such as health or gender? We now consider regressions of an indicator for whether the individual is an optimist on an indicator for whether they have trust in others, whether they are risk averse, health quality, age, gender, and employment status. We define those as risk averse if they respond to the question "What amount of financial risk are you willing to take when you save or make investments" with "the individual is not willing to take any financial risks" or "takes above average financial risks expecting to earn above average returns."

Table 4 documents these results. Age is negatively correlated with optimism, showing that people tend to become more pessimistic as they grow older. Employment status is positively correlated with optimism, which reflects a combination of state-dependence and income effects. More importantly, we find that these is a strong association between optimism and trust, risk aversion, and health. For example, those who tend to trust in others have a 0.76 pp higher probability of also being an optimist under our preferred specification in column 4, which controls for country $\times$ year fixed effects. We also see that those who are in good health have a 5.46 pp higher probability of being an optimist, consistent with empirical evidence that health shapes the way that people process their environment (Finkelstein et al., 2013). Not surprisingly, risk aversion is also negatively correlated with optimism: individuals who are risk averse are 1.34 pp less likely to be optimists. Importantly, the coefficient on risk aversion is twice as large as the coefficient on trust, suggesting that attitudes related to risk more heavily driven expectations and hope for the future, relative to overall trust in others.

[INSERT TABLE 4 HERE]

5 Robustness Exercises

We now investigate several robustness exercises. One of our concerns is that our measure of optimism is influenced by temperature. For example, Makridis (2020) shows that increases in very hot and very cold temperatures lead to declines in subjective well-being and economic optimism. To address this concern, we take the average value of our optimism variable

Another concern is that we are capturing other unobserved shocks to an individual's financial portfolio, i.e. an income effect. For example, an individual might experience a decline in their

overall net worth, thereby affecting their willingness to invest in different financial assets. Although we do not have comprehensive measures of wealth, we have their self-reported property value, which we use as a proxy for household wealth since property is one of the most significant contributors to household wealth (Flavin and Yamashita, 2011). Table 5 documents these results. While there is a strong positive correlation between temperature and property values in the cross-section (column 1), these effects disappear when we control for country and year fixed effects (column 2). We subsequently layer additional fixed effects on NUTS and person (columns 3-5). The fact that we find no statistically significant association suggests that income effects are not at play.

[INSERT TABLE 5 HERE]

Another potential concern is that we are simply detecting another omitted person-specific characteristic that also varies with temperature. Table 6 presents similar results when we use happiness as a dimension of heterogeneity. However, the interaction effects with temperature are all statistically insignificant. We also show similar results for general interest and depression. Only in one case do we find a statistically significant negative relationship between investment in bonds and temperature for optimists. Tables 7 and 8 examine these results using general interest and depression as personality characteristics.

[INSERT TABLE 6 HERE]

6 Conclusion

Despite the large and growing empirical evidence that points towards the role of behavioral biases that affect asset prices and the real economy, there is little understanding about the interaction

between personality characteristics for an individual investor and external stimuli. That is, how do personality characteristics moderate or mediate the effects of shocks on financial decision-making? Exploiting year-to-year variation in the exposure to different temperatures across countries for over a decade, we identify the causal effect of temperature on both the intensive and extensive margin of financial investments, ranging from bonds to stocks, and the moderating role of optimism. Our identification comes from within-person variation, controlling for country $\times$ year fixed effects.

Our primary result is that hotter temperatures reduce optimists' appetite for risk by depressing their demand for stocks and boosting their demand for safe assets, such as bonds and mutual funds. However, we find no such effects for pessimists. Given a large body of empirical literature from psychology that has documented differences between optimists and pessimists, especially with regards to their responsiveness to external stimuli, these results show how different types of investors may respond to external stimuli. In this sense, the fluctuations that are observed in stock returns reflects a change in not only underlying fundamentals, but also the composition of investors. We show that these results are driven by optimism as the personality characteristic, rather than general interests or mental well-being. Furthermore, we find that attitudes about risk are a major determinant of the differences in optimism that we observe in the cross-section.

One limitation of our research is that our sample consists of primarily older individuals. While we still believe these results are important and applicable to behavioral finance, especially since younger individuals are less likely to participate in the stock market anyways, it would be interesting to see whether these results hold on a more representative sample and at a higher frequency. For example, is it climate (i.e., longer-run changes) or weather (i.e., shorter-run changes) that affects financial decision-making? Similarly, how do personality characteristics moderate other external stimuli? We have focused on temperature because of its ability to cleanly identify causal

effects, but there are many other external shocks that are even more interesting for understanding fluctuations in asset prices as a result of investor behavior.

Tables and Figures

Table 1: Descriptive Statistics, 2004-2018

	Pooled Sample		Optimists		Pessimists	
	mean	sd	mean	sd	mean	sd
financial investments						
investments in bonds	0.03	0.17	0.03	0.18	0.01	0.11
investments in stocks	0.1	0.3	0.1	0.3	0.0	0.1
investments in mutual funds	0.06	0.24	0.07	0.26	0.02	0.13
investments in retirement accounts	0.1	0.3	0.1	0.3	0.0	0.2
amounts in financial investments						
amount invested in bonds	45596.94	72485.29	46535.57	73585.56	35230.61	58153.96
amount invested in stocks	41103.5	86946.0	41642.2	87850.4	33327.8	71812.6
amount invested in mutual funds	58767.45	95607.67	58776.67	94360.83	56377.02	108686.62
amount invested in retirement accounts	41902.5	77087.9	43529.8	78320.0	25808.3	64402.9
personality						
optimism	0.86	0.35	1.00	0.00	0.00	0.00
depression	0.6	0.5	0.6	0.5	0.4	0.5
happiness	0.82	0.38	0.87	0.33	0.69	0.46
interest	0.9	0.3	0.9	0.3	0.8	0.4
trust others	6.81	2.39	6.95	2.33	6.16	2.53
risk aversion	0.82	0.39	0.80	0.40	0.90	0.30
health quality	0.56	0.50	0.63	0.48	0.35	0.48
demographics						
male	0.44	0.50	0.45	0.50	0.42	0.49
age at interview	67.52	9.95	66.51	9.59	69.93	10.57
employed	0.23	0.42	0.25	0.43	0.13	0.34
property value	200786.97	188239.27	211036.02	190386.94	138327.99	158932.25
country sentiment						
population growth	0.26	0.62	0.34	0.57	0.23	0.56
services value	62.77	5.15	63.14	5.01	61.89	5.02
total agriculture value	1.95	0.93	1.78	0.86	2.21	0.89
gdp per capita	34526.27	17471.82	37462.86	16959.48	28058.82	13448.59
weather						
temperature	10.00	3.99	10.36	3.89	10.38	3.75
precipitation	11.91	3.09	12.01	2.81	11.98	2.86
Observations	206743		127375		21376	

Notes.—Sources: Survey of Health, Ageing and Retirement (SHARE) in Europe (2004-2018). The table reports financial investments, amounts invested in financial derivatives, personality traits, region weather information, individual basic demographic and country sentiment descriptive statistics. Financial investments are binary variables taking 0 or 1 and show if the respondents have invested or not in financial derivatives. Real amounts invested in bonds, stocks etc. are continuous variables, presenting the amounts that the respondent has invested in bonds, stocks, mutual funds and retirement accounts. The personality traits are binary variables taking 0 or 1 and indicate if the respondents have felt optimism, depression, happiness and interest in things, recently. Other personality traits such as the levels of trust, risk aversion and health quality as determinants of optimism. Risk aversion and health quality are binary variables whereas trust takes values from 0 to 10 related to a higher level of trust. Temperature is measure in degrees of Celsius and precipitation in millimeters. Male indicates the gender of each respondent, taking the value 1 for males and 0 for females. Age is measured as continuous variable. Employed is an indicator for whether the individual is employed or not and property value which is a continuous variable expressed in real terms and it is used as an indicator of wealth. GDP per capita is measured also as a continuous variable in current U.S dollars, population growth, services value and total agriculture are all measured as percentages of GDP. Sample weights are not used.

Table 2: Baseline Effects of Temperature on Financial Investments for Optimists and Pessimists

	Investment in Bonds					Investment in Stocks				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Optimist	-.0436***	-.0095	-.0274***	-.0031	-.0254**	-.0545***	.0174	-.0098	.0617***	.0345**
	[.0083]	[.0084]	[.0082]	[.0128]	[.0124]	[.0144]	[.0145]	[.0147]	[.0173]	[.0174]
log(Temperature)	-.0182***	-.0091**	-.0004	-.0071	-.0069	.0001	-.0126**	-.0033	.0028	.0098
	[.0027]	[.0036]	[.0044]	[.0052]	[.0063]	[.0047]	[.0057]	[.0070]	[.0066]	[.0080]
x Optimist	.0189***	.0068**	.0133***	.0018	.0100**	.0274***	.0009	.0107*	-.0219***	-.0121*
	[.0031]	[.0031]	[.0031]	[.0048]	[.0047]	[.0055]	[.0055]	[.0056]	[.0066]	[.0066]
R-squared	.02	.03	.04	.55	.55	.06	.12	.12	.71	.71
Sample	89701	89701	89701	61798	61798	89732	89732	89732	61817	61817
	Investment in Mutual Funds					Investment in Retirement				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Optimist	-.0374***	-.0296**	-.0215*	-.0313*	-.0260	.0302	-.0684***	-.0700***	-.0093	-.0218
	[.0127]	[.0125]	[.0126]	[.0169]	[.0170]	[.0204]	[.0206]	[.0209]	[.0251]	[.0261]
log(Temperature)	-.0240***	-.0068	.0099	-.0033	-.0014	.0415***	-.0141*	-.0171*	.0006	-.0154
	[.0041]	[.0052]	[.0067]	[.0065]	[.0083]	[.0070]	[.0081]	[.0091]	[.0095]	[.0111]
x Optimist	.0243***	.0179***	.0148***	.0127**	.0108*	.0049	.0316***	.0319***	.0034	.0072
	[.0049]	[.0048]	[.0049]	[.0063]	[.0064]	[.0078]	[.0079]	[.0081]	[.0095]	[.0100]
R-squared	.04	.08	.08	.67	.67	.08	.19	.21	.72	.72
Sample	89771	89771	89771	61831	61831	89981	89981	89981	62041	62041
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	No	No	No	Yes	No	No	No
Year FE	No	Yes	No	Yes	No	No	Yes	No	Yes	No
Person FE	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Country*Year FE	No	No	Yes	No	Yes	No	No	Yes	No	Yes

Notes.—Sources: Survey of Health, Ageing and Retirement (SHARE) in Europe (2004-2018). The table reports the coefficients associated with regressions of an indicator for investment in bonds, stocks, mutual funds and retirement accounts on an indicator for whether the individual is optimistic, logged annual temperature for the NUTS1 region (within a country), their interaction, and a vector of precipitation and individual demographic characteristics, which include age, gender and whether individual is employed or not. Additional country level controls are used such as GDP per capita, population growth, services and agriculture value as a percentage of GDP. Standard errors are robust and clustered at the individual-level. Observations are unweighted.

Table 3: Examining the Intensive Margin Effects of Temperature on Investment Moderated by Optimism

	log(Amounts invested in Bonds)					log(Amounts invested in Stocks)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Optimist	-.1955***	-.0096	-.0263***	-.0055	-.0233	-.0545***	.0174	-.0098	.0617***	.0345**
	[.0478]	[.0103]	[.0098]	[.0166]	[.0145]	[.0144]	[.0145]	[.0147]	[.0173]	[.0174]
log(Temperature)	-.0395**	-.0242***	-.0073	-.0245***	-.0102	.0001	-.0126**	-.0033	.0028	.0098
	[.0165]	[.0047]	[.0055]	[.0072]	[.0077]	[.0047]	[.0057]	[.0070]	[.0066]	[.0080]
x Optimist	.0865***	.0074*	.0136***	.0024	.0095*	.0274***	.0009	.0107*	-.0219***	-.0121*
	[.0179]	[.0040]	[.0038]	[.0063]	[.0056]	[.0055]	[.0055]	[.0056]	[.0066]	[.0066]
R-squared	.01	.91	.91	.95	.95	.06	.12	.12	.71	.71
Sample	90412	90412	90412	62464	62464	89732	89732	89732	61817	61817
	log(Amounts invested in Mutual Funds)					log(Amounts invested in Retirement)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Optimist	-.2173***	-.0265*	-.0187	-.0409**	-.0307*	-.1125***	-.0646***	-.0677***	-.0122	-.0275
	[.0488]	[.0147]	[.0150]	[.0186]	[.0183]	[.0255]	[.0206]	[.0210]	[.0255]	[.0265]
log(Temperature)	-.0794***	-.0041	.0117	-.0049	-.0011	.0614***	-.0123	-.0168*	.0018	-.0184
	[.0170]	[.0063]	[.0080]	[.0076]	[.0094]	[.0094]	[.0082]	[.0092]	[.0099]	[.0112]
x Optimist	.1015***	.0175***	.0146**	.0168**	.0130*	.0627***	.0304***	.0311***	.0048	.0097
	[.0182]	[.0056]	[.0057]	[.0070]	[.0069]	[.0098]	[.0079]	[.0081]	[.0097]	[.0101]
R-squared	.01	.88	.88	.95	.95	.04	.79	.80	.92	.92
Sample	90299	90299	90299	62322	62322	90369	90369	90369	62382	62382
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	No	No	No	Yes	No	No	No
Year FE	No	Yes	No	Yes	No	No	Yes	No	Yes	No
Person FE	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Country*Year FE	No	No	Yes	No	Yes	No	No	Yes	No	Yes

Notes.—Sources: Survey of Health, Ageing and Retirement (SHARE) in Europe (2004-2018). The table reports the coefficients associated with regressions of an indicator for logged real amounts invested in bonds, stocks, mutual funds and retirement accounts, on an indicator for whether individual is optimistic, logged annual temperature for the NUTS1 region (within a country), their interaction, and a vector of precipitation and individual demographic characteristics, which include age, gender and whether individual is employed or not. Additional country level controls are used such as GDP per capita, population growth, services and agriculture value as a percentage of GDP. Standard errors are robust and clustered at the individual-level. Observations are unweighted.

Table 4: Examining the Determinants of Optimism

	Optimist			
	(1)	(2)	(3)	(4)
Trust others	.0086***	.0083***	.0082***	.0080***
	[.0006]	[.0005]	[.0005]	[.0005]
Risk aversion	-.0243***	-.0147***	-.0147***	-.0134***
	[.0026]	[.0025]	[.0025]	[.0025]
Health quality	.0716***	.0551***	.0549***	.0546***
	[.0026]	[.0025]	[.0025]	[.0025]
Age at interview	-.0009***	-.0019***	-.0019***	-.0018***
	[.0002]	[.0002]	[.0002]	[.0002]
Male	-.0019	-.0003	-.0006	-.0003
	[.0024]	[.0023]	[.0023]	[.0022]
Employed	.0105***	.0097***	.0099***	.0084***
	[.0031]	[.0030]	[.0030]	[.0030]
Constant	-.9511***	3.5416***	3.6688***	-1.3135
	[.0586]	[.6197]	[.6216]	[.8928]
R-squared	.09	.20	.21	.22
Sample	65176	65176	65176	65176
Controls	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	No
Year FE	No	Yes	No	No
Nuts FE	No	No	Yes	No
Country*Year FE	No	No	No	Yes

Notes.—Sources: Survey of Health, Ageing and Retirement (SHARE) in Europe (2004-2018). The table reports the coefficients of determinants of optimism such as the levels of trust, risk aversion and health quality, logged annual temperature for the NUTS1 region (within a country), their interaction, and a vector of precipitation and individual demographic characteristics, which include age, gender and whether individual is employed or not. Additional country level controls are used such as GDP per capita, population growth, services and agriculture value as a percentage of GDP. Standard errors are robust and clustered at the individual-level. Observations are unweighted.

Table 5: Robustness: Examining Income and Wealth Effects

	Value of Property				
	(1)	(2)	(3)	(4)	(5)
Optimist	.8567***	.3486**	.3640**	.1939	.2207
	[.1601]	[.1567]	[.1603]	[.2297]	[.2337]
log(Temperature)	.3417***	-.0628	-.0105	-.0306	.0430
	[.0584]	[.0591]	[.0643]	[.0877]	[.0957]
x Optimist	-.2538***	-.0563	-.0631	-.0710	-.0817
	[.0600]	[.0587]	[.0600]	[.0868]	[.0885]
R-squared	.32	.35	.35	.76	.76
Sample	50568	50568	50568	29661	29661
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	No	No
Year FE	No	Yes	No	Yes	No
Person FE	No	No	No	Yes	Yes
Country*Year FE	No	No	Yes	No	Yes

Notes.—Sources: Survey of Health, Ageing and Retirement (SHARE) in Europe (2004-2018). The table reports the coefficients associated with regressions of the respondent's logged self-reported real property value on logged annual temperature for the NUTS1 region (within a country), an indicator for being optimistic, their interaction, and a vector of precipitation and individual demographic characteristics, which include age, gender and whether individual is employed or not. Additional country level controls are used such as GDP per capita, population growth, services and agriculture value as a percentage of GDP. Standard errors are robust and clustered at the individual-level. Observations are unweighted.

Table 6: Robustness Exercise Using Happiness as an Alternative Measure of Optimism

	Investment in Bonds					Investment in Stocks				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
happy	.0514***	.0556***	.0248*	.0692***	.0366*	-.0311*	.0462***	.0058	.0921***	.0378*
	[.0109]	[.0113]	[.0130]	[.0177]	[.0202]	[.0183]	[.0179]	[.0191]	[.0214]	[.0230]
log(Temperature)	.0065*	-.0028	.0097	-.0009	.0087	.0144**	-.0124*	-.0005	-.0159**	-.0138
	[.0036]	[.0044]	[.0063]	[.0062]	[.0092]	[.0060]	[.0065]	[.0081]	[.0071]	[.0096]
x happy	-.0162***	-.0174***	-.0059	-.0245***	-.0120	.0216***	-.0126*	.0027	-.0347***	-.0135
	[.0042]	[.0043]	[.0050]	[.0068]	[.0078]	[.0070]	[.0069]	[.0074]	[.0082]	[.0087]
R-squared	.02	.03	.04	.53	.54	.07	.12	.13	.71	.71
Sample	67572	67572	67572	37824	37824	67596	67596	67596	37830	37830
	Investment in Mutual Funds					Investment in Retirement				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
happy	-.0170	.0338*	.0380*	-.0037	-.0081	-.2151***	-.0677***	-.0394*	-.0272	-.0416
	[.0181]	[.0177]	[.0196]	[.0224]	[.0257]	[.0226]	[.0217]	[.0223]	[.0256]	[.0279]
log(Temperature)	-.0090	.0095	.0185*	.0111	.0261**	.0178**	.0063	-.0176*	.0023	-.0344***
	[.0062]	[.0071]	[.0099]	[.0079]	[.0115]	[.0075]	[.0079]	[.0092]	[.0085]	[.0114]
x happy	.0128*	-.0072	-.0091	.0034	.0049	.0893***	.0309***	.0201**	.0108	.0165
	[.0070]	[.0068]	[.0075]	[.0085]	[.0098]	[.0087]	[.0083]	[.0086]	[.0099]	[.0107]
R-squared	.04	.08	.08	.65	.65	.11	.18	.19	.69	.69
Sample	67641	67641	67641	37853	37853	67778	67778	67778	37986	37986
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	No	No	No	Yes	No	No	No
Year FE	No	Yes	No	Yes	No	No	Yes	No	Yes	No
Person FE	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Country*Year FE	No	No	Yes	No	Yes	No	No	Yes	No	Yes

Notes.—Sources: Survey of Health, Ageing and Retirement (SHARE) in Europe (2004-2018). The table reports the coefficients associated with regressions of an indicator for investment in bonds, stocks, mutual funds and retirement accounts on an indicator for whether the individual has felt any enjoyment recently, logged annual temperature for the NUTS1 region (within a country), their interaction, and a vector of precipitation and individual demographic characteristics, which include age, gender and whether individual is employed or not. Additional country level controls are used such as GDP per capita, population growth, services and agriculture value as a percentage of GDP. Standard errors are robust and clustered at the individual-level. Observations are unweighted.

Table 7: Robustness Exercise Using General Interest as an Alternative Measure of Optimism

	Investment in Bonds					Investment in Stocks				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
interested	.0254**	.0479***	.0203	.0469**	.0124	-.0565**	.0415*	.0062	.0920***	.0555*
	[.0121]	[.0125]	[.0133]	[.0236]	[.0269]	[.0231]	[.0223]	[.0232]	[.0319]	[.0338]
log(Temperature)	-.0012	-.0051	.0076	-.0049	.0070	.0102	-.0150*	.0009	-.0201*	-.0098
	[.0042]	[.0052]	[.0068]	[.0087]	[.0120]	[.0080]	[.0085]	[.0105]	[.0116]	[.0136]
x interested	-.0066	-.0144***	-.0041	-.0169*	-.0037	.0278***	-.0119	.0011	-.0336***	-.0197
	[.0046]	[.0047]	[.0050]	[.0089]	[.0102]	[.0088]	[.0085]	[.0089]	[.0122]	[.0129]
R-squared	.02	.03	.04	.53	.53	.07	.12	.13	.70	.71
Sample	64550	64550	64550	35101	35101	64565	64565	64565	35110	35110
	Investment in Mutual Funds					Investment in Retirement				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
interested	-.0416**	.0138	-.0004	.0142	.0165	-.2312***	-.0435*	-.0087	.0260	.0814**
	[.0201]	[.0193]	[.0206]	[.0262]	[.0299]	[.0273]	[.0256]	[.0273]	[.0312]	[.0354]
log(Temperature)	-.0159**	.0004	.0006	.0139	.0352***	.0195**	.0131	-.0086	.0175*	.0093
	[.0068]	[.0075]	[.0102]	[.0096]	[.0125]	[.0094]	[.0097]	[.0116]	[.0106]	[.0139]
x interested	.0205***	-.0012	.0041	-.0018	-.0028	.0869***	.0193**	.0062	-.0093	-.0304**
	[.0076]	[.0074]	[.0079]	[.0100]	[.0114]	[.0104]	[.0098]	[.0105]	[.0118]	[.0133]
R-squared	.04	.08	.08	.65	.65	.11	.18	.19	.69	.70
Sample	64609	64609	64609	35144	35144	64740	64740	64740	35261	35261
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	No	No	No	Yes	No	No	No
Year FE	No	Yes	No	Yes	No	No	Yes	No	Yes	No
Person FE	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Country*Year FE	No	No	Yes	No	Yes	No	No	Yes	No	Yes

Notes.—Sources: Survey of Health, Ageing and Retirement (SHARE) in Europe (2004-2018). The table reports the coefficients associated with regressions of an indicator for investment in bonds, stocks, mutual funds and retirement accounts on an indicator for whether the individual has mentioned any interest in general things, logged annual temperature for the NUTS1 region (within a country), their interaction, and a vector of precipitation and individual demographic characteristics, which include age, gender and whether individual is employed or not. Additional country level controls are used such as GDP per capita, population growth, services and agriculture value as a percentage of GDP. Standard errors are robust and clustered at the individual-level. Observations are unweighted.

Table 8: Robustness Exercise Using Depression as an Alternative Measure of Optimism

	Investment in Bonds					Investment in Stocks				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Depressed	-.0198**	-.0096	-.0159*	-.0227**	-.0310***	-.0343**	-.0181	-.0252*	-.0090	-.0230
	[.0085]	[.0085]	[.0084]	[.0102]	[.0101]	[.0144]	[.0140]	[.0140]	[.0146]	[.0144]
log(Temperature)	-.0066***	-.0050*	.0086**	-.0089**	-.0030	.0145***	-.0165***	-.0016	-.0183***	-.0074
	[.0024]	[.0030]	[.0039]	[.0035]	[.0050]	[.0041]	[.0046]	[.0059]	[.0045]	[.0059]
x Depressed	.0093***	.0057*	.0081**	.0080**	.0113***	.0170***	.0104*	.0131**	.0034	.0089
	[.0032]	[.0032]	[.0032]	[.0039]	[.0039]	[.0055]	[.0054]	[.0053]	[.0056]	[.0055]
R-squared	.02	.03	.04	.54	.55	.06	.12	.12	.71	.71
Sample	92367	92367	92367	65336	65336	92395	92395	92395	65359	65359
	Investment in Mutual Funds					Investment in Retirement				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Depressed	.0036	.0016	.0074	-.0104	-.0062	-.0598***	-.0591***	-.0399**	-.0386**	-.0277
	[.0139]	[.0137]	[.0137]	[.0148]	[.0149]	[.0173]	[.0163]	[.0162]	[.0176]	[.0175]
log(Temperature)	-.0032	.0089*	.0248***	.0063	.0073	.0270***	-.0008	.0006	-.0068	-.0161**
	[.0039]	[.0046]	[.0062]	[.0046]	[.0066]	[.0049]	[.0053]	[.0063]	[.0056]	[.0069]
x Depressed	.0020	.0027	.0007	.0034	.0019	.0267***	.0250***	.0183***	.0145**	.0107
	[.0053]	[.0052]	[.0052]	[.0056]	[.0056]	[.0066]	[.0062]	[.0062]	[.0067]	[.0067]
R-squared	.04	.08	.08	.67	.67	.10	.21	.22	.72	.72
Sample	92425	92425	92425	65357	65357	92621	92621	92621	65533	65533
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	No	No	No	Yes	No	No	No
Year FE	No	Yes	No	Yes	No	No	Yes	No	Yes	No
Person FE	No	No	No	Yes	Yes	No	No	No	Yes	Yes
Country*Year FE	No	No	Yes	No	Yes	No	No	Yes	No	Yes

Notes.—Sources: Survey of Health, Ageing and Retirement (SHARE) in Europe (2004-2018). The table reports the coefficients associated with regressions of an indicator for investment in bonds, stocks, mutual funds and retirement accounts on an indicator for whether the individual has felt sad or depressed in the last month, logged annual temperature for the NUTS1 region (within a country), their interaction, and a vector of precipitation and individual demographic characteristics, which include age, gender and whether individual is employed or not. Additional country level controls are used such as GDP per capita, population growth, services and agriculture value as a percentage of GDP. Standard errors are robust and clustered at the individual-level. Observations are unweighted.

A Online Appendix

A.1 SHARE NUTS 1 Regional Data

Investment in Bonds: The variable takes the value 1 if the respondent has currently invested in bonds and 0 otherwise. Bonds are a debt instrument issued by the government or a corporation in order to generate capital by borrowing.

Investment in Stocks: The variable takes the value 1 if the respondent has currently invested in stocks and 0 otherwise. Stocks are a form of investment that allows a person to own a part of a corporation and gives him/her the right to receive dividends from it.

Investment in Mutual funds: The variable takes the value 1 if the respondent has currently invested in mutual funds and 0 otherwise. A mutual fund is a form of investment which is set up by a financial institution that collects money from many investors and gives it to a manager to invest it in stocks, bonds, and other financial products.

Investment in Retirement accounts: The variable takes the value 1 if the respondent has currently invested in retirement accounts and 0 otherwise. A retirement account is retirement plan that lefts the person put some money away each year, to be (partially) taken out at retirement time.

Amounts invested in Bonds: The respondents answer the question "How much do you currently have in government or corporate bonds ?". It is a continuous variable, expressed in Euros.

Amounts invested in Stocks: The respondents answer the question "How much do you currently have in stocks or shares ?". It is a continuous variable, expressed in Euros.

Amounts invested in Mutual funds: The respondents answer the question "How much do you

currently have in mutual funds or managed investment accounts ?". It is a continuous variable, expressed in Euros.

Amounts invested in Retirement accounts: "How much do you currently have in retirement accounts ?". It is a continuous variable, expressed in Euros.

Optimism: Individuals respond to the question "What are your hopes for the future ? Please note only whether hopes are mentioned or not". Takes the value 1 if the respondent is optimist about the future and 0 if the individual is pessimist.

Depression: Individuals respond to the question "In the last month have you been sad or depressed ?". Takes the value 1 if the respondent has felt sad or depressed and 0 otherwise.

Happiness: Individuals respond to the question "Have you feel enjoyment recently ?". Takes the value 1 if the respondent has mentioned any enjoyment and 0 if not.

Interest: Individuals respond to the question "In the last month what is your interest in things ?". Takes the value 1 whether the respondent mentions no loss of interest and 0 whether mentions less interest than usual.

Trust others: Individuals respond to the question "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" Takes values from 0 to 10, where 0 means you can't be too careful and 10 means that most people can be trusted.

Risk aversion: Individuals respond to the question "What the amount of financial risk you are willing to take when you save or make investments?. Takes the value 1 where 1 means that individual is not willing to take any financial risks, or takes above average financial risks expecting to earn above average returns and 0 depicts that individual takes average financial risks expecting to earn average returns or substantial financial risks expecting to earn substantial returns.

Health quality: The individual completes the sentence "Would you say your health is..." taking the value 1 if the respondent has mentioned excellent or good health and 0 if not.

Age: The age of the respondent, calculated by the year of birth and year of interview.

Male: The gender of each respondent. Takes the value 1 for males and 0 for females.

Employed: The variable reports the current employment status of the respondent i.e. employed or unemployed.

Property value: The individual answers the question "In your opinion, how much would you receive if you sold your property today?". It is a continuous variable, expressed in Euros.

A.2 World Bank Indicators and Aggregate Data

GDP per capita: GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars.

Population growth: Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.

Services value: Services correspond to ISIC divisions 50-99 and they include value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services. Also included are imputed bank service charges, import duties, and any statistical discrepancies noted

by national compilers as well as discrepancies arising from rescaling. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources.

Total agriculture value: Agriculture corresponds to ISIC divisions 1-5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources.

A.3 ECMWF ERA 5 Reanalysis Data

Temperature: The yearly temperature is calculated as the sum of the mean monthly temperature at 2 meters, measured in Celsius degrees.

Precipitation: The yearly precipitation is calculated as the sum of the mean monthly precipitation in 1000's of millimeters.

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