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Life Satisfaction, Household Income and Personality Traits

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Abstract: We show that personality traits mediate the effect of income on Life Satisfaction. The effect is strong in the case of Neuroticism, which measures the sensitivity to threat and punishment, in both the British Household Panel Survey and the German Socioeconomic Panel. Neuroticism increases the usually observed concavity of the relationship: Individuals with higher Neuroticism score enjoy income more than those with lower score if they are poorer and enjoy income less if they are richer. When the interaction between income and neuroticism is introduced, income does not have significant effect on his own.

To interpret the results, we present a simple model where we assume that (i) Life Satisfaction is dependent from the gap between aspired and realized income, and this is modulated by Neuroticism and (ii) income increases in aspirations with a slope less than unity, so that the gap between aspired and realized income increase with aspirations. From the estimation of this model we argue that poorer tend to over-shoot in their aspiration, while rich tend to under-shoot. The estimation of the model also shows substantial effect of traits on income.

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1 Introduction

The general relation between self-reported well-being and personally available income has been widely investigated. A regression of Life Satisfaction on income using both cross-sectional and panel survey data in a developed country generally shows a significant, positive, but small estimated coefficient of income (e.g. Blanchflower and Oswald, 2004; Ferrer-i-Carbonell and Frijters, 2004). Although the debate on the existence of a satiation point is still open, there is general agreement that the size of the effect is decreasing with income, consistently with the usual assumptions over individuals' utility function, as Layard et al. (2008) explicitly point out.[1]

However a significant amount of evidence suggests that the link between Life Satisfaction is more complex than that. Life satisfaction appears to be monotonically increasing with income when one studies this relation at a point in time across nations (e.g. Deaton, 2008; Stevenson and Wolfers, 2008). Over time however, the relation between GDP and Life Satisfaction appears rather different. In a well-known finding, Easterlin reported no significant relationship between happiness and aggregate income in time-series analysis. For example, the income per capita in the USA in the period 1974-2004 almost doubled, but the average level of happiness shows no appreciable trend upwards. This puzzling finding, appropriately called the Easterlin Paradox (Easterlin, 1974) has been confirmed in similar studies by psychologists (Diener et al., 1995) and political scientists (Inglehart, 1990), and has been shown to hold also for European countries, Easterlin (1995).[2] A potential explanation of the paradox is that individuals adapt to current conditions, and the level of subjective well being tends to revert to a baseline level depending on a reference point, an idea originally proposed by

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[1]Layard et al. (2008) find that the marginal Life Satisfaction with respect to income declines at a faster rate than the one implied by a logarithm utility function. Kahneman and Deaton (2010) argue that the effect of income on an emotional dimension of well-being, like happiness self-report, reaches a maximum at an annual income of 75,000 USD, and has no further positive influence for higher values; while the non emotional measures of well being like the Cantrill ladder does not feature this satiation point

[2]There is some disagreement in the time-series based analysis: Oswald (1997) shows evidences of a small positive temporal correlation between Life Satisfaction and GDP in industrialized countries and Stevenson and Wolfers (2008) find significant happiness gains in Japan the post-war period.

Brickman and Campbell (1971). Aspirations have been naturally associated to the reference point provided by current income: hence to the extent that an increase in income leads to an increase in aspirations, changes in income may not have a long-run effect on subjective well being.[3] A different explanation of the Easterlin Paradox hinges on the concept that relative, rather than absolute income, is the main determinant of Life Satisfaction, an idea that can de dated back to Duesenberry (1949).[4]

The present paper aims to shed more lights on the relation between personal income and Life Satisfaction by bringing into the analysis the personality theory. We first analyze how traits interact in this relationship, and we then propose a theoretical explanation of the empirical findings. We finally test this explanation by estimating a structural model based on our theory. Our analysis shows that Neuroticism affects not just the level of Life Satisfaction, but also modulates the relationship between income and Life satisfaction in both the British Household Panel Survey and the German Socioeconomic Panel. The effect of income seems largely mediated by the personality traits. When the interaction between income and Neuroticism is introduced, income does not have significant effect on his own. Neuroticism increases the usually observed concavity of the relationship between income and Life Satisfaction. Individuals with higher Neuroticism score enjoy income more than those with a lower score if they are poorer; conversely, they enjoy income less if they are richer.[5]

Why do we observe this strong effect? Neuroticism is linked to higher sensitivity to negative emotions like anger, hostility or depression (e.g. Clark and Watson, 2008), is associated with structural features of the brain systems associated with sensitivity to threat and punishment (DeYoung et Al. 2010) and with low levels of serotonin in turns associated with aggression, poor impulse control, depression, and anxiety (Spoont 1992). For this reason modern studies

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[3]Easterlin (2005), Stutzer (2004), McBride (2006) provides some empirical evidence on how aspirations increase in income

[4]Clark and Oswald (1996), Blanchflower and Oswald (2004), Luttmer (2005), Senik (2009) among others present empirical validations of this hypothesis. See Clark et al. (2008) for an extensive survey of the theoretical and empirical literature explaining the Easterlin Paradox.

[5]These results are consistent with Boyce and Wood (2010), who find that Neuroticism interacts negatively in a model with the logarithm of the income in a Life Satisfaction equation.

identify this personality trait with sensibility to negative outcomes, threats and punishments (see DeYoung and Gray (2010) for a recent survey). It is therefore reasonable to argue that people with higher Neuroticism experience higher sensitivity to losses or failure to meet the expectations. Accordingly, we propose an explanation of why Neuroticism decreases the elasticity between income and Life Satisfaction for high income level and increase this elasticity for lower income levels. The explanation is based on the sensitivity to the gap between aspiration and realization in income.

In a simple structural model we take the aspiration determined by personality traits and income to be a monotonic function of aspiration, and assume that the responsiveness of Life Satisfaction to the gap between aspired and realized income is proportional to Neuroticism. The estimation of the model shows that the elasticity between income and Life Satisfaction increases with Neuroticism for lower incomes and declines with Neuroticism at higher incomes; thus aspirations are in average fulfilled for low income and in average un-fulfilled for high income.

We therefore estimate the elasticity of Life Satisfaction on income as a variable dependent from individual's personality. Kahneman et al. (2006) and Akin et al. (2009) show that individuals tend to underestimate the Life Satisfaction of the poorer. Their conclusion is that individuals work to become richer because of the illusion that wealth brings happiness. The present paper bringing into the analysis the personality theory suggests a different reading of these empirical findings. Richer people having a different personality than poorer estimate correctly how bad they would feel if they themselves were poorer, and it is also for this reason that they are not poorer.

The estimation of the reduced form of our structural model unveil other relevant empirical results. Traits underlying motivation, like Conscientiousness, Openness and Extraversion, increase income significantly. These results confirm that personality traits are important for predicting life outcomes, income in this case (see Roberts et al. (2007) and Burks et al. (2009) for other life outcomes).

Finally, we note that the result that the marginal satisfaction of individuals with higher Neuroticism decline faster for high income levels provide a possible explanation of the choice- subjective well being reversal found by Benjamin et

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al. (2011) more often in neurotic individuals. Neurotic and highly ambitious individuals, even when they prefer to be richer, expect that the cost of being rich is high for then, hence they may predict that this leads to less satisfaction.

Recently economists have recognized the importance of introducing personality traits in the economic model (Borghans, et al 2008; Rustichini, 2009; Almlund et a. 2011). Data on Personality traits are considered at least as stable as the economic preferences on risk, intertemporal discount rates, altruism and leisure (Borghans, et al. 2008); traits have a stronger predictive power than economic preferences for many important economic outcomes (Anderson et al. 2011) and have a comparable predictive power with respect to cognitive abilities (Almlund et a. 2011). Personality traits and economic preferences seem to be only weakly correlated, suggesting that both group of variables have independent predictive power for economic outcomes (Anderson et al. 2011). Personality are also related to genetic factors: for example, using analysis based on the difference between DZ and MZ twins Rieman et al. (1997) show for all five factors, genetic effects were the strongest source of the phenotypic variance on the personality traits measured vis self-report, accounting of about 50 percent of the variance. Other studies (see Loehlin's (1992) meta analysis) based on the difference between twins reared apart and reared together show that shared sibling environment effects contributed little to phenotypic variance. They were negligible for Extraversion (2 percent) and small for Openness (6 percent), Conscientiousness (7 percent), Neuroticism (7 percent) and Agreeableness (11 percent).

It is known that personality traits can change with the age (Borghans, et al. 2008). We partially address this problem by considering the residuals of personality traits after controlling for age. Traits can also change in response to external environment. In this respect, Cobb-Clark and Schurer (2011) show that personality traits change after external shocks only to a negligible extent. For example, individuals who experienced five or more main adverse employment or income shocks between 2006 and 2009 (an event occurring to less than one percent of population) become more neurotic of the order 0.28 standard deviations for men and 0.15 for women. This produces –considering the estimated effect of traits on income (see eg Mueller and Plug (2006), and also our estimation below)– a

decrease of 0.012 US in hourly wage.

The predictive power of any particular personality measure tends to be smaller than the predictive power of IQ but in some cases rivals it. Conscientiousness best predicts overall schooling attainment and achievement and college grades to the same degree that SAT scores do and it is the best predictor of overall job performance and wages across a broad range of occupational categories; Neuroticism predict a variety of labor market outcomes, including job search effort (see Almlund et a. 2011 for a survey of these results). The traits linked to ambition and aspirations are: openness (Vaughn et al. 2007), extraversion (Depue and Collins 1999) and the proactive side of Conscientiousness, as a need for achievement and commitment to work (Costa et al., 1991).

The rest of the paper is organized as follows. In section 2 we describe datasets and main variables. In Section 3 we show the empirical results. In section 4 we describe our theory and estimate the structural model. Section 5 concludes. Additional analysis and more technical details are in the appendix.

2 Data

We use two national data sets: the British Household Panel Survey (BHPS), covering the years 1996-2008 (the question on Life Satisfaction has been introduced in 1996), and the German Socioeconomic Panel Study (SOEP), available for the years 1984-2009. Both SOEP and BHPS have longitudinal data, with the same individuals interviewed every year. All main data are presented in tables 1 and 2. We provide now a brief description of the main variables.

Big 5 Personality Traits. The Big Five are usually measured through self-report based on the NEO Five-Factor Inventory (Costa and McCrae, 1989). There is large literature demonstrating the reliability of this questionnaire and the stability of the personality traits. The data used in the current paper have been elaborated from the standard short questionnaire present in the BHPS and SOEP data-set (in the year 2005), personality traits are usually assessed with the NEO-Five Factor Inventory (NEO-FFI) with 60 items (12 items per domain). However, recent scale-development studies have indicated that the Big

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Five traits can be reliably assessed with a small number of items (e.g., Gosling et al., 2003). For instance, pilot work from the German Socio-Economic Panel (GSOEP) study led to a 15-item version of the well-validated Big Five Inventory (Benet-Martinez and John, 1998) that can be used in large-scale surveys. The questions are presented in section A of the appendix.

We consider the residuals of the traits after regressing them against age and age square and jointly normalize them so that they always range within 0 and 1.[6] Tables 1 and 2 present the descriptive statistics of the personality traits variable, including the original data (with the asterisks) as well as the residuals.

Life Satisfaction. In the BHPS the Life Satisfaction question is: *"How dissatisfied or satisfied are you with your life overall?"* and it is coded on a scale from 1 (not satisfied at all) to 7 (completely satisfied). In the SOEP the questions is *"We would like to ask you about your satisfaction with your life in general"*, coded on a scale from 0 (completely dissatisfied) to 10 (completely satisfied).

To ease comparability of the statistical results for different data sets, we transformed the measures of Life Satisfaction to always lie in a range between 1 and 7. In particular, we transformed the index of the SOEP according to the formula $1 + \frac{\text{Life Satisfaction} \times 6}{10}$.

Household income. In both SOEP and BSHP datasets the income has been transformed in USD at 2005 constant prices, using the Consumer Price Index (CPI) of World Bank-World Development indicators. Data on income are all in 10K units. Figure 4 in the appendix displays the histograms of Income distribution for UK and Germany.

Control variables. Unless explicitly stated otherwise, in all regressions we control for demographic variables as age and gender, marital status, number of children in the household, academic qualifications, number of visits to the doctor to control for the health status. We will also introduce dummies to control for region of residence and labor force participation status like home caring, unemployed, retired and so on. In some of the regressions we also introduce labor

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[6]Borghans et al. 2007 and Specht et al. 2011 show that personality traits variate across the life cycle, Cobb-Clark et al. (2011) substantially confirm this finding but shows that this change is small. Also in our data, the age explain a small portion of the total variance. For example in a regression of Neuroticism with age and age^2 the $R^2 = 0.0027$ in the SOEP and $R^2 = 0.0025$ in the BHPS.

environment related controls, like worked hours, sector, socioeconomic status and firm size.

3   Analysis

We use a quadratic specification of the model linking income to Life Satisfaction because we are interested in analyzing how traits influence the concavity of this relation. In order to avoid the excessive weight given to the outliers by this specification, we exclude from the sample the top and bottom 1 percent observations. Excluding observations in the two tails of the income distribution is standard in this literature.[7]

Figures 1 and 2 display the residuals Life Satisfaction – after controlling for age, age^2, gender and the five personality traits–, as a function of income residuals after controlling for the same variables, in UK and Germany respectively. From the two panels in figure 1, we note that for individuals with high Neuroticism score, the curve is more concave while for those with low Neuroticism this relation is almost linear. Furthermore in both countries the relation is steeper for highly neurotic with respect to low neurotic in the region of the graph corresponding to lower incomes, while it is seems flatter for highly neurotic with high income. Finally we note from the graphs in figure 2 that no other trait has such a clear effect on the relation we are analyzing.

Panels in figures 1 and 2 are based on data pooled across waves. To exploit the longitudinal nature of our dataset by taking into account individuals' heterogeneity and exclude the role of omitted variables, we estimate a number of econometric models controlling for a large number of potentially confounding factors. In particular we estimate the following model:

$$h_{it} = \beta_1 y_{it} + \beta_2 y_{it}^2 + \beta_1' \theta_i y_{it} + \beta_2' \theta_i y_{it}^2 + \Gamma z_{it} + \Lambda \theta_i + \epsilon_i + \eta_t + e_{it} \qquad (1)$$

In equation (1), i represents the individual and t the year of the survey, h_{it} is Life

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[7]For the SOEP this excludes at the top 3964 observations with an income between 114K and 1,515K, at the bottom 4019 observations with an income less or equal 7,277 euro per year. All following results are robust to different thresholds of exclusion

Satisfaction, y_{it} the household income. The individual fixed effect is described as $\Lambda\theta_i + \epsilon_i$, where

$$\theta_i = (N_i, E_i, C_i, A_i, O_i, M_i) \tag{2}$$

with $N = Neuroticism$, $E = Extraversion$, $C = Conscientiousness$, $A = Agreeableness$, $O = Openness$, $M = Male$ and ϵ_i is the individual specific random effect. The terms $\beta_1'\theta_i y_{it} + \beta_2'\theta_i y_{it}^2$ represent the interaction of a personality trait index with the income variables. The vector, z_{it}, consists of time changing individual characteristics: Age, Age^2, Marital state (a set of dummies depending on whether the respondent is married, divorced, separated or widowed), Education (a set of dummies measuring high school achievement, vocational training or college degree); Number of children in the household, Region of residence (a set of dummies one for each region of residence of the household), Health status (a set of dummies indicating intervals in terms of number of visits to the doctor); Labor force participation (a set of dummies depending on whether the individual is employed, house carer, unemployed, retired); occupation types (a large set of dummies for socioeconomic status (manager, employed, professional, white-collar, blue collar, farm-worker and so on), worked hours per week and its squared term. The variable η_t denotes a year (and wave) fixed effect and e_{it} is random noise.

In table 3, we report the OLS estimation of the model (1).[8] The table shows that in both datasets Neuroticism is the only one of the five traits trait to affect the relation between Income and Life Satisfaction, and in a qualitatively similar way. No other trait seems to affect both linear and quadratic term in both datasets. Furthermore, both in Germany and in the UK, the usually observed marginal decreasing effect of income on Life Satisfaction is entirely mediated by Neuroticism. Once the interacted term is taken into account, either there is no effect of income on Life Satisfaction or this effect becomes convex as in column 2. We will return to the interpretation of the marginal effects below when we

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[8]It is known in this literature that assuming ordinality or cardinality of happiness scores makes little difference (Ferrer-i-Carbonell Frijters 2004). This can also be observed in table 9 of the appendix, where we report the estimation of a similar model using an ordered probit estimator

present the result of the structural model.

A possible concern is that the random effect estimator is not consistent due to the fact that ϵ_i is correlated with the other regressors, we therefore estimate a model similar to 1 with individual fixed effects, the results are reported in table 4. Finally we further interacted the terms Neuroticism*income with a male dummy. From table 5 we note that for male individual the Neuroticism affects more strongly than in female the relation between income and Life Satisfaction, in other words the concavity of this relation, due to the Neuroticism, is stronger among male.

4 Happiness and Personality

The data we have seen suggest that Neuroticism affects systematically the relation between Life Satisfaction and income. Both the linear and the quadratic interaction of income with Neuroticism are significant, which implies that Neuroticism increases the positive effect of income on Life Satisfaction for lower level of income and it decreases this effect for high income levels. To provide an explanation we present a model based on the modern personality traits theory; we then show that this model is able to produce an equation similar to equation 1 as a reduced form and we will estimate this model using an appropriate estimator. We then interpret the coefficient of the estimation in light of the underlying structural model. In the model, behavior is explained by traits that characterize an individual, rather than by optimization.

We use the convention that the coefficients are assumed to be positive. The terms $e_{it}; u_{it}; v_{it}$ are error terms. The model has three equations. The dependent observable variables are the household income y_{it} and the Life Satisfaction h_{it}. The dependent latent variable is the *desired income* for any individual i at time t is denoted by a_{it}. We assume that the aspiration to an income, a_{it} induces (through effort, persistence, and confidence) a real level of income that is increasing in the aspiration level. We assume for convenience a linear form: what is essential is that the relationship is monotonic. Thus the *Level of income*

depends on the desired income as:

$$y_{it} = \alpha_2 + \beta_2 a_{it} + u_{it} \tag{3}$$

The *Life Satisfaction* depends on the realized income and other variables; it increases with income, but it depends on the distance with aspirations and this distance is modulated by Neuroticism:

$$
\begin{aligned}
h_{it} \;=\; & \alpha_1 + \beta_1 y_{it} + \delta y_{it}^2 + \\
& + \gamma_1 N_i \left(a_{it} - y_{it} \right) + \gamma_{2,1} N_i \left(a_{it} - y_{it} \right)^{+2} + \\
& + \gamma_{2,2} N_i \left(a_{it} - y_{it} \right)^{-2} \Gamma_1 z_{it} + \Lambda_1 \theta_{hi} + e_{it}.
\end{aligned}
\tag{4}
$$

We expect the term γ_1 to be negative while the terms $\gamma_{2,1}$ and $\gamma_{2,2}$ depend on the concavity of the function. If we consider a_{it} as a reference point, prospect theory would predict $\gamma_{2,1} < 0$ and $\gamma_{2,2} > 0$.

Personality traits also affect the Life Satisfaction by shifting the intercept and interacting with income. The vector $\theta_{h,i}$ includes Neuroticism and Extraversion, in addition to the gender (variable Male). The dependence of the γ_1, $\gamma_{2,1}$ and $\gamma_{2,2}$ coefficients is assumed to be linear (so the effect is a multiplicative interaction). An individual's sensitivity to the gap between aspired and realized income depends on his personality. Modern literature in psychology views Neuroticism as sensibility to negative outcomes (DeYoung and Gray, 2010). Ex-post, individuals perceive the negative gap between real and aspired income as a negative outcome, and the higher their Neuroticism score, the higher is the potential subjective welfare cost of this gap.

We assume that aspirations are exogenous with respect to individuals' choices. Following the literature on the hedonic treadmill theory (Diener et Lucas, 1999), we assume that past income as well as personality affect expectations, hence:

$$a_{it} = \alpha_0 + \eta_0 y_{it-1} + \Gamma_0 z_{it} + \Lambda_0 \theta_{ai} + v_{it} \tag{5}$$

where θ_{ai} is a vector containing time independent personal characteristics (gender and the personality traits), $z_{i,t}$ are the time dependent personal characteristics

(education and age), y_{it-1} is the real income in the previous wave. The interpretation of the equation: at any time t, individuals form realistic expectations on next period income, with an upward adjustment affected by individuals' characteristics, education and age.

This model is consistent with the idea of "Keeping up with the Jones" (Duesenberry (1949)) if we consider that aspiration could be set to depend on the top incomes of some reference group. It is also consistent with habit formation ideas (Brickman and Campbell (1971)) since aspirations are updated with the past income. The main problem in estimating the model described by 3, 4 and 5 is that the aspiration level, a_{it} is not observable. We therefore solve for a_{it} equation 5 and substitute it in 4 so to have a "semi-reduced" form that can be estimated.

Before we proceed with this strategy, we check the plausibility of this model by estimating the two equations 5, and 3 by using a proxy for aspiration, present in the SOEP dataset, provided by the answer to the question "Is success important in job?", coded from Unimportant (1) to Very Important (4). The results are presented in table 10 of the appendix.[9] As expected, the answer to this question correlates positively and significantly with the traits implying motivations: openness, conscientiousness and extraversion (and negatively with the others) in the first stage regression and, as an instrumented variable, the same question is a significantly positive predictor of income in the 3 stage least square estimation. Next, we solve equation 3 by a_{it}, and substitute it in 4 to obtain the equations below. For $y_{i,t} > \frac{u_{i,t} + \alpha_2}{1 - \beta_2}$

$$
\begin{aligned}
h_{it} = {} & \gamma_{2,1} N_i \left(\frac{-u_{i,t} + y_{i,t} - \alpha_2}{\beta_2} - y_{i,t} \right)^2 + \gamma_1 N_i \left(\frac{-u_{i,t} + y_{i,t} - \alpha_2}{\beta_2} - y_{i,t} \right) + \\
& \beta_1 y_{i,t} + \delta y_{i,t}^2 + \Gamma_1 z_{i,t} + \Lambda_1 \theta_{hi} + \alpha_1 + e_{i,t}.
\end{aligned} \tag{6}
$$

---

[9]This question is present in the waves 1990, 1992, 1995, 2004, 2008 and it is originally inversely coded.

For $y_{i,t} < \frac{u_{i,t}+\alpha_2}{1-\beta_2}$

$$
\begin{aligned}
h_{it} = {} & \gamma_{2,1} N_i \left(\frac{-u_{i,t} + y_{i,t} - \alpha_2}{\beta_2} - y_{i,t} \right)^2 + \gamma_1 N_i \left(\frac{-u_{i,t} + y_{i,t} - \alpha_2}{\beta_2} - y_{i,t} \right) + \\
& \beta_1 y_{i,t} + \delta y_{i,t}^2 + \Gamma_1 z_{i,t} + \Lambda_1 \theta_{hi} + \alpha_1 + e_{i,t}
\end{aligned}
\tag{7}
$$

We estimate a single equation:

$$
\begin{aligned}
h_{it} = {} & \gamma_2 N_i \left(\frac{-u_{i,t} + y_{i,t} - \alpha_2}{\beta_2} - y_{i,t} \right)^2 + \gamma_1 N_i \left(\frac{-u_{i,t} + y_{i,t} - \alpha_2}{\beta_2} - y_{i,t} \right) + \\
& \beta_1 y_{i,t} + \delta y_{i,t}^2 + \Gamma_1 z_{i,t} + \Lambda_1 \theta_{hi} + \alpha_1 + e_{i,t}
\end{aligned}
\tag{8}
$$

which implies that γ_2 is the sum of two different effects. For example if the equation is concave when $y_{i,t} > \frac{u_{i,t}+\alpha_2}{1-\beta_2}$ and convex when $y_{i,t} < \frac{u_{i,t}+\alpha_2}{1-\beta_2}$ and if $\gamma_2 < 0$, then this suggests that the concavity of the function when the aspiration are "over-shooting" is stronger than its convexity when the aspiration are "under-shooting". Equation 8 can be rewritten as

$$
\begin{aligned}
h_{it} = {} & \alpha_1 + \beta_1 y_{it} + \delta y_{it}^2 + \gamma_2 \left(\frac{1-\beta_2}{\beta_2} \right)^2 N_i y_{it}^2 + (C u_{it} + B) N_i y_{it} + \\
& + N_i \left(F u_{it}^2 + G u_{it} + D \right) + \Gamma_1 z_{it} + \lambda_E E_i + e_{it};
\end{aligned}
\tag{9}
$$

where B, C, D, F and G are constants that depend on the parameters of the structural model that we present in the appendix B. Moreover substituting 5 in 3, we have:

$$
y_{it} = A_2 + B_2 y_{it-1} + C_2 z_{it} + D_2 \theta_{ai} + \beta_2 v_{it} + u_{it}.
\tag{10}
$$

The results of the estimations of the system of equations 9 and 10 is presented in table 6, where we used 3 stages least squares and considered only data for the year 2005– when the traits have been measured in both datasets; and in table 7– where we used a 2SLS estimator and considered the entire panel of data by introducing the individual random effect. We note that in both datasets both the linear and quadratic interactions of income with Neuroticism are significant and the non interacted relation between income and Life Satisfaction become linear in Germany and convex in the UK. Figure 3 plots the coefficients of the

regression presented in table 7 for the highest (dashed line) and the lowest level of Neuroticism (bold line). In highly neurotic individuals income increases Life Satisfaction faster than in low neurotic for lower level of income, but this effect is reverted in the the high income region, where non neurotic seem to enjoy more than neurotic a marginal increase in income. Note also that Neuroticism is the element determining the concavity of the relation between income and Life Satisfaction, in non neurotic individuals the relation is not concave both in Germany and in the UK.

Now we will interpret the results of tables 6 and 7 in the light of our structural model represented by equations 3, 4 and 5. Considering the estimated equation 9, we note that $B > 0$, where

$$B = \frac{(1 - \beta_2)(\beta_2 \gamma_1 - 2\alpha_2 \gamma_2)}{\beta_2^2}. \tag{11}$$

The sign of the coefficient of $N_i y_{it}^2$ is negative therefore the sign of γ_2 is identified and negative.

If we assume that aspiration to income, a_{it}, induces (through effort, persistence, and confidence) a real level of income increasing in the aspiration level, but at a rate smaller than 1, so that $\beta_2 < 1$ and assuming that $\gamma_1 < 0$: the Life Satisfaction is negatively related to the gap between aspiration and real income, then $\alpha_2 > 0$. From equation 3 this implies that rich fail to meet their aspirations in average more than poor. In other words, rich under-shoot in their aspiration in average more than poorer.

Lower aspiration implies that individuals in average "overshoot" in the sense of achieving an income larger than their own aspiration and this has a benefit in terms of relief for an avoided threat; an effect perfectly in line with Carver's (2009) finding that relief strongly correlates with threat sensitivity, hence, following our above argument, with Neuroticism. We summarize the above results as follows: *(i)* higher motivation produces aspiration to higher income, and hence to higher realized income; *(ii)* High aspiration levels are necessary for a higher income, but the higher they are, the more likely it is that they go unfulfilled. The effect of aspiration on realized income thus occurs at a decreasing rate.

Is this result reasonable? consider the search for a new occupation. An individual searching for a job may set a reservation wage to be reached before he or she stops searching. The higher the aspiration level the higher the wage found will be, everything else being equal, although perhaps at a later date. Increasing aspiration may then increase realized income, however, only up to a point, after this point will be extremely difficult to find a better paid job; hence we may observe decreasing rate of return on searching and aspiration.

Our tables 6 and 8 provide an estimate of the effect of traits on income. Motivation is likely to increase income; hence Openness, Conscientiousness and Extraversion (traits underlying motivation) should affect income positively.[10] From table 6, using only one year of data, we note that Openness and Extraversion have the expected sign while Contentiousness seems to have the opposite sign or have no effect. This is probably due to the collinearity with education: when education is excluded the sign of conscientiousness on income becomes positive (this regression is not reported here). Furthermore, when the same system of equations is estimated using all years pooled together, like in table 8, Conscientiousness is positive and significant in both datasets.

The magnitudes of the effects of personality on household income per year are noticeable: for example in the UK sample the size is around $3, 5K$ USD for Openness, $-8, 5K$ USD for Neuroticism, and $6K$ USD for Extraversion. For comparison, the effect of Male is $1.3K$ USD per year, hence the effects of some personality traits are between three and five times larger than the gender gap. These results confirm that personality traits are important for predicting life outcomes, income in this case (see Roberts et al. (2007) Burks et al. (2009) for other life outcomes). Consistently with the literature (Cohen et al. (2003), Vitters and Nilsen (2002)), the direct effects of Neuroticism on Life Satisfaction are negative, large and significant; those of Extraversion are positive and significant.

As we argued above there is widespread agreement among psychologists that traits are largely exogenous and stable. We address anyway the possibility that traits are endogenous by using the entire panel of data. In this way we are

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[10]Boyce et al. (2010) succesfully test a related assumption that conscientiousness matters for Life Satisfaction indirectly when interacted with unemployment

considering a span of 26 years of data for Germany and 12 years for the UK while the traits are relative to a single year. As already mentioned in table 7 we present the estimation of the system using the entire panel of data available for the two countries. The results in table 7 are largely in line with the one in table 6, based on a single year: the interactions between Neuroticism and income are positive and the ones with squared income are negative. Once Neuroticism is taken into account, the simple relation between income and life satisfaction is linearly increasing for Germany and non significant for the UK.

In summary, our empirical test provides support for our theory based on the gap between aspiration and income, explaining our above findings that Life Satisfaction declines faster at higher income when Neuroticism is higher. Further research will explore the merit of alternative explanations. A plausible alternative hypothesis, also consistent with the notion of Neuroticism as sensitivity to negative rewards and punishment, is that higher income is also associated with higher variance of the income. Higher income variance and the associated anticipated anxiety might hurt the level of Life Satisfaction in individuals with higher score in Neuroticism. In this explanation the effect of Neuroticism is produced by the anticipation of future fluctuations in income, rather than the comparison with past aspiration levels. This hypothesis is harder to test with the data we are using, although we see it as complementary to the one discussed here.

5 Conclusions

Neuroticism is responsible for slow increase of Life Satisfaction with high income and its larger increase for lower incomes. Our model suggests that the effect is due to the psychological cost of the gap between aspiration and realized income, positive for lower income levels and negative for higher levels. Motivation induces higher aspirations in income, and on average also to higher income. This effect occurs however at a decreasing rate, and thus generates a gap between desired and realized income which is negative and in absolute values higher for higher incomes. This in turn induces a decrease in the marginal Life Satisfaction. Neuroticism measures the sensitivity to the gap, and in fact individuals with higher

score in Neuroticism have a stronger marginal decline of happiness with income for high income, and a stronger marginal increase for lower income, where the gap is positive.

This conclusion suggests a different interpretation of the well established fact that Life Satisfaction increases slowly, or is completely flat at high levels of income (Kanheman and Deaton 2010). This finding has been so far interpreted with the argument that the marginal Life Satisfaction is decreasing, just as utility. Our results suggest a stronger reason: the flatness of happiness with income is the effect of opposite forces on Life Satisfaction: a natural effect of increasing happiness with income, and a negative effect induced by the gap between aspiration and realization.

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Figure 1: **Life Satisfaction Income and Personality Traits in UK and Germany.** Quadratic Interpolations. Bold line = Individuals in the top 5 percentile in Neuroticism score. Dashed line = Individuals in the bottom 5 percentile in Neuroticism score

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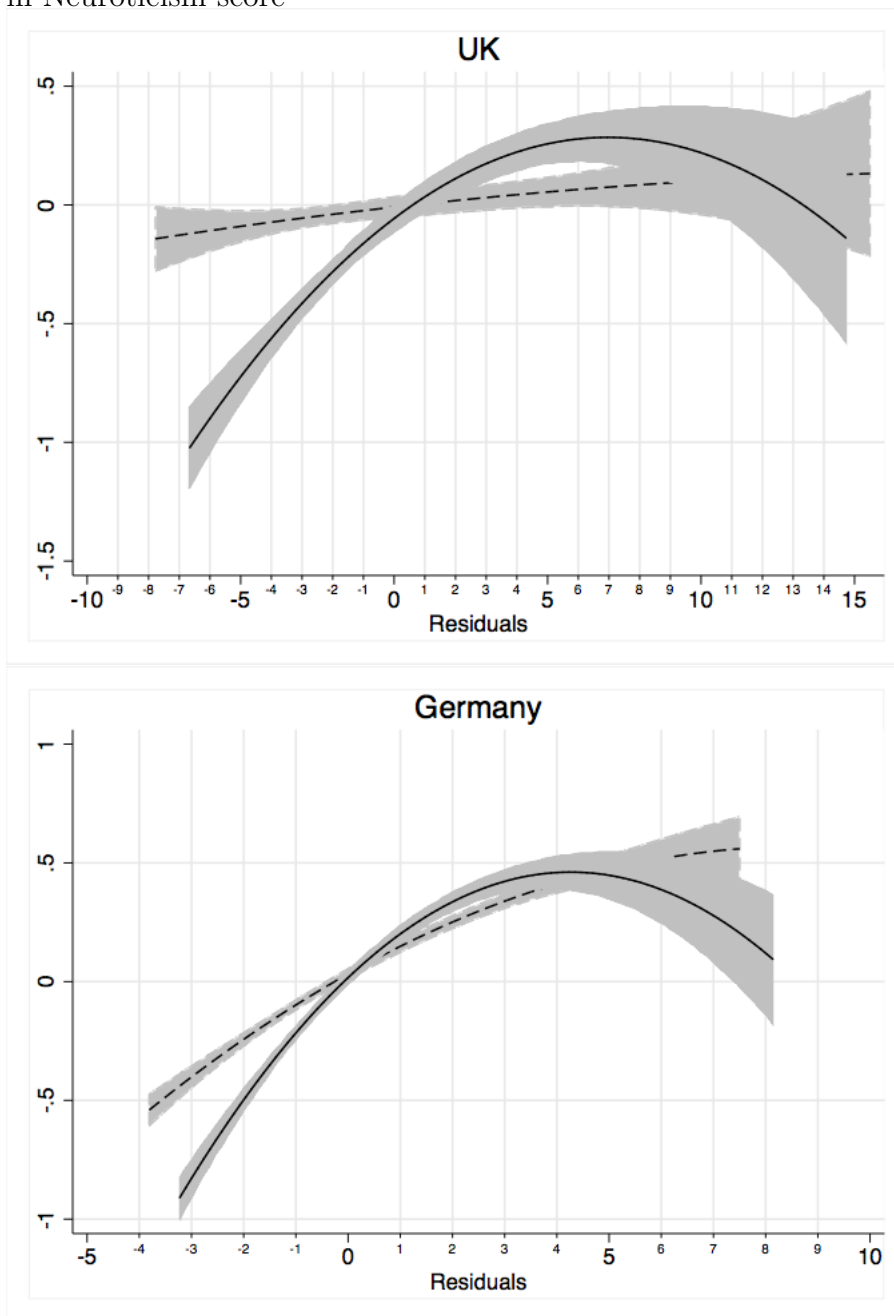
Figure 2: **Life Satisfaction Income and Personality Traits in UK and Germany.** Quadratic Interpolations. Bold line = Individuals in the top 5 percentile in Neuroticism score. Dashed line = Individuals in the bottom 5 percentile in Neuroticism score
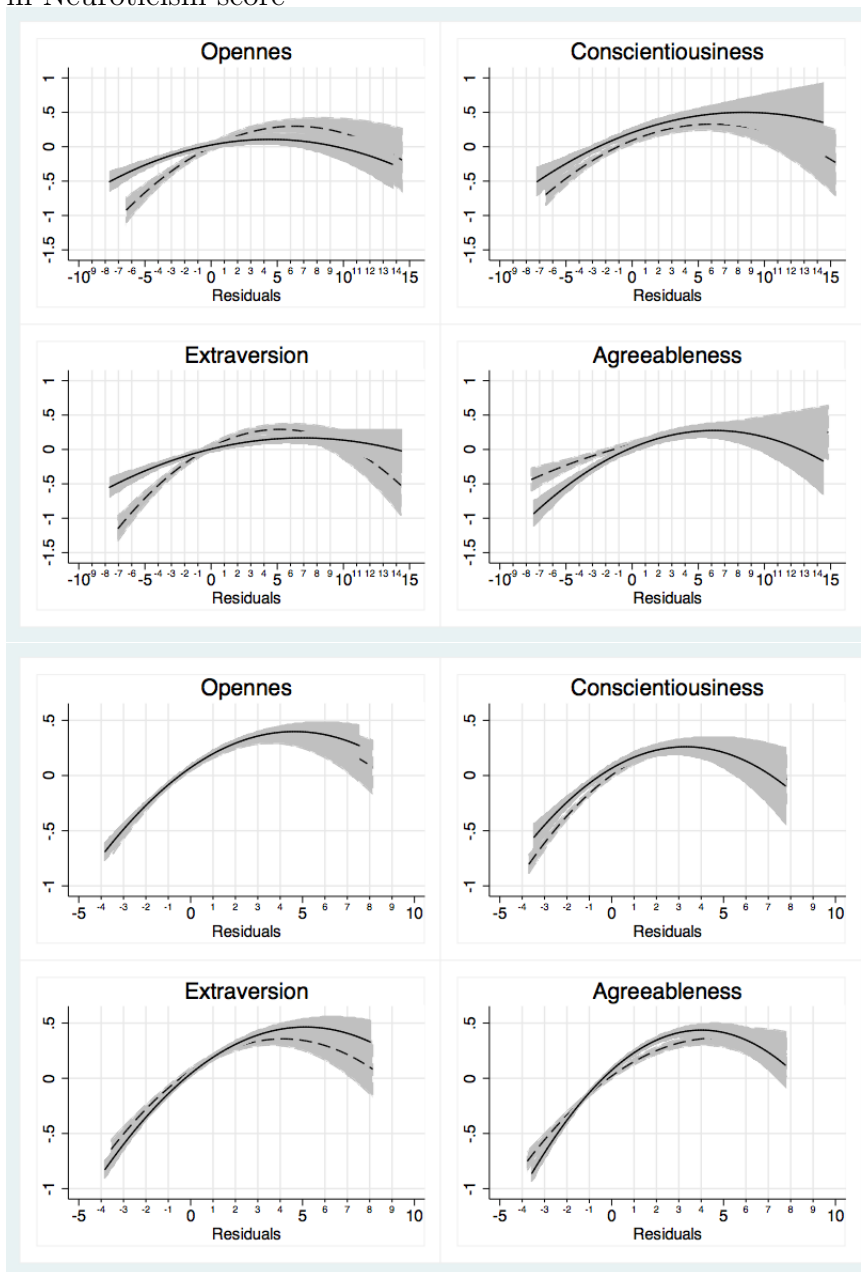
Figure 3: **Coefficients of Income on Life satisfaction.** Estimated using the 2SLS on the entire panel of data. Bold line = Individuals with the highest level of Neuroticism, Dashed line = Individuals with the lowest level of Neuroticism
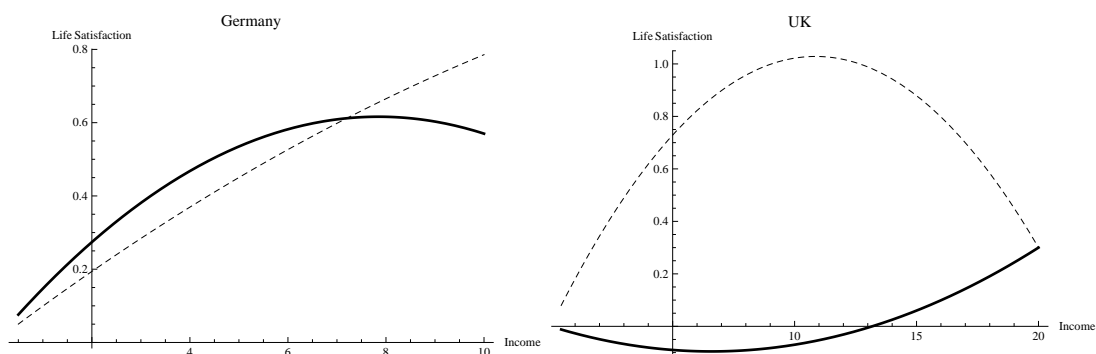
Table 1: Germany: SOEP dataset years 1984-2009, Main Variables used in the regressions

Variable	Mean	Std. Dev.	Min.	Max.	N
Life Satisfaction	5.187	1.088	1	7	324354
Income	3.749	1.822	0.728	11.49	309166
Age	41.762	12.827	18	65	325313
Male	0.492	0.5	0	1	325313
Agreeableness*	5.419	0.971	1	7	15389
Conscientiouseness*	5.95	0.9	1	7	15364
Extraversion*	4.857	1.129	1	7	15407
Neuroticism*	3.959	1.212	1	7	15393
Openness*	4.516	1.181	1	7	15332
Agreeableness	0.618	0.117	0.082	0.813	219832
Conscientiouseness	0.618	0.108	0.008	0.832	219250
Extraversion	0.613	0.135	0.134	0.904	219981
Neuroticism	0.621	0.144	0.236	0.999	219955
Openness	0.609	0.144	0.19	0.92	218995
Hours worked	28.715	20.226	0	80	304634

Table 2: UK: BHPS dataset years 1996-2008, Main Variables used in the regressions

Variable	Mean	Std. Dev.	Min.	Max.	N
Life Satisfaction	5.143	1.267	1	7	117041
Income	6.44	3.702	0.433	20.774	136582
Age	41.213	12.801	18	65	136582
Male	0.466	0.499	0	1	136581
Agreeableness*	5.45	0.985	1	7	10484
Conscientiouseness*	5.344	1.045	1	7	10463
Extraversion*	4.523	1.148	1	7	10475
Neuroticism*	3.737	1.299	1	7	10493
Openness*	4.502	1.167	1	7	10457
Agreeableness	0.558	0.121	0	0.774	105485
Conscientiouseness	0.558	0.129	0.007	0.828	105320
Extraversion	0.559	0.142	0.078	0.899	105433
Neuroticism	0.557	0.16	0.203	0.985	105599
Openness	0.559	0.144	0.106	0.931	105231
Hours worked	25.949	18.739	0	99	132846

Table 3: **Life Satisfaction Income and Neuroticism in UK and Germany.** Panel Data with Individual Random Effects. Dependent variable is Life satisfaction, all regressions include control for Age, Age^2, Gender, omitted from the table , Income is in 10K USD, (errors clustered at individual level, std errors in brackets)

	Germany 1984-09 b/se	Germany 1984-09 b/se	UK 1996-08 b/se	UK 1996-08 b/se	UK 1996-08 b/se
Income	0.0225	−0.0933*	−0.0020	−0.0020	0.0116
	(0.0233)	(0.0541)	(0.0157)	(0.0047)	(0.0115)
Income^2	0.0022	0.0105**	0.0001		
	(0.0021)	(0.0051)	(0.0008)		
Neur*Inc	0.1287***	0.1453***	0.0864***	0.0434***	0.0505**
	(0.0379)	(0.0388)	(0.0286)	(0.0110)	(0.0234)
Neur*Inc^2	−0.0128***	−0.0139***	−0.0036**	−0.0016***	−0.0022*
	(0.0035)	(0.0036)	(0.0015)	(0.0004)	(0.0012)
Ext*Inc		0.0624			−0.0507*
		(0.0449)			(0.0301)
Ext*Inc^2		−0.0028			0.0025
		(0.0041)			(0.0016)
Cons*Inc		0.1648***			−0.0289
		(0.0524)			(0.0367)
Cons*Inc^2		−0.0130***			0.0015
		(0.0049)			(0.0020)
Open*Inc		−0.0463			0.0050
		(0.0428)			(0.0307)
Open*Inc^2		0.0044			−0.0003
		(0.0039)			(0.0017)
Agr*Inc		−0.0079			0.0399
		(0.0502)			(0.0370)
Agr*Inc^2		−0.0011			−0.0029
		(0.0046)			(0.0020)
Neuroticism	−1.2911***	−1.3320***	−2.2545***	−1.9095***	−1.9142***
	(0.0939)	(0.0954)	(0.1258)	(0.0852)	(0.1106)
Extraversion	0.2595***	0.0734	0.4035***	0.4683***	0.6540***
	(0.0383)	(0.1108)	(0.0648)	(0.0614)	(0.1357)
Conscientiousness	0.2688***	−0.1194	1.0748***	0.9551***	1.0532***
	(0.0487)	(0.1310)	(0.0750)	(0.0716)	(0.1605)
Openness	0.2385***	0.3357***	−0.1040	−0.1333**	−0.1444
	(0.0364)	(0.1056)	(0.0662)	(0.0649)	(0.1360)
Agreableness	0.4528***	0.5056***	0.6498***	0.6926***	0.5993***
	(0.0443)	(0.1260)	(0.0780)	(0.0747)	(0.1639)
Individual random effects	Yes	Yes	Yes	Yes	Yes
Wave effects	Yes	Yes	Yes	Yes	Yes
Region effects	Yes	Yes	Yes	Yes	Yes
Number of children	Yes	Yes	Yes	Yes	Yes
Marital status	Yes	Yes	No	Yes	Yes
Education	Yes	Yes	No	Yes	Yes
Employment status	Yes	Yes	No	Yes	Yes
Occupation type	Yes	Yes	No	Yes	Yes
Health Status	Yes	Yes	No	Yes	Yes
Worked Hours	Yes	Yes	Yes	Yes	No
Worked Hours^2	Yes	Yes	Yes	Yes	No
N	177562	177562	90026	88961	91085

Table 4: **Life Satisfaction Income and Personality Traits in UK and Germany.** Panel Data with *Individual Fixed Effects.* Dependent variable is Life satisfaction, all regressions include control for Age, Age^2, Gender, omitted from the table , Income is in 10K USD, (errors clustered at individual level, std errors in brackets)

	Germany 1984-09 b/se	Germany 1984-09 b/se	UK 1996-08 b/se	UK 1996-08 b/se
Income	0.0241		0.0045	
	(0.0288)		(0.0057)	
Income^2	0.0014			
	(0.0026)			
Neur*Inc	0.1156**	0.0907**	0.0404***	0.0533**
	(0.0467)	(0.0387)	(0.0130)	(0.0266)
Neur*Inc^2	−0.0121***	−0.0086**	−0.0022***	−0.0026*
	(0.0044)	(0.0036)	(0.0004)	(0.0014)
Ext*Inc		0.0465		−0.0530
		(0.0527)		(0.0344)
Ext*Inc^2		0.0011		0.0032*
		(0.0049)		(0.0018)
Cons*Inc		0.1389**		−0.0227
		(0.0601)		(0.0437)
Cons*Inc^2		−0.0101*		0.0014
		(0.0056)		(0.0023)
Open*Inc		−0.0498		0.0419
		(0.0516)		(0.0346)
Open*Inc^2		0.0047		−0.0019
		(0.0048)		(0.0018)
Agr*Inc		−0.0695		0.0470
		(0.0565)		(0.0430)
Agr*Inc^2		0.0029		−0.0032
		(0.0052)		(0.0022)
Individual fixed effects	Yes	Yes	Yes	Yes
Wave effects	Yes	Yes	Yes	Yes
Region effects	Yes	Yes	Yes	Yes
Number of children	Yes	Yes	Yes	Yes
Marital status	Yes	Yes	No	No
Education	Yes	Yes	No	No
Employment status	Yes	Yes	No	No
Occupation type	Yes	Yes	No	No
Health Status	Yes	Yes	No	No
Worked Hours	Yes	Yes	Yes	No
Worked Hours^2	Yes	Yes	Yes	No
r2	0.046	0.047	0.008	0.005
N	180940	177562	91246	92174

Table 5: **Life Satisfaction Income and Personality Traits in UK and Germany with Gender differences** Panel Data with Individual random Effects. Dependent variable is Life satisfaction, all regressions include control for Age, Age^2, Gender, omitted from the table , Income is in 10K USD, (errors clustered at individual level, std errors in brackets).

	Germany 1984-09 b/se	UK 1996-08 b/se	UK 1996-08 b/se
Income	0.0115	−0.0100	−0.0035
	(0.0260)	(0.0162)	(0.0049)
$Income^2$	0.0035	0.0005	
	(0.0023)	(0.0008)	
Neur*Inc	0.1397***	0.0874***	0.0362***
	(0.0416)	(0.0286)	(0.0125)
Neur*Inc^2	−0.0139***	−0.0036**	−0.0011**
	(0.0038)	(0.0015)	(0.0005)
Male*Neur*Inc	0.0531***	0.0341**	0.0272*
	(0.0192)	(0.0163)	(0.0153)
Male*Neur*Inc^2	−0.0043**	−0.0016*	−0.0012
	(0.0018)	(0.0009)	(0.0008)
Neuroticism	−1.3586***	−2.2462***	−1.8628***
	(0.1070)	(0.1329)	(0.0972)
Male*Neuroticism	−0.2462***	−0.1601	−0.1690
	(0.0847)	(0.1309)	(0.1246)
Extraversion	0.2784***	0.4041***	0.4688***
	(0.0421)	(0.0648)	(0.0614)
Conscientiousness	0.3818***	1.0746***	0.9537***
	(0.0538)	(0.0750)	(0.0716)
Openness	0.2576***	−0.1031	−0.1328**
	(0.0400)	(0.0662)	(0.0649)
Agreableness	0.4703***	0.6486***	0.6904***
	(0.0488)	(0.0780)	(0.0747)
Individual random effects	Yes	Yes	Yes
Wave effects	Yes	Yes	Yes
Region effects	Yes	Yes	Yes
Number of children	Yes	Yes	Yes
Marital status	Yes	No	Yes
Education	Yes	No	Yes
Employment status	Yes	No	Yes
Occupation type	Yes	No	Yes
Health Status	Yes	No	Yes
Worked Hours	Yes	Yes	Yes
Worked Hours^2	Yes	Yes	Yes
N	177562	90026	88961

Table 6: **Life Satisfaction, Household Income and Personality Traits in a 3SLS structural model for year 2005.** Dependent variable is Life Satisfaction, Income is in 10K USD, traits are normalized between 0 and 1 (errors clustered at individual level, std errors in brackets).

	Germany	Germany	UK	UK
Life Satisfaction				
Income	0.039*	0.030	−0.027*	−0.095*
	(0.022)	(0.100)	(0.015)	(0.056)
Income^2		0.001		0.004
		(0.010)		(0.003)
Neur.× Income	0.283***	0.297*	0.214***	0.331***
	(0.048)	(0.160)	(0.036)	(0.098)
Neur.× Income^2	−0.017***	−0.019	−0.007***	−0.014**
	(0.004)	(0.016)	(0.002)	(0.006)
Neuroticism	−2.632***	−2.652***	−3.451***	−3.790***
	(0.160)	(0.337)	(0.187)	(0.329)
Extraversion	0.708***	0.708***	1.031***	1.027***
	(0.064)	(0.064)	(0.085)	(0.085)
Age	−0.072***	−0.072***	−0.068***	−0.068***
	(0.005)	(0.005)	(0.007)	(0.007)
Age^2	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Male	−0.152***	−0.152***	−0.223***	−0.223***
	(0.017)	(0.018)	(0.024)	(0.024)
region effects	Yes	Yes	Yes	Yes
number of children	Yes	Yes	Yes	Yes
marital status	Yes	Yes	Yes	Yes
education	Yes	Yes	Yes	Yes
Income				
Agreeableness	−0.260***	−0.245***	−0.268*	−0.253*
	(0.063)	(0.062)	(0.156)	(0.153)
Conscientiousness	−0.122*	−0.121*	0.071	0.049
	(0.069)	(0.068)	(0.154)	(0.151)
Openness	0.117**	0.115**	0.344**	0.351***
	(0.054)	(0.054)	(0.137)	(0.135)
Extraversion	0.013	0.012	0.579***	0.598***
	(0.056)	(0.055)	(0.131)	(0.129)
Neuroticism	−0.250***	−0.240***	−0.794***	−0.809***
	(0.064)	(0.064)	(0.146)	(0.144)
Age	0.002***	0.002***	−0.009***	−0.008***
	(0.001)	(0.001)	(0.001)	(0.001)
Male	0.031**	0.032**	0.145***	0.134***
	(0.015)	(0.015)	(0.040)	(0.039)
Income at t−1	0.772***	0.770***	0.715***	0.715***
	(0.004)	(0.004)	(0.005)	(0.005)
Education	0.068***	0.068***	0.116***	0.114***
	(0.003)	(0.003)	(0.006)	(0.006)
N	13655	13655	9829	9829

Table 7: **Life Satisfaction Income and Personality Traits, structural 2SLS model using the entire panel of Germany and UK data**. Dependent variable is Life Satisfaction, Income is in 10K USD, traits are normalized between 0 and 1. Estimates of the structural model using a 2SLS estimator with individual random effects (errors clustered at individual level, std errors in brackets).

	Germany	Germany	UK	UK
	(1) 1984-09	(2) 1984-09	(3) 1996-08	(4) 1996-08
Income	0.085***	−0.043	−0.014	−0.085**
	(0.011)	(0.047)	(0.010)	(0.037)
Income^2		0.013***		0.005**
		(0.005)		(0.002)
Neur.× Income	0.072***	0.270***	0.158***	0.280***
	(0.023)	(0.074)	(0.024)	(0.066)
Neur.× Income^2	−0.010***	−0.031***	−0.007***	−0.014***
	(0.002)	(0.008)	(0.001)	(0.004)
Neuroticism	−1.422***	−1.797***	−2.716***	−3.060***
	(0.079)	(0.153)	(0.122)	(0.214)
Extraversion	0.449***	0.448***	0.589***	0.588***
	(0.038)	(0.038)	(0.058)	(0.058)
Age	−0.034***	−0.034***	−0.055***	−0.055***
	(0.002)	(0.002)	(0.003)	(0.003)
Age^2	0.000***	0.000***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Male	−0.108***	−0.108***	−0.178***	−0.178***
	(0.010)	(0.010)	(0.017)	(0.017)
individual random effects	Yes	Yes	Yes	Yes
wave effects	Yes	Yes	Yes	Yes
region effects	Yes	Yes	Yes	Yes
number of children	Yes	Yes	Yes	Yes
marital status	Yes	Yes	Yes	Yes
education	Yes	Yes	Yes	Yes
N	188367	188367	83034	83034

Table 8: **Life Satisfaction, Household Income and Personality Traits in a structural model using the entire panel of Germany and UK data.** Dependent variable is Life Satisfaction, Income is in 10K USD, traits are normalized between 0 and 1. Control for Age, Age^2 and gender are omitted from the table (errors clustered at individual level, std errors in brackets).

	Germany 1984-09	UK 1996-08
life Satisfaction		
Income	0.023	−0.061***
	(0.029)	(0.021)
Income^2	0.007**	0.003**
	(0.003)	(0.001)
Neur.× Income	0.330***	0.279***
	(0.046)	(0.035)
Neur.× Income^2	−0.032***	−0.012***
	(0.005)	(0.002)
Neuroticism	−1.978***	−3.178***
	(0.095)	(0.117)
Extraversion	0.377***	0.585***
	(0.017)	(0.029)
Age	−0.056***	−0.076***
	(0.001)	(0.003)
Age^2	0.001***	0.001***
	(0.000)	(0.000)
Male	−0.109***	−0.188***
	(0.005)	(0.009)
region effects	Yes	Yes
number of children	Yes	Yes
marital status	Yes	Yes
education	Yes	Yes
Income		
Agreeableness	−0.139***	−0.193***
	(0.015)	(0.051)
Conscientiousness	0.092***	0.374***
	(0.017)	(0.050)
Openness	0.047***	0.225***
	(0.013)	(0.044)
Extraversion	0.114***	0.350***
	(0.014)	(0.042)
Neuroticism	−0.207***	−0.412***
	(0.016)	(0.048)
Age	0.001***	−0.005***
	(0.000)	(0.000)
Male	0.037***	0.115***
	(0.004)	(0.013)
Income at t−1	0.778***	0.724***
	(0.001)	(0.002)
Education	0.052***	0.106***
	(0.001)	(0.002)
N	188367	83034

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Appendices

A   The "Big Five" in the SOEP and BHPS datasets

I see myself as someone who:

1. (A) Is sometimes rude to others (*reverse-scored*).

2. (C) Does a thorough job.

3. (E) Is talkative.

4. (N) Worries a lot.

5. (O) Is original, comes up with new ideas.

6. (A) Has a forgiving nature.

7. (C) Tends to be lazy (*reverse-scored*).

8. (E) Is outgoing, sociable.

9. (N) Gets nervous easily.

10. (O) Values artistic, aesthetic experiences.

B   Estimating the Structural Model

Now we determine the correct estimator for the model represented by equations 9 and 10. The error term of the latter, $\epsilon_{it}^y = \beta_2 v_{it} + u_{it}$, poses no problem, given that both 2SLS and 3SLS are non biased estimator when errors are cross-correlated between equations.

Considering now the 9, this can be rewritten as:

$$
\begin{aligned}
h_{it} = \alpha_1 + \beta_1 y_{it} + \delta y_{it}^2 - \gamma \left(\frac{1 - \beta_2}{\beta_2} \right)^2 N_i y_{it}^2 - (C u_{it} + B) N_i y_{it} + \\
- N_i \left(F E(u^2) + G u_{it} + D \right) + F N_i \left(u_{it}^2 - E(u^2) \right) + \Gamma_1 z_{it} + \lambda_E E_i + e_{it}
\end{aligned}
\tag{12}
$$

Its error term can be written as:

$$
\underline{\epsilon}_{it}^h = -G N_i u_{it} - C N_i y_{it} u_{it} + e_{it}
\tag{13}
$$

1

Given 3, y_{it} and u_{it} are correlated by construction. Substituting 10 in 13, we obtain:

$$\underline{\epsilon}_{it}^h = - GN_i u_{it} - CN_i(A_2 + B_2 y_{it-1} + C_2 z_{it} + D_2 \theta_{ai} + \beta_2 v_{it} + u_{it})u_{it} + FN_i \left(u_{it}^2 - E(u^2)\right) + e_{it} \tag{14}$$

from where we note that

$$E(\underline{\epsilon}_{it}^h) - CN_i E(u^2) = 0. \tag{15}$$

Therefore, we define $\epsilon_{it}^h = \underline{\epsilon}_{it}^h + CN_i E(u^2)$ and we rewrite 12, as:

$$h_{it} = \alpha_1 + \beta_1 y_{it} + \delta y_{it}^2 - \gamma \left(\frac{1 - \beta_2}{\beta_2}\right)^2 N_i y_{it}^2 - BN_i y_{it} + \\ - N_i \left((F + C)E(u^2) + D\right) + \Gamma_1 z_{it} + \lambda_E E_i + \epsilon_{it}^h, \tag{16}$$

whose errors satisfy the conditional mean condition: $E(\epsilon_{it}^h | N_i, E_i, y_{it}, z_{it}) = 0$.

More precisely:

$$
\begin{aligned}
B &= \frac{(1 - \beta_2)(\beta_2 \gamma_1 - 2\alpha_2 \gamma_2)}{\beta_2^2} \\
C &= -\frac{2(1 - \beta_2)\gamma_2}{\beta_2^2} \\
D &= \lambda_N - \frac{\alpha_2^2 \gamma_2}{\beta_2^2} - \frac{\alpha_2 \gamma_1}{\beta_2} \\
F &= -\frac{\gamma_2}{\beta_2^2} \\
G &= \frac{\beta_2 \gamma_1 - 2\alpha_2 \gamma_2}{\beta_2^2}
\end{aligned}
$$

Moreover, substituting 3 in 5 we have:

$$
\begin{aligned}
A_2 &= \alpha_2 + \alpha_0 \beta_2 \\
B_2 &= \beta_2 \eta_0 \\
C_2 &= \beta_2 \Gamma_0 \\
D_2 &= \beta_2 \Lambda_0.
\end{aligned}
$$

Figure 4: **Household Income distribution UK and Germany. Income in 10K 2005 USD.**
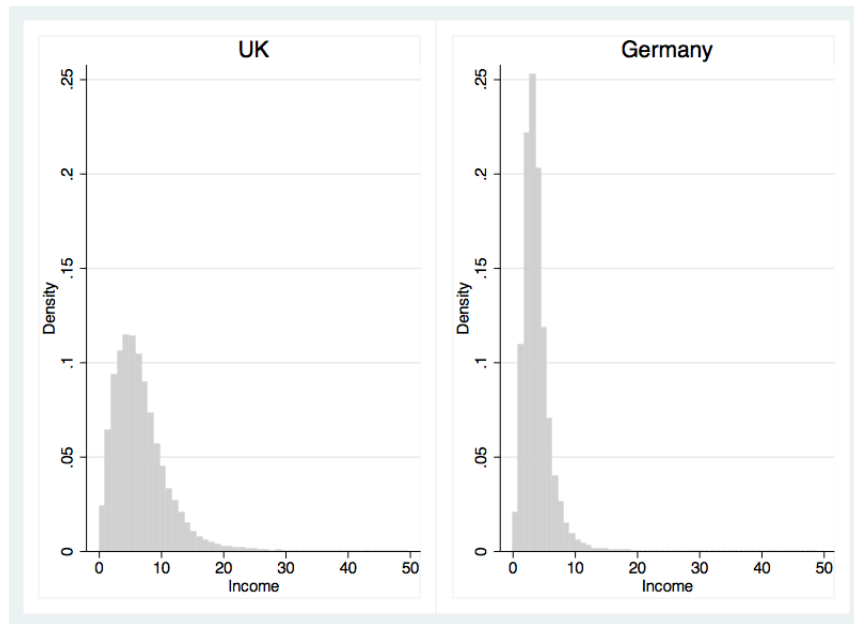
Table 9: **Life Satisfaction, Household Income and Traits, Ordered Probit with random effect estimators.** The dependent variable is individual Life Satisfaction. (errors clustered at individual level, std errors in brackets). USD

	Germany Ordered Probit 1984-09	UK Ordered Probit 1996-08
Income	0.013	−0.006
	(0.0591)	(0.0110)
Income^2	0.003	−0.000
	(0.0060)	(0.0004)
Neur*Inc	0.137***	0.033***
	(0.0419)	(0.0071)
Neur*Inc^2	−0.017***	−0.000*
	(0.0042)	(0.0002)
Cons*Inc	0.187***	0.003
	(0.0588)	(0.0094)
Cons*Inc^2	−0.016***	0.000
	(0.0058)	(0.0003)
Ext*Inc	0.040	−0.002
	(0.0486)	(0.0085)
Ext*Inc^2	0.002	−0.000
	(0.0049)	(0.0003)
Agr*Inc	−0.017	0.006
	(0.0537)	(0.0113)
Agr*Inc^2	0.000	−0.000
	(0.0053)	(0.0004)
Open*Inc	−0.039	0.001
	(0.0456)	(0.0092)
Open*Inc^2	0.007	0.000
	(0.0046)	(0.0003)
Neuroticism	−1.948***	−1.339***
	(0.0975)	(0.0431)
Extraversion	0.136	0.391***
	(0.1159)	(0.0497)
Conscientiousness	0.169	0.579***
	(0.1394)	(0.0557)
Agreableness	0.680***	0.535***
	(0.1280)	(0.0630)
Openness	0.278**	−0.099*
	(0.1084)	(0.0512)
Age	−0.047***	−0.070***
	(0.0018)	(0.0024)
Age^2	0.000***	0.001***
	(0.0000)	(0.0000)
Male	−0.132***	−0.145***
	(0.0125)	(0.0085)
Number of children	Yes	Yes
Education	Yes	Yes
N	201686	92874

Table 10: **Income, Job Motivation and Personality Traits in Germany.**
3SLS estimation, dependent variable is Household Income (std errors in brackets)

	Germany 2004 b/se	Germany 2004 b/se	Germany 2004 b/se	Germany 2004 b/se
Income				
Success Important	1.453***	0.190*	2.616***	0.193***
	(0.114)	(0.110)	(0.144)	(0.064)
Education		0.162***	0.115***	
		(0.006)	(0.008)	
Age	0.113***	0.058***	0.056***	0.029***
	(0.010)	(0.009)	(0.013)	(0.006)
Age^2	−0.001***	−0.001***	−0.000	−0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Male	−0.121**	0.146***	−0.429***	0.010
	(0.047)	(0.043)	(0.058)	(0.026)
Income at t−1				0.810***
				(0.005)
Success important				
Education	0.034***	0.017***	−0.008***	0.019***
	(0.002)	(0.002)	(0.002)	(0.002)
Age	−0.007**	−0.000	−0.007**	−0.000
	(0.003)	(0.003)	(0.003)	(0.003)
Age^2	−0.000***	−0.000***	−0.000***	−0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.246***	0.268***	0.224***	0.268***
	(0.012)	(0.013)	(0.013)	(0.013)
Neuroticism	−0.114***	0.049	−0.001	0.041
	(0.040)	(0.044)	(0.033)	(0.044)
Extraversion	0.270***	0.285***	0.163***	0.286***
	(0.045)	(0.049)	(0.037)	(0.050)
Conscientiousness	0.773***	1.016***	0.542***	1.028***
	(0.058)	(0.061)	(0.053)	(0.063)
Agreeableness	−0.240***	−0.124**	−0.108***	−0.136**
	(0.051)	(0.056)	(0.042)	(0.057)
Openness	0.499***	0.526***	0.265***	0.510***
	(0.043)	(0.047)	(0.037)	(0.048)
Income at t−1			0.155***	
			(0.002)	
N	13615	13615	12996	12996