

Schäfer, Konrad C.

Working Paper

An investigation into the stability of the big-five in Germany

Hannover Economic Papers (HEP), No. 600

Provided in Cooperation with:

School of Economics and Management, University of Hannover

Suggested Citation: Schäfer, Konrad C. (2017) : An investigation into the stability of the big-five in Germany, Hannover Economic Papers (HEP), No. 600, Leibniz Universität Hannover, Wirtschaftswissenschaftliche Fakultät, Hannover

This Version is available at:

<https://hdl.handle.net/10419/172854>

Standard-Nutzungsbedingungen:

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

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

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

Terms of use:

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

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

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

An Investigation Into the Stability of the Big-Five in Germany

Konrad C. Schäfer*

Leibniz Universität Hannover

July 2017

Abstract

This paper investigates the stability of the Big-Five personality traits based on the German Socio-Economic Panel (*SOEP*) from 2005, 2009, and 2013. The results indicate that the population means only show little variance over the eight year time frame. There is no link between age and mean-levels, and only minor changes of the mean-levels of the Big-Five over time for the working age population (25-64 years of age) in Germany. However, there are intra-individual changes which can partly be explained by adverse life events. They impact the Big-Five traits and thereby contradict the general finding of stability of the traits in the literature. Exploratory fixed effects wage estimations that exploit the intra-individual changes in the Big-Five find no significant effects for men but positive effects of agreeableness and conscientiousness on women's wages.

Keywords: Non-cognitive skills, Big-Five, personality traits, wages, Germany.

JEL codes: J3, C18

*Leibniz Universität Hannover, Institute of Labor Economics, Königsworther Platz 1, 30167 Hannover, Germany, phone: +49(0)511/762-5661, e-mail: schaefer@aoek.uni-hannover.de

This project was partly supported by the Narodowe Centrum Nauki (NCN) and Deutsche Forschungsgemeinschaft (DFG) under the joint project: Modelling Retirement Decisions with Incomplete Rationality - Insights for Policy Design. Project number: PU307-10-1. Socio-Economic Panel (SOEP), data for years 1984-2015, version 32, SOEP, 2017, doi:10.5684/soep.v32

1 Introduction

The Big-Five personality traits are a long established measure for personality in the psychological literature dating back to the validation by McCrae and Costa (1987). Similar constructs haven been discussed even before. Along the increasing popularity of behavioral economics, economic researchers start to include personality traits into economic models and like to assume that theses personality traits are somehow stable over time. Stable in the sense that the measures do not react like a stock index to bad rumors, but are stable in a certain bandwidth around a specific value. That specific value might be determined during adolescent years with a higher volatility until it is fixed during adulthood. If this hypothesis holds, the Big-Five traits can be included into empirical analysis like place of birth or gender as a pre-determined variable. They might include factors of growing up that are not as easily observable as parent's education or the neighborhood and could be able to add explanatory power to models that consider decisions later in life.

If the Big-Five were to be highly volatile they would be reduced to be a descriptive feature used for post change analysis. The additional practical benefit of the stability of the Big-Five would be the possibility to generalize the traits to different points in time as big panel data surveys only collect the traits every few years. An empirical proof that these measures are stable over time strengthens the validity of economic findings based on these panel data.

Specht et al. (2011) investigate a sample population from 17 to over 80 years of age. They find that especially in the early years up to an age around 25 and for individuals over 65 there is considerable fluctuation in the traits. This is also supported by Cobb-Clark and Schurer (2012). Important economic decisions are usually made by individuals in their prime working age and therefore it is worth investigating if the stability hypothesis holds true for individuals between 25 and 65 years of age. Compared to Specht et al. (2011) this paper extends the time horizon by including the 2013 wave into the analysis increasing the time frame by 4 years (2005 to 2013). This paper investigates possible sources for the found intra-individual variation. Possible wage effects of the Big-Five are estimated under different assumptions. First is the classical stability assumption following the approach by Heineck and Anger (2010). The second approach uses the observed variation to include the personality traits in a fixed effects wage estimation.

The German Socio-Economic Panel (*SOEP*) collects a representative sample of the German population since 1984. It also includes a self-completion questionnaire for the Big-Five in 2005, 2009, and most recently 2013 wave. Based on the *SOEP* data it will be investigated if the results found by Cobb-Clark and Schurer (2012) that the Big-Five traits are stable for a working age population holds for the German data set and can further support the stability assumption. Results for the Big-Five of the working age sample of the *SOEP* show a rather large variation on the individual level leaving the stability hypothesis in question. For the sample population as a whole the Big-Five seem to be rather stable and independent of age effects.

This paper is structured as follows: Section 2 briefly describes the data while Section 3 presents detailed results and Section 4 concludes the paper.

2 Data

The data used for the analysis comes from the *SOEP* which is a representative panel study for Germany collected since 1984 with over 10,000 households (Wagner et al., 2007). In 2005, 2009, and 2013 the *SOEP* used a self-completion questionnaire of the Big-Five personality inventory with each trait scored from one to seven with a higher score indicating a better fit. Instead of applying the Revised Neuroticism, Extraversion, Openness to Experience Personality Inventory¹ (*NEOPI – R*) with 240 items, the *SOEP* administered a shortened version of the original long questionnaire to elicit the Big-Five. The Big-Five Inventory Short (*BFI – S*) is a short item scale with 15 instead of 44 items in the original BFI-scale developed by Gerlitz and Schupp (2005) to be included in the standard *SOEP* questionnaire. The 15 questions are phrased in the way “I am somebody, who ...” and can be answered on a 7 item Likert-scale with 1 as “does not apply at all” and 7 as “totally applies”. The pre-test for the *BFI – S*, which has been conducted before the addition to the *SOEP* questionnaire, shows a high middle inter-item correlation between 0.28 and 0.40. Given the low number of items and the high item heterogeneity high Cronbach’s α coefficients² between 0.51 and 0.66, with 0.7 being seen as sufficient have been achieved (Dehne and Schupp, 2007, p. 33). A test for external validity has shown that the *BFI – S* is generally able to capture the Big-Five dimensions (Dehne and Schupp, 2007, p.40).

Given the argumentation above it can be assumed that the Big-Five measures in the *SOEP* are able to capture the five dimensions. This makes it possible to investigate if the stability of the Big-Five found by Cobb-Clark and Schurer (2012) based on the Australian *HILDA*³ data can be observed for the German *SOEP*.

The summary statistics for the Big-Five measures in the *SOEP* are displayed in Table 1. The pooled sample contains 17,028 individuals aged 25-64 who answered the *BFI – S* in 2005, 2009, and 2013, with 5,676 individuals per year. The sample consist of 46.7% women and 53.3% men. The means and standard deviations (*SD*) are similar to the Australian data used by Cobb-Clark and Schurer (2012) but differ in certain dimensions of the Big-Five⁴. Germans on

¹For further information see McCrae and Costa Jr (2010).

²Cronbach’s α is a coefficient of internal consistency of a scale and is commonly used as an estimate of the reliability of a psychometric tests.

³Household, Income and Labour Dynamics in Australia data set. The *HILDA* data set contains a self-completion questionnaire on the Big-Five for their 2005 and 2009 wave.

⁴Table 7 in the appendix contains a direct comparison with the Cobb-Clark and Schurer (2012) paper.

average score 0.42 points higher on the extraversion scale compared to the average Australian. Furthermore, the score for conscientiousness is about 0.77 points higher for Germans making them more detail oriented than Australians. At the same time their emotional stability is over one point lower compared to Australians. There is also an observed difference between men and women in the *SOEP*. Women score lower in emotional stability. Over all, the scores for women and men look fairly similar in terms of mean values and distributions⁵.

Table 1: Summary statistics of personality traits and their change over time

	Level		Changes between 2005 and 2013						
	Mean	SD	Mean	SD	1st	25th	50th	75th	99th
Percentile of distribution									
Mean Difference									
Extraversion	4.822	1.134	-0.064	0.993	-2.667	-0.667	0.000	0.667	2.333
Agreeableness	5.345	0.965	-0.095	0.965	-2.667	-0.667	0.000	0.333	2.333
Conscientiousness	5.925	0.872	-0.091	0.873	-2.333	-0.667	0.000	0.333	2.333
Emotional Stability	4.161	1.207	0.172	1.158	-2.667	-0.667	0.000	1.000	3.000
Openness	4.490	1.169	-0.033	1.079	-3.000	-0.667	0.000	0.667	2.667
Absolute Difference									
Extraversion			0.750	0.653	0.000	0.333	0.667	1.000	2.667
Agreeableness			0.733	0.635	0.000	0.333	0.667	1.000	2.667
Conscientiousness			0.632	0.610	0.000	0.333	0.333	1.000	2.667
Emotional Stability			0.900	0.748	0.000	0.333	0.667	1.333	3.333
Openness			0.823	0.700	0.000	0.333	0.667	1.333	3.000

Notes: Data taken from SOEP wave 2005, 2009 and 2013. The pooled sample consists of 17,025 individual observations.
SD = standard deviation

3 Results

3.1 Mean-level consistency

Population Means

The first aim of the analysis is to check if there are larger variations in mean-levels of the Big-Five traits indicating a change for the sample population as a whole. The investigation focuses at first on mean-level consistency to check if there are systematic changes in the levels of the trait dimensions for the investigated population. The variable for the change in the reported Big-Five traits for each individual is constructed by subtracting individual specific 2005 values from the individual specific 2013 values⁶.

⁵See appendix for gender separated mean tables.

⁶Change variables are also constructed for the 2005-2009 and 2009-2013 time frame.

$$\Delta^j = T_{2013}^j - T_{2005}^j$$

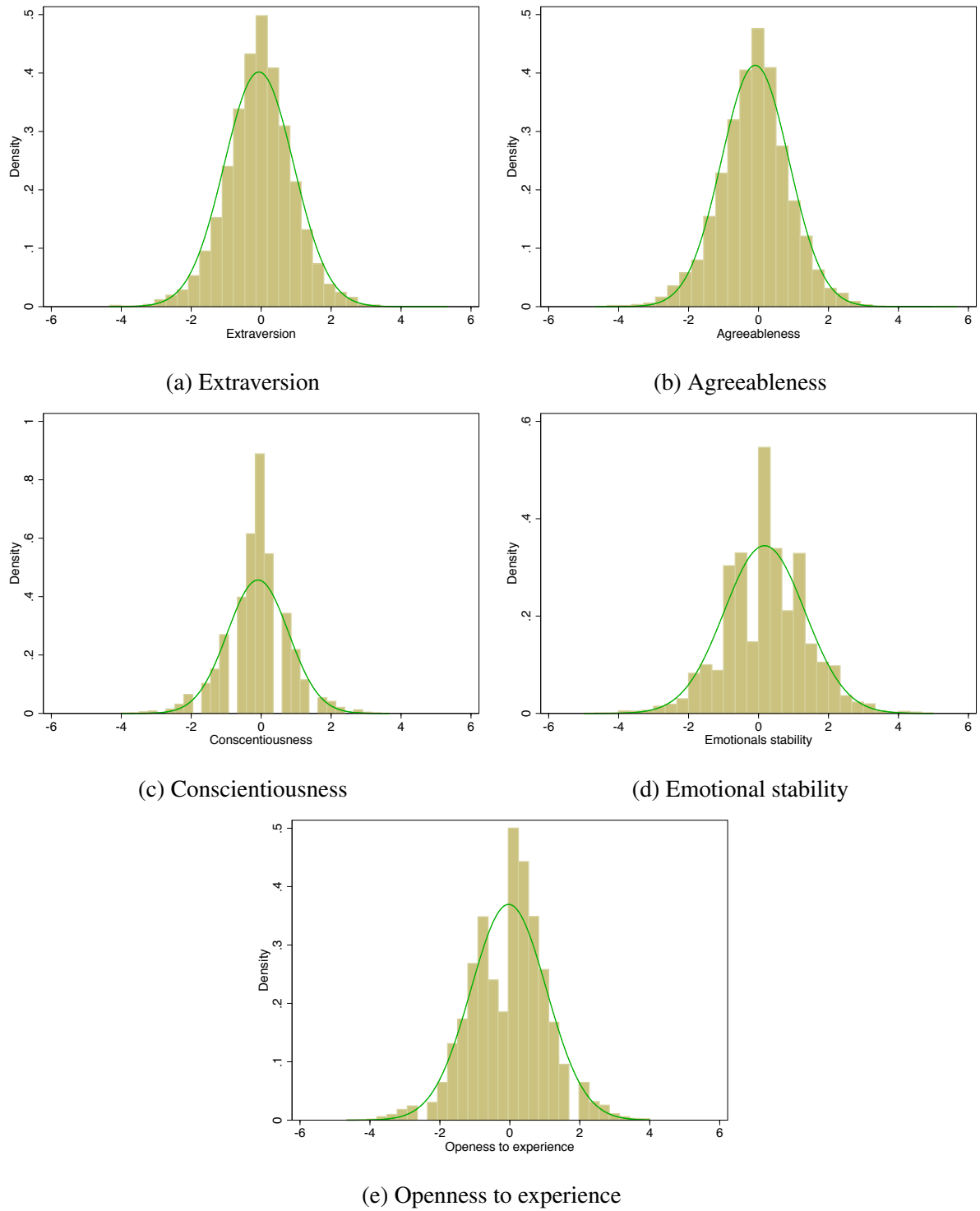
with $j \in \{\text{extraversion, agreeableness, conscientiousness, emotional stability, openness to experience}\}$. This results in negative values if the trait is less salient in 2013 and positive values if trait score increases over time. The information about the mean-level changes are provided in columns 3-9 in Table 1. The table indicates that the changes are symmetrically distributed around zero. Compared to the findings by Cobb-Clark and Schurer (2012) the tails of the distribution are heavier. The means are close to zero and a standard deviation ranging from 0.87 to 1.11 indicates a wider distributions of the changes in the Big-Five traits for the *SOEP*. The distributions are also not as symmetrical, since the change in median for agreeableness and conscientiousness is zero. The distribution is slightly skewed to the left with a value of -0.666 at the 25th percentile and only 0.333 at the 75th percentile. Therefore, slightly more people experience a depreciation in these traits than people experiencing an increase. This observation is confirmed by the 1st percentile of the distributions which shows lower absolute values compared to the 99th percentile. For extraversion and openness to experience the distribution is close to being symmetrical, with only small differences between the 1st and 99th percentile.

Figure 1 shows the histograms for the Big-Five traits indicating that the mean level changes are approximately normally distributed around zero. The extremes of the distributions for the *SOEP* data show high absolute values in both directions indicating intra-individual changes for a large share of the population. Given the large changes in both directions Table 1 also reports the average absolute mean-level changes to give a better overview of the actual movement in the traits. The absolute mean-level changes are usually above two thirds of the respective standard deviation indicating a significant variation for the individuals. Additionally over 20% of the sample population experience a trait change of at least one point on the seven point Likert-scale. In general there is more volatility in the changes of the Big-Five in the German data compared to the Australian data. This is an indicator for less stability. Further down the intra-individual analysis will focus on these changes.

There is a general trend in the data. All Big-Five measures show a decrease in their mean values from 2005 to 2013⁷. For the time period from 2005 to 2013 a decrease in all trait values from 2005 to 2009 is observable. This is followed by an increase in all trait values from 2009 to 2013 which is slightly lower in absolute values compared to the drop from 2005 to 2009⁸. These are either due to external circumstances or a change in questioning style. One explanation for the drop in 2009 could be that all individuals scored lower in the questionnaires in general due to external circumstances like the financial crises from 2008. Given more uncertain times and a

⁷Emotional stability is the inverted scale of neuroticism elicited in the *SOEP*.

⁸See Figure 4 in the appendix.



Note: The green line plots the normal density function

Figure 1: Histograms for the mean level change of the Big-Five between 2005 and 2013

troubled environment it would make little sense that emotional stability would increase in such a time. The other explanation could be the changes in the elicitation of the traits. In 2005 the questions directly follow after the health questions. In 2009 there are attitude and risk questions before the elicitation of the Big-Five. In 2013 the Big-Five inventory is moved to another

section with different questions just before the elicitation. The different questions just before the elicitation can prime the individuals in different ways inducing an additional measurement bias (Rasinski et al., 2005). It will be interesting to see how the population means change over time once additional waves are collected. All differences in the population mean-levels from 2005-2013 are statistically significant. Although the changes in the mean-levels are significant the size is only around a tenth of a standard deviation for the average Big-Five trait.

Age Group Means

The next step investigates how mean-levels and mean-level changes vary over the life cycle. The sample is split into age groups of five year intervals⁹. Figure 2 shows the mean-levels for the different age groups in 2009¹⁰:

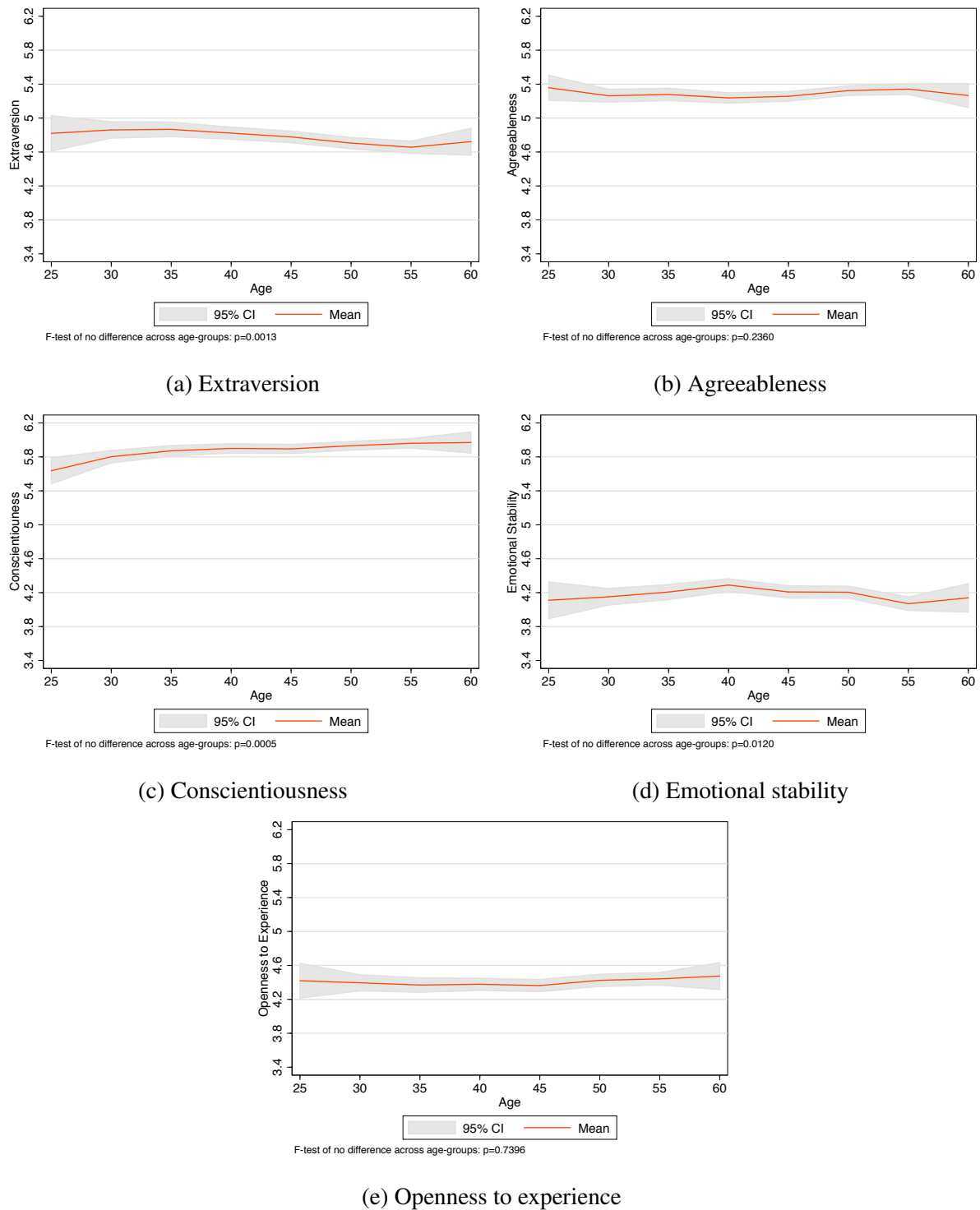
The construction of the age groups and the necessity that all individuals need to be observed at all three points in time results in lower observation numbers in the first and the last age group which in turn warrants larger confidence intervals. The F-test used to check for significant differences between age groups is based on an ANOVA with H_0 being that all group means are equal and H_1 that at least one mean differs. Unfortunately, Bartlett's-test for equal variance rejects the null hypothesis on several occasions, rendering of the results of standard ANOVA invalid. Therefore, the Bonferroni multiple-comparison test is implemented to circumvent the problem of unequal variances between the age groups and in order to identify the exact groups that deviate from each other.

In all observational years there is no statistically significant difference between the age groups for the traits agreeableness and openness to experience. However, there are significant differences between some of age groups for the other traits. Comparing all three years leads to the conclusion that differences between the various age groups are not related to the actual age. To the contrary, they seem to be related to the different cohorts dragging their respective higher or lower values with them as they get older. The groups that are statistically different from each other move almost simultaneously to the right as we switch from the year 2005 to 2013. Therefore, the differences are not due to a certain age instead they are caused by the different cohorts. It is observable that younger individuals in the sample are less conscientious and show higher scores of extraversion.

For conscientiousness there is a significant difference between the youngest age group and most other groups in 2005 and 2009 but only between the youngest and the 55-59 year old in 2013. For extraversion it starts in 2005 with a significant difference between the individuals aged 25-34 and the individuals between 55-59 years of age. In 2009 the differences are between the

⁹Age groups: 25-29; 30-34; 35-39; 40-44; 45-49; 50-54; 55-59; 60-64.

¹⁰The graphs for the years 2005 and 2013 are included in the appendix.



Note: Age groups are defined as 25 = 25-29; 30 = 30-34; 35 = 35-39; 40 = 40-44; 45 = 45-49; 50 = 50-54; 55 = 55-59; 60 = 60-64

Figure 2: Mean values for the Big-Five personality traits over age groups for 2009

30-44 and again the 55-59 year olds and in 2013 only between the individuals aged 40 to 44 and the 50-64 year old individuals. All differences range between 0.13 and 0.33 points on the 7 point Likert-scale. Taking for example individuals who are 55-59 years old in 2009 it can be shown that they are significantly less emotional stable by 0.22 points on the 7 point Likert-scale compared to individuals who are between 40 and 45 years old. While the later group grew up

and was socialized during the 80's, a more or less safe and stable time period, the other group was socialized during the late 60's and early 70's which was the time of the students riots and the terror of the RAF (Red Army Fraction), possibly leading to greater anxiety. The difference between the specific cohorts is also observable in 2005 but no longer in 2013 which could be due to the mixing of the age groups over time. A closer investigation of this hypothesis is out of the scope of this paper. The important aspect is that the difference in means between the age groups is not caused by age, but it is rather a cohort effect.

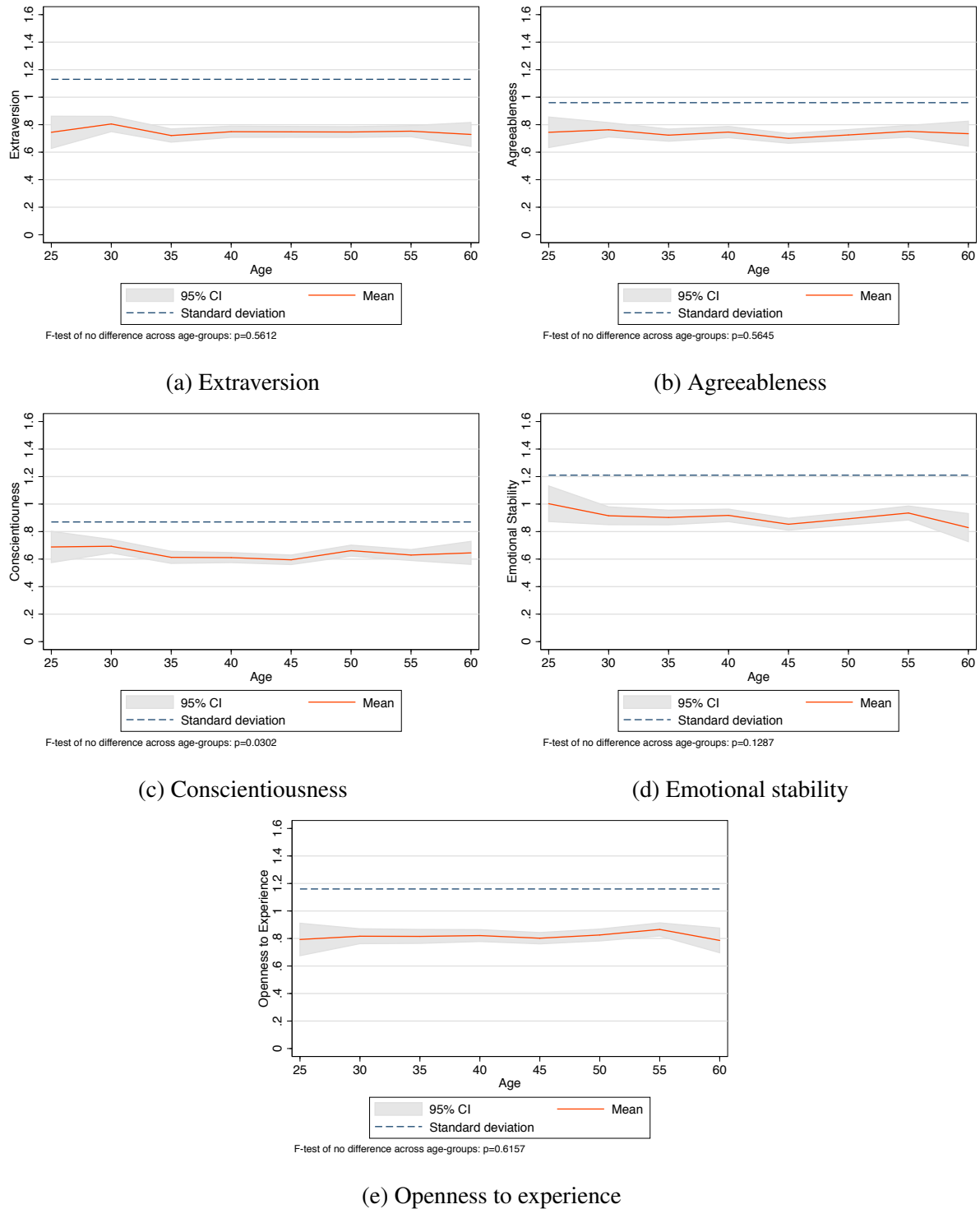
The next part presents the analysis for the average absolute change in mean-levels on the combined sample of women and men between 2005 to 2013. The graphs for the average absolute changes are based on the age in 2009 (see Figure 3). The absolute change is used as the presented data above shows large variation in each direction. The interested reader is referred to the appendix for the graphs related to the changes of 2005-2009 and 2009-2013.

The figures show the average absolute change between 2005 and 2013 across age groups for all Big-Five traits. Additionally, the dashed line represents the sample standard deviation of each trait. The average absolute change is between 0.6 and 1 point on the 7 point Likert-scale. Emotional stability shows the largest absolute changes of all traits. The only trait that indicates a significant difference across the age groups is conscientiousness, while Cobb-Clark and Schurer (2012) also find differences for agreeableness. The ANOVA to check for significant differences between the age groups only reports significant differences for conscientiousness supported by the Bonferroni multiple-comparison test which reveals that 30-34 year old individuals have a significantly different average absolute change compared to the 45-49 year old individuals. For the absolute changes from 2005 to 2009 only emotional stability shows a difference between the last two age groups. The absolute changes from 2009 to 2013 show no significant difference between the age groups.

In general there are significant absolute changes in the population and in each age group. The size of the average absolute difference is between 0.66 and 0.82 standard deviations indicating considerable movement of the individuals. The significant differences in age groups do not repeat for the different time frames and the Bonferroni multiple-comparison test results confirm that there are no systematic age effects. Therefore, there is no larger or smaller variation in the traits over age for the investigated age frame.

3.2 Intra-individual consistency

This subsection investigates how the traits change for each individual. To better understand if certain events are the cause for the change in the Big-Five traits the analysis considers adverse life events in the family and health domain between 2005 and 2013. The analysis finds significant effects for the adverse life events as a whole indicating that people who experience such



Note: Age groups are defined as 25 = 25-29; 30 = 30-34; 35 = 35-39; 40 = 40-44; 45 = 45-49; 50 = 50-54; 55 = 55-59; 60 = 60-64

Figure 3: Absolute changes in the Big-Five personality traits between 2005 and 2013

events have larger changes in their Big-Five scores. Splitting the sample between genders and discriminating between health and family events reveals that men are less effected by the events and show lower changes compared to women. Finally discriminating between different events for each domain reveals more pronounced effects for the different life events.

The analysis uses a similar approach to Cobb-Clark and Schurer (2012) creating the following adverse life events for the family domain: death of a spouse, death of the mother, death of the father, death of a child, and death of another household member¹¹. It would also be interesting to include property crimes but unfortunately the data is not available in the *SOEP*. The health domain includes five conditions: having a stroke, high blood pressure, being diabetic, having cancer and being disabled¹². The status change for disabled individuals is counted if the change was within the observational time frame. The *SOEP* provides data on disability for the full time frame while the other health data have only been collected in 2009, 2011, and 2013. Furthermore, while disability is coded as an actual status changes the other health questions asked if the diagnosis has been made at any point in time regardless of the survey year. Adverse employment measures are not included as they most likely suffer from endogeneity as they are more influenced by changes in personality traits of the individual compared to the death of someone close. The problem is that the causality cannot be determined, especially in the case of wage drops or being fired. It might be the case, that a person experienced these events because she had the change in personality and not the other way around.

Before discriminating between gender it is worth investigating if the individuals who have been effected by adverse life events either in health or family domain show larger differences compared to the individuals who have not experience such events. The dependent variable is the standardized difference for each individual. The control variables include dummy indicators which are equal to one if an individual has experienced events in the respective domain and zero otherwise. Furthermore, following Cobb-Clark and Schurer (2012) additional controls for age, marital status, immigrant status, education, income and employment status measured in respective base year are added.

In general one would assume that the adverse life events occur at random and that the groups are therefore assigned randomly. For the health domain the assumption is stronger as certain behavioral patterns are likely to increase events like diabetes and high blood pressure, such as higher sugar intakes (Malik et al., 2010). But there are also genetic markers increasing the risk to be effect which are not influenced by the individuals (Collins, 2010). The measure of the Big-Five is four years apart increasing the likelihood that there are other events that have an effect on the traits. If the additional events occur randomly in both groups there would be no problem with this approach. If they occur mainly in the control group there might be no significant difference left. On the other hand if they occur mainly in the treatment group the

¹¹Death of a child has been included in the *SOEP* from 2007 onward and death of another household member from 2008 onward.

¹²Additional health markers available in the *SOEP* have been excluded either because of endogeneity concerns, e.g. psychiatric disorders or because they only have been observed in 2011 and 2013, and are therefore not available in the time frame from 2005 to 2009.

effects will be biased upwards.

Table 2 shows the estimated effects for the standardized intra-individual changes for three different time frames. Column one in Table 2 reports a significant negative effect on emotional stability if one experienced adverse health events between 2005 and 2009 decreasing the score by 0.114 standard deviations (*SD*). All other traits seem to be unaffected in the time frame from 2005 to 2009 and there is no effect for the family events. For the time frame between 2009 and 2013 only extraversion is effected by adverse life events. The score increases by .22 *SD* if one experiences both negative health and family events. The last two columns represent the effects for the time horizon from 2005 to 2013 using the indicator variables for both event domains and the two time frames. While there is virtually no effect if the events occurred between 2005 and 2009, there are significant effects of adverse health events between 2009-2013. If individuals experience adverse health events the show an increase in conscientiousness by 0.11 *SD* while at the same time experiencing a decrease in emotional stability by 0.14 *SD*. There is no significant effect for the family events which seems odd as one would expect a severe impact of the death of someone close.

The next part will split the sample between women and men, and will use cumulative measures of the adverse life events to investigate accumulation effects if one experiences more than one adverse life event. The actual number of events as well as dummy indicators for the individuals who have experienced an extreme number of events (larger 2 *SD* and larger 3 *SD*)¹³. As in the case above the standardized intra-individual changes in the Big-Five between 2005 and 2013 traits are used. The models are based on the 2005 data and are separately estimated for women and men using ordinary least squares applying the same controls as above. Therefore, the results can similarly be interpreted as standard deviation changes in the respective trait.

Table 3 shows the estimates for the adverse life event measures. For men only openness to experience is significantly affected by the adverse life events in the family domain. Men increase their openness by 0.091 *SD* for each additional event they experience. The effect is almost identical using the indicator variables for the 2 *SD* but at a lower significance level while for the 3 *SD* the estimated effect is insignificant. In the health domain emotional stability and openness are both effected by adverse events. For emotional stability the effect per additional adverse health event is a decrease by 0.071 *SD*. Additionally for the 2 *SD* indicator variable the effect increase to 0.183 *SD* and for the 3 *SD* indicator the effect increases to 0.266 *SD*. Openness is only effected at the extreme if one accumulates events beyond 3 *SD* from the mean with an increase of 0.260 *SD*. Therefore, instead of withdrawing from live men seem to counteract the adverse life events by trying out new things. Part of the effect could be attributed to the change in routine that is likely to be inflicted by some of the adverse health events. In both instances

¹³Family 2 *SD* ≥ 1 event and 3 *SD* ≥ 2 events. Health 2 *SD* ≥ 2 events and 3 *SD* ≥ 3 events.

Table 2: Intra-Individual Change Estimates for the Different Time Frames

	2005-2009	2009-2013	2005-2013	
			2005-2009	2009-2013
Extraversion				
health	0.0185 (0.0356)	-0.0098 (0.0332)	0.0100 (0.0430)	0.0018 (0.0411)
family	-0.0229 (0.0638)	-0.0936 (0.0704)	0.0505 (0.0601)	-0.0137 (0.0654)
combined	-0.1055 (0.1042)	0.2198** (0.1002)	-0.0298 (0.0967)	0.0550 (0.0924)
Agreeableness				
health	0.0171 (0.0367)	0.0415 (0.0332)	-0.0209 (0.0449)	0.0808* (0.0415)
family	-0.0176 (0.0633)	0.0325 (0.0667)	0.0185 (0.0643)	0.0077 (0.0684)
combined	-0.1106 (0.1018)	-0.0601 (0.0931)	-0.0357 (0.1017)	-0.0595 (0.0995)
Conscientiousness				
health	-0.0045 (0.0354)	0.0408 (0.0324)	-0.0471 (0.0437)	0.1063*** (0.0410)
family	0.0277 (0.0606)	0.0422 (0.0612)	0.1075* (0.0584)	0.0161 (0.0685)
combined	-0.0857 (0.0999)	0.0121 (0.0893)	-0.1067 (0.1022)	-0.0154 (0.0977)
Emotional Satbility				
health	-0.1140*** (0.0359)	-0.0216 (0.0333)	0.0816* (0.0450)	-0.1390*** (0.0423)
family	-0.0614 (0.0581)	0.0467 (0.0694)	0.0219 (0.0610)	-0.0143 (0.0670)
combined	0.0956 (0.0953)	-0.1001 (0.0997)	0.0959 (0.0967)	0.0757 (0.0978)
Openness				
health	-0.0455 (0.0370)	-0.0006 (0.0333)	-0.0248 (0.0452)	0.0141 (0.0422)
family	0.0512 (0.0644)	-0.0098 (0.0625)	0.0642 (0.0628)	-0.0523 (0.0662)
combined	-0.1082 (0.1033)	0.0700 (0.0931)	-0.1149 (0.0994)	0.1332 (0.0947)
N	4274	4389	4274	
Any Events	1633	2184	2450	
Health Events	1342	1935	1342	1342
Family Events	468	496	468	476
Combined	177	247	177	236

Notes: ***, ** and * denote significance at the 1%, 5% and 10% level. Every entry represents a single regression on the respective trait for the give time frame with additional controls: age, relationship status, migration background, education, employment and net income. Standard deviation in parenthesis. Combined represents the point estimate of having experienced both health and family events.

the point estimates increase for the indicator variables suggesting that the effects of the single life events tend to accumulate.

For women there are no significant effects of the adverse family events on the Big-Five. Women get more agreeable with each adverse health event increasing their score by 0.073 *SD*. Similar to men there is an increase for openness to experience for the 3 *SD* indicator with a slightly

Table 3: Estimated effects of combined family and combined health events by gender

	Ext	Agree	Consc	Emstab	Open	N
Men						
Family	-0.005 (0.048)	0.033 (0.048)	0.028 (0.046)	0.017 (0.045)	0.091* (0.046)	536.000
2SD	-0.002 (0.053)	0.036 (0.054)	0.032 (0.054)	0.039 (0.052)	0.090* (0.051)	457.000
3SD	-0.012 (0.177)	0.062 (0.168)	0.027 (0.144)	-0.126 (0.144)	0.247 (0.172)	43.000
Health	0.030 (0.032)	0.005 (0.030)	-0.004 (0.031)	-0.071** (0.029)	0.016 (0.030)	1033.000
2SD	0.053 (0.074)	-0.050 (0.075)	-0.064 (0.076)	-0.183** (0.073)	0.067 (0.073)	240.000
3SD	0.139 (0.156)	-0.042 (0.142)	-0.017 (0.152)	-0.226* (0.130)	0.261** (0.125)	54.000
Women						
Family	0.061 (0.045)	-0.051 (0.046)	0.052 (0.047)	0.028 (0.047)	-0.044 (0.046)	618.000
2SD	0.072 (0.050)	-0.043 (0.055)	0.057 (0.054)	0.036 (0.055)	-0.047 (0.054)	438.000
3SD	0.083 (0.156)	-0.187 (0.135)	0.093 (0.160)	0.016 (0.148)	-0.090 (0.140)	48.000
Health	0.007 (0.032)	0.073** (0.033)	0.010 (0.032)	-0.031 (0.033)	0.001 (0.032)	1087.000
2SD	0.005 (0.083)	0.110 (0.083)	-0.029 (0.078)	0.002 (0.080)	-0.035 (0.078)	178.000
3SD	0.046 (0.163)	0.163 (0.152)	-0.175 (0.186)	-0.049 (0.194)	0.347** (0.167)	33.000

Notes: ***, ** and * denote significance at the 1%, 5% and 10% level. OLS coefficients are interpreted in terms of a standard-deviation change in the respective mean-level change. The Family and Health regressions include a control simply counting the number of events. N relates to the number of individuals for whom the shock indicator is equal to 1 for having more events than 2 or 3 from the mean. Every entry represents a single regression on the respective trait with additional controls: age, relationship status, migration background, education, employment, net income and the number of events in the other domain. The analysis is based on a sample of 2,189 men and 2,085 women aged between 25 and 64.

larger point estimate of 0.349 *SD* if one experiences equal to or more than 3 adverse health events. Estimating the models based on the 2009 values for the control variables leads to qualitatively similar results for men. For women the results vary greatly showing negative effects of adverse health events on emotional stability and positive effects of adverse family events on extraversion. This sensitivity indicates that the effects for women have to be interpreted cautiously.

The last step of this part of the analysis now uses the separate life events to estimate their effects on the Big-Five. Table 4 shows the significantly estimated life events for the different Big-Five measures by gender. Every column represents a single regression analysis with the standardized intra-individual change as the dependent variable and additional controls mentioned above measured in 2005¹⁴. Similar to Cobb-Clark and Schurer (2012) the results are interpreted as standard deviation changes. The blank spaces represent insignificant estimates with p-values

¹⁴Using the measures based on the 2009 values results in qualitatively similar results.

above 0.1 for the regressions¹⁵.

Table 4: Estimated effects of combined family and combined health events by gender

	Women					Men				
	Ext	Agree	Consc	Emstab	Open	Ext	Agree	Consc	Emstab	Open
Death of a spouse										
Death of father										
Death of mother										0.18** (0.07)
Death of a child			0.43** (0.20)	-0.80*** (0.09)	-2.05*** (0.44)				-0.73*** (0.28)	
Death a household m.					-0.76** (0.34)					
Stroke		0.62*** (0.19)	-0.47** (0.20)				0.41* (0.23)			
High blood pressure										
Diabetes									-0.18** (0.09)	
Cancer										
Disablity					-0.17* (0.09)					

Notes: ***, ** and * denote significance at the 1%, 5% and 10%, respectively. Every entry represents a single regression on the respective trait with additional controls: age, relationship status, migration background, education, employment and net income. Standard errors in parenthesis. The analysis is based SOEP data with a sample of 2,189 men and 2,085 women

While the personality of a man only seems to be effected by the death of his mother or a child, women show significant effects only for the death of s child or another person living in the household. Similar to men there are strong effects for the death of a child that do not show up for the combined measures. This indicates that the combination of the adverse events disguises effects of single adverse life events. Men are most effected by the death of a child which decreases their emotional stability by 0.73 standard deviations (*SD*) while the death of their mother increases their openness to experience by 0.18 *SD*.

For women the effect of the death of a child is slightly larger with a decrease 0.80 *SD* in their emotional stability score. Furthermore, the death of a child seems to increase the conscientiousness of women by 0.43 *SD* and has a negative effect on their openness to experience with a decrease of 2.03 *SD*. There is also negative effect of 0.76 *SD* of the death of another household member on openness to experience. This indicates a withdrawal into the known, by being less curious and feeling less excitable. There are no effects of the death of a spouse or the death of the father for neither women nor men. This is odd as one would expect significant changes at least by the death of a spouse. The average age for individuals who lose a spouse is six years above the sample average indicating that most individuals are older and the event might not come as such a surprise. Therefore, it has a lower impact on the personality traits. Interesting to

¹⁵The interested reader is referred to the appendix for the complete table.

note is that the combined adverse life events in the family domain show no significant effect on openness to experience, while at the same time the largest point estimate for the single adverse life event is the death of a child on openness to experience.

If diagnosed with a stroke both women and men show positive effects on agreeableness. Women become more agreeable with an increase of 0.62 *SD* and men increase by 0.41 *SD*. Therefore, both are getting more tender minded and less stubborn. Additionally, women also show a decrease for conscientiousness after a stroke by 0.48 *SD*, decreasing their level of competence, organization, and motivation. For both women and men there are no effects of high blood pressure indicating that this diagnosis has no severe impact on the personality traits. Furthermore, if men are diagnosed with diabetes their emotional stability decreases by 0.18 *SD*. Women's emotional stability is negatively effected when they become disabled in any way decreasing emotional stability by 0.17 *SD*. Certain life events can have a significant effect on the size of the intra-individual change and therefore on the Big-Five traits themselves although they can only explain a small part of the observed variation.

3.3 Economic Impact

The question now is how economically important these changes in the Big-Five dimensions are. This analysis uses estimates for the wage effects based on the used sample drawn from the *SOEP*. The estimation sample includes 1,450 women and 1,595 men for whom at least 2 observations are available resulting in 3,772 observations for women and 4,319 observations for men. Table 5 reports the estimates of the benchmark OLS regression as well as the estimates of the Hausman-Taylor regression following Heineck and Anger (2010) and the estimates of a fixed-effects regression using the observed variation in the Big-Five traits. All models account for selection bias using the sample selection procedure proposed by Heckman (1979) and include individual controls following the estimation approach by Heineck and Anger (2010)¹⁶.

The pooled OLS regression with sample selection estimates significant wage-effects of agreeableness decreasing the wage of men by 4.1% and women by 3.2% per standard deviation increase in the trait. Additionally, there seem to be positive effects of conscientiousness and a negative effect of extraversion on women's wage increasing/decreasing the wage by 1.6% per standard deviation increase. Also openness seems to have a positive effect on the wage of men increasing it by 1.9% per standard deviation increase.

Following the approach by Heineck and Anger (2010) the Hausman-Taylor estimator is used to

¹⁶The controls are: age, age squared, living in east Germany, being a couple, migration background, education, being a state employee, working in a firm with over 2,000 employees, having a white collar job, working full time, having a time limited contract, tenure, tenure squared and year dummies.

Table 5: Wage Effects Regressions - Gross Monthly Wages

Variable	Men			Women		
	OLS	HT	FE	OLS	HT	FE
Extraversion	0.0028 (0.0077)	0.0198 (0.0247)	0.0030 (0.0057)	-0.0162* (0.0093)	-0.0307 (0.0218)	0.0019 (0.0088)
Agreeableness	-0.0407*** (0.0075)	-0.0910* (0.0497)	-0.0054 (0.0046)	-0.0323*** (0.0095)	-0.0873*** (0.0196)	0.0143* (0.0074)
Conscientiousness	0.0080 (0.0073)	0.0141 (0.0170)	0.0044 (0.0054)	0.0165* (0.0097)	0.0279 (0.0304)	0.0159** (0.0080)
Emotional stability	0.0122 (0.0084)	0.0072 (0.0189)	0.0007 (0.0053)	-0.0045 (0.0087)	0.0010 (0.0194)	-0.0071 (0.0081)
Openness	0.0194** (0.0078)	-0.0098 (0.0281)	0.0018 (0.0058)	-0.0122 (0.0090)	0.0080 (0.0204)	-0.0046 (0.0086)
Invid. controls	+	+	+	+	+	+
Add. traits	+	+	-	+	+	-
R^2	0.54		0.23	0.54		0.22

Note: ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Standard errors appear in parentheses. Clustered standard errors are calculated to account for possible intra-individual correlation of error terms. The sample size in each regression is N=3,772 for women and N=4,319 for men. All models account for sample selection using Heckman's correction procedure (Heckman, 1979). HT refers to the Hausman-Taylor regression and FE to the Fixed Effects regression. The FE regression excludes Locus of Control, pos. Reciprocity and neg. Reciprocity as these are time-invariant in the data.

estimate the wage effects of the Big-Five utilizing the panel design of the *SOEP*. The underlying assumption is that the traits are stable over time. Contrary to Heineck and Anger (2010) there are now three observations for the Big-Five for the years 2005, 2009, and 2013. The average trait score for each individual over the three years is used in each year in order to apply the Hausman-Taylor estimator and to satisfy the stability assumption. Using the average implies that the observed variations are measurement errors and that the average represents the assumed to be stable Big-Five trait. The cognitive ability control variable used by Heineck and Anger (2010) cannot be included as no one in the sample took part in the measurement of the cognitive abilities. Similar to Heineck and Anger (2010) the Hausman-Taylor estimates return almost no significant estimates of the Big-Five for men only agreeableness shows a negative effect on the 10% level decreasing the wage by 9.1%. For women the same trait (agreeableness) shows a significant effect as in Heineck and Anger (2010) but the point estimate is more than twice the size. The negative effect of agreeableness decreases the wage by 8.7% per standard deviation.

Finally, the fixed-effects estimations uses the observed variation in the Big-Five utilizing the within variation of each individual. Applying the fixed effects estimator denies the use of the locus of control and the reciprocity variables as controls as they are time invariant. As for the Hausman-Taylor estimates there are no significant effects for men. For women there is now a positive effect of agreeableness increasing the wage by 1.4% per standard deviation and

a positive effect for Conscientiousness increasing the wage by 1.6% per standard deviation. Over the full trait scale observed in the sample the effect from the lowest to the highest value would be 8.6% for agreeableness and 9.4% for conscientiousness¹⁷. There is a reversal of the effect direction of agreeableness between the Hausman-Taylor estimation and the fixed-effects estimation. One reason could be the exclusion of the additional controls locus of control and reciprocity. A separate Hausman-Taylor regression which excludes the additional traits has been estimated and shows no qualitative change in the estimate. The estimated effect is now 0.7% per standard deviation and is still negative. Therefore, the reversal in the effect is not caused by the exclusion of the locus of control and instead is due to the observed variation in the data.

The problem remaining with the fixed-effects estimates is the variation used for the estimation. There is the possibility of reversed causality as there is no way to be sure that the change in the traits has caused the change in wage and not the other way around. If changes in the wage actually change the traits, the estimation would suffer from endogeneity and the estimates would likely be inconsistent. Nevertheless, given the facets associated with agreeableness a positive relationship seems more plausible than the other way around. This also holds true for the possible effect of conscientiousness on wage. Still the fixed effects estimates should be seen as purely exploratory.

The average wage based on the estimation sample gives an average gross monthly wage for women of €2165.25 and €3447.54 for men in 2005 wages. The gross monthly wages are used as there are 695 wage observations missing the information on contracted working hours. Therefore, using the hourly wages would have further reduced the sample size. The 3 *SD* adverse health-events are used to give an upper bound for the possible effects of the Big-Five on wage. Combining the estimates with the average monthly wage for women and men gives the wage equivalent personality change expressed in Euros per month in 2005 values. The wage effects for the change in the Big-Five are computed as follows:

$$\Delta_i^w = w_i^{Big5} \cdot s_i^{Big5} \cdot \bar{x}_i^w; \quad i \in \{men, women\}$$

where Δ_i^w is the wage equivalent effect of the adverse life events based on the change in a Big-Five trait, w_i^{Big5} as the Big-Five wage return induced by a one standard deviation change in the trait, s_i^{Big5} the estimated standard deviation change in response to the adverse life events, and \bar{w}_i as the average monthly wage for men and women. The results are reported in Table 6.

There are basically no wage equivalent effects as there is no combination in which both the wage effect of the Big-Five and the Big-Five changes in response to adverse health events are

¹⁷The change over the full scale is calculated using the difference between the highest and the lowest value divided by the standard deviation of the trait times the effect of the trait: $\Delta_{full} = ((max_{Big5} - min_{Big5})/SD_{Big5}) \cdot w_{Big5}$.

Table 6: Wage equivalent of changes in Big-Five personality traits due to adverse health events

	Est. FE wage effect	Est. shock on Big 5	Wage equiv. in absolute €	
			by individual Big 5 trait	sum over all Big 5 traits
Men				
Extraversion	0.003	0.139	1.44	4.97
Agreeableness	-0.005	-0.042	0.72	
Conscientiousness	0.004	-0.017	0.23	
Emotional Stability	0.001	-0.226*	-0.78	
Openness to Experience	0.002	0.261**	1.80	
Women				
Extraversion	0.002	-0.046	-0.20	15.70
Agreeableness	0.014*	0.163	4.94	
Conscientiousness	0.016**	-0.175	-6.06	
Emotional Stability	-0.007	0.049	-0.74	
Openness to Experience	-0.005	0.347**	-3.76	

Notes: ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Data taken from *SOEP*, average monthly wage in the estimation sample in 2005 values for men = € 3447.54, women = € 2165.25.

significant. For the sake of the argument using the face values gives the following results. The largest effect would be an increase in the average gross monthly income for men by € 1.80 based on the positive effect of adverse health events on Openness and the additionally effect on wages. For women the largest effect would be a wage effect of € 6.06 for the change of Conscientiousness of women in response to adverse health events and the corresponding effect on wages. Summing up the absolute values of the would-be-changes reveals that the possible variation in income amounts to € 4.97 for men and € 15.70 for women per month. Compared to the average monthly wages this would be 0.14% for men and 0.72% for women.

One effect that can be calculated is the effect of having a stroke on the wages of women since the adverse health event significantly effects the agreeableness and conscientiousness. Both are also significantly estimated in the fixed effects wage regressions. The effect on agreeableness returns a wage equivalent of € 19.20 per month and the effect on conscientiousness returns a wage equivalent of € 16.18. Both effects point in different directions as the health event on conscientiousness is negative. Thus, any observable effect would be reduced to € 3.02.

The economic effect is quite small and if only the effects are used for which the wage effect and the effect of the adverse life events are significant, the wage effect of adverse life events through the Big-Five is zero. Only singular adverse events actually result in wage equivalent changes. Furthermore, one has to consider that the health events will affect the wage in a more direct way than through the personality traits as events such as having a stroke or having cancer have a high chance of rendering somebody unable to work.

4 Conclusion

The findings presented in this paper show that there are only minor changes in the Big-Five traits for the sample population as a whole. Additionally, there are no systematic age effects. Nevertheless, the analysis shows significant intra-individual changes in the Big-Five traits. This indicates that stable population means which are due to positive and negative individual changes canceling each other out. The average absolute change in the traits for the sample population is usually just above two thirds of a standard deviation. Some of this variation can be attributed to adverse life events which influence the traits. Still a large part of the variation is not explainable through life events which begs the question about the source of this variation. The observed simultaneous changes in the sample population for the different time points indicate some year effects induced by external circumstances or changes in the placement of questions between the different years.

The last part of the analysis gives an overview of how the adverse life events effect wages through the Big-Five. The wage equivalent effects are relatively small if there are some at all. As for the most pronounced family event, the death of a child the effect on monthly wages is still below 1% of monthly wages as the trait most affected by this event does not have any effect on wages. The direct effects of the adverse life events on wages are most likely larger in size because some will render the individual unable to work.

Overall it can be concluded that there is a fairly large variation in the traits for a working age population. The time frame between each observation is four years which makes it very hard to establish any causal reasons for these changes. Any significant change found could be interpreted as a lower bound of the actual effect size. As the adverse life events explain only a small part of the observed variation in the Big-Five and the additional change in the placement of the short Big-Five inventory in the *SOEP* leaves space for measurement errors.

On top of that the general time frame discussed in this paper is limited although certain topics in economics deal with the whole working life of an individual. These topics could be the case for career developments, life-cycle spendings and savings for retirement. All of these cover up to and more than 40 years of an individual, while this analysis is based on an eight year time window. This issue will resolve over time once additional waves have been collected. If the representative data sets are continuously collected and stick to the pattern there will be a new wave with Big-Five data in the 2017 *SOEP* wave. Thereby 40 years will still not be covered but it enhances the observational window to 12 years which could give further insights into the issues discussed. Additionally, representative data that collect the traits on a yearly basis could enable future research to determine the sources of potential changes more precisely.

References

- Cobb-Clark, D. A. and S. Schurer (2012, 4). The stability of big-five personality traits. *Economics Letters* 115(1), 11–15.
- Collins, F. (2010). Has the revolution arrived? *Nature* 464, 674–675.
- Dehne, M. and J. Schupp (2007). Persönlichkeitsmerkmale im Sozio-oekonomischen Panel (SOEP) - Konzept, Umsetzung und empirische Eigenschaften. *DIW Research Note* 26, 1–70.
- Gerlitz, J.-Y. and J. Schupp (2005). Zur Erhebung der Big-Five-basierten Persönlichkeitsmerkmale im SOEP. Technical report, DIW Research Note.
- Heckman, J. J. (1979). Sample Selection Bias as a Specification Error. *Econometrica* 47(1), 153–161.
- Heineck, G. and S. Anger (2010). The returns to cognitive abilities and personality traits in Germany. *Labour Economics* 17(3), 535–546.
- Malik, V. S., B. M. Popkin, G. A. Bray, J.-P. Després, and F. B. Hu (2010). Sugar-sweetened beverages, obesity, type 2 diabetes mellitus, and cardiovascular disease risk. *Circulation* 121(11), 1356–1364.
- McCrae, R. R. and P. T. Costa (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of personality and social psychology* 52(1), 81.
- McCrae, R. R. and P. T. Costa Jr (2010). *NEO inventories: Professional manual*. Psychological Assessment Resources.
- Rasinski, K. A., P. S. Visser, M. Zagatsky, and E. M. Rickett (2005). Using implicit goal priming to improve the quality of self-report data. *Journal of Experimental Social Psychology* 41(3), 321–327.
- Specht, J., B. Egloff, and S. C. Schmukle (2011). Stability and change of personality across the life course: the impact of age and major life events on mean-level and rank-order stability of the Big Five. *Journal of personality and social psychology* 101(4), 862.
- Wagner, G. G., J. R. Frick, and J. Schupp (2007). The German Socio-Economic Panel Study (SOEP) - Scope, Evolution and Enhancements. *Schmollers Jahrbuch* 127(1), 139–169.

A Appendix

Table 7: Mean comparison for the *SOEP* and *HILDA* data

	<i>SOEP</i>		<i>HILDA</i>	
	Mean	SD	Mean	SD
Extraversion	4.822	1.134	4.395	1.087
Agreeableness	5.346	0.965	5.403	0.888
Conscientiousness	5.925	0.872	5.152	1.005
Emotional stability	4.161	1.207	5.195	1.047
Openness to experience	4.490	1.169	4.237	1.052

Notes: Data taken from *SOEP* wave 2005, 2009 and 2013. The pooled sample consists of 17,028 individual observations. The *HILDA* means are taken from Cobb-Clark and Schurer (2012). SD = standard deviation

Table 8: Summary statistics of personality traits and their change over time (men)

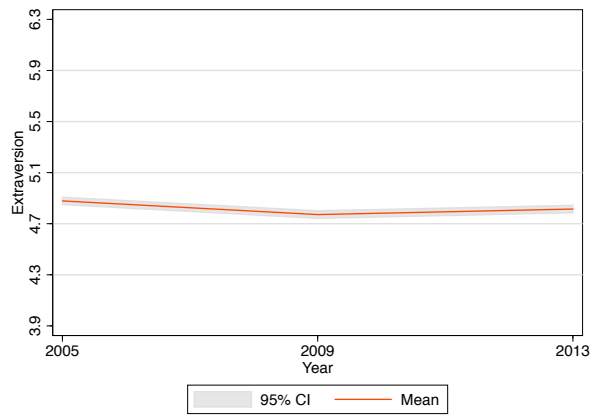
	Level		Changes between 2005 and 2013						
	Mean	SD	Mean	SD	1st	25th	50th	75th	99th
Percentile of distribution									
Mean Difference									
Extraversion	4.667	1.136	-0.082	1.010	-2.667	-0.667	0.000	0.667	2.333
Agreeableness	5.172	0.977	-0.114	0.997	-2.667	-0.667	0.000	0.333	2.333
Conscientiousness	5.843	0.898	-0.110	0.894	-2.333	-0.667	0.000	0.333	2.333
Emotional Stability	4.417	1.161	0.168	1.143	-2.667	-0.667	0.000	1.000	3.000
Openness	4.388	1.138	-0.039	1.077	-3.000	-0.667	0.000	0.667	2.667
Absolute Difference									
Extraversion			0.761	0.669	0.000	0.333	0.667	1.000	2.667
Agreeableness			0.763	0.652	0.000	0.333	0.667	1.000	2.667
Conscientiousness			0.651	0.623	0.000	0.333	0.333	1.000	2.667
Emotional Stability			0.887	0.740	0.000	0.333	0.667	1.333	3.333
Openness			0.820	0.699	0.000	0.333	0.667	1.000	3.000

Notes: Data taken from *SOEP* wave 2005, 2009 and 2013. The pooled sample consists of 7,953 individual observations for men. SD = standard deviation

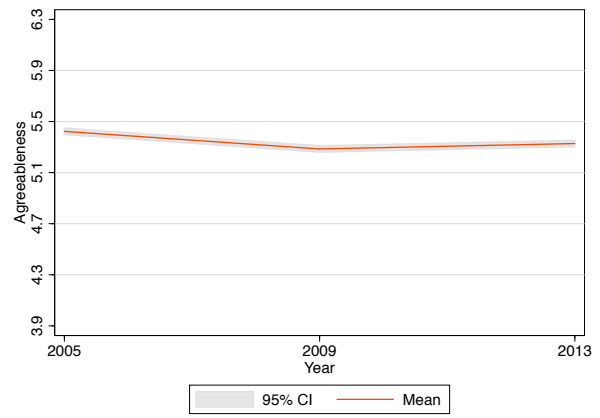
Table 9: Summary statistics of personality traits and their change over time (men)

	Level		Changes between 2005 and 2013						
	Mean	SD	Mean	SD	1st	25th	50th	75th	99th
Percentile of distribution									
Mean Difference									
Extraversion	4.957	1.116	-0.048	0.977	-2.667	-0.667	0.000	0.667	2.333
Agreeableness	5.497	0.927	-0.079	0.936	-2.333	-0.667	0.000	0.333	2.333
Conscientiousness	5.997	0.842	-0.074	0.854	-2.333	-0.667	0.000	0.333	2.333
Emotional Stability	3.936	1.202	0.175	1.170	-2.667	-0.667	0.000	1.000	3.000
Openness	4.579	1.189	-0.027	1.082	-2.667	-0.667	0.000	0.667	2.667
Absolute Difference									
Extraversion			0.741	0.639	0.000	0.333	0.667	1.000	2.667
Agreeableness			0.706	0.619	0.000	0.333	0.667	1.000	2.667
Conscientiousness			0.615	0.597	0.000	0.333	0.333	1.000	2.667
Emotional Stability			0.912	0.754	0.000	0.333	0.667	1.333	3.333
Openness			0.825	0.700	0.000	0.333	0.667	1.333	3.000

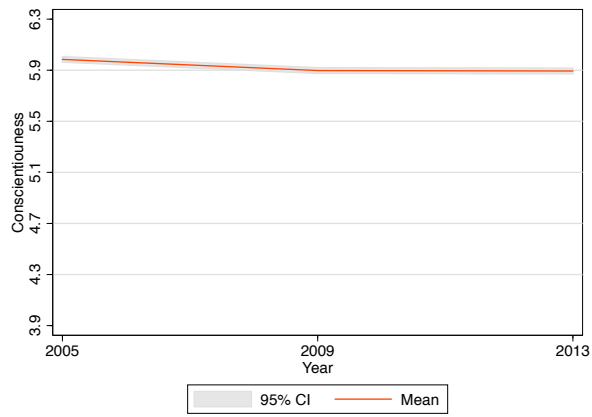
Notes: Data taken from SOEP wave 2005, 2009 and 2013. The pooled sample consists of 9,072 individual observations women. SD = standard deviation



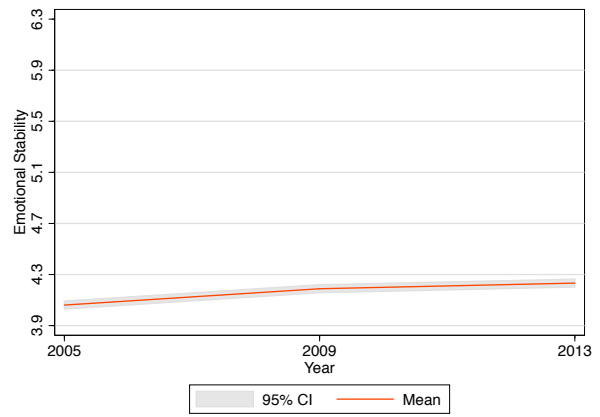
(a) Extraversion



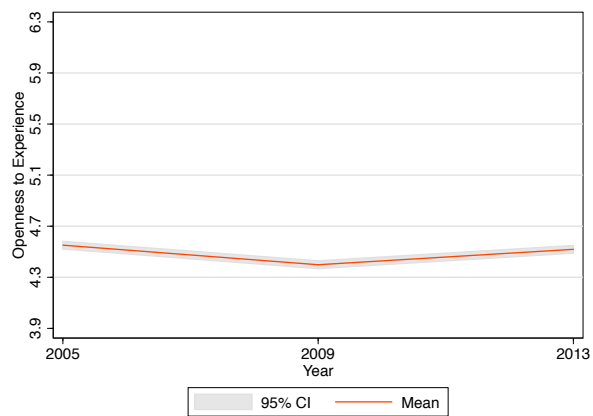
(b) Agreeableness



(c) Conscientiousness

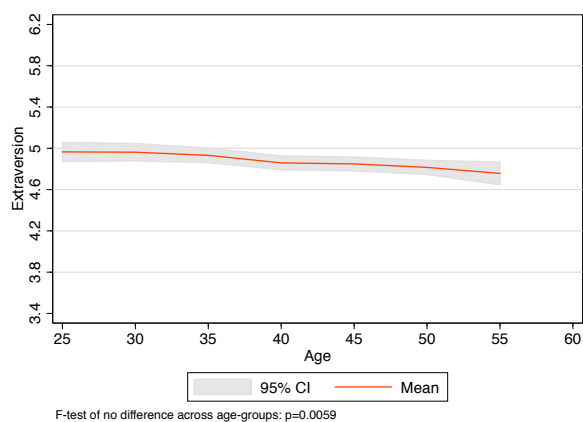


(d) Emotional stability

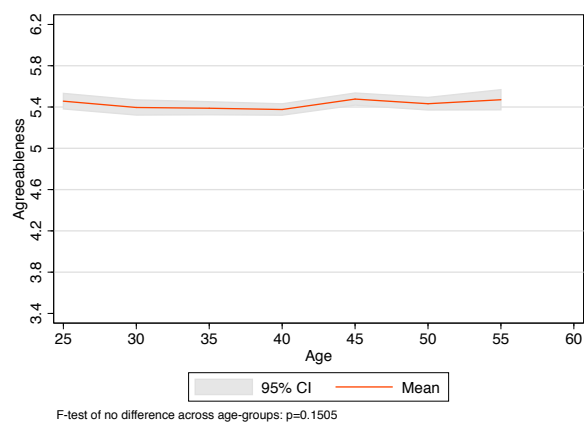


(e) Openness to experience

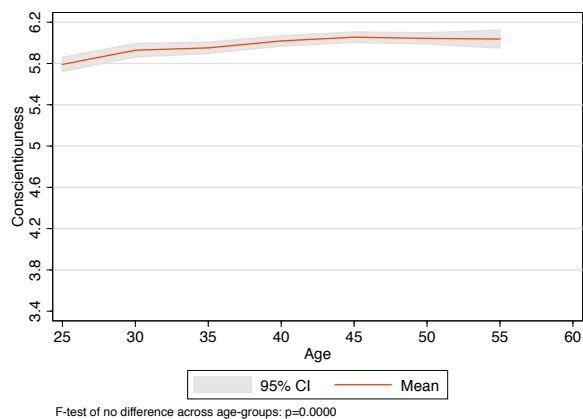
Figure 4: Sample mean levels of the Big-Five personality traits 2005 - 2013



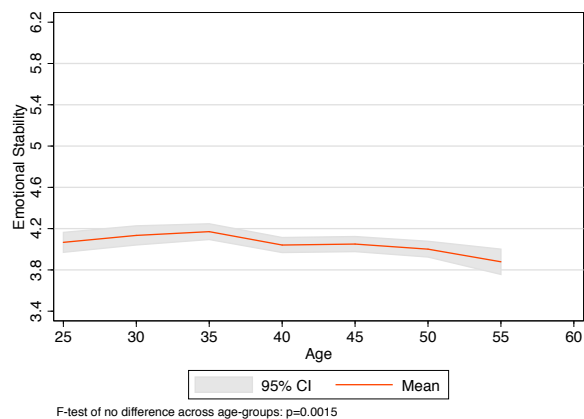
(a) Extraversion



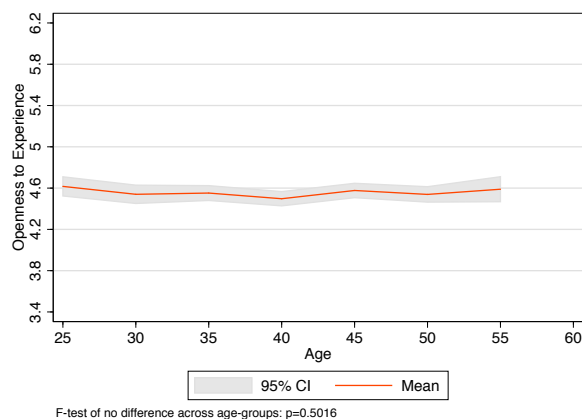
(b) Agreeableness



(c) Conscientiousness



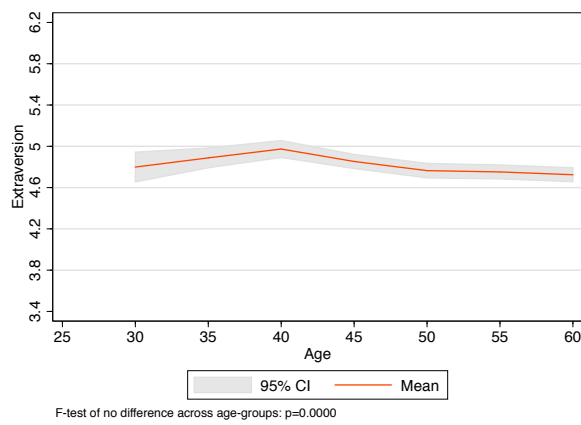
(d) Emotional stability



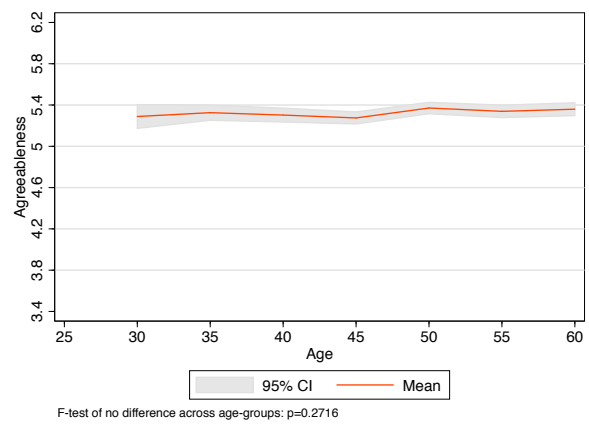
(e) Openness to experience

Note: Age groups are defined as 25 = 25-29; 30 = 30-34; 35 = 35-39; 40 = 40-44; 45 = 45-49; 50 = 50-54; 55 = 55-59; 60 = 60-64

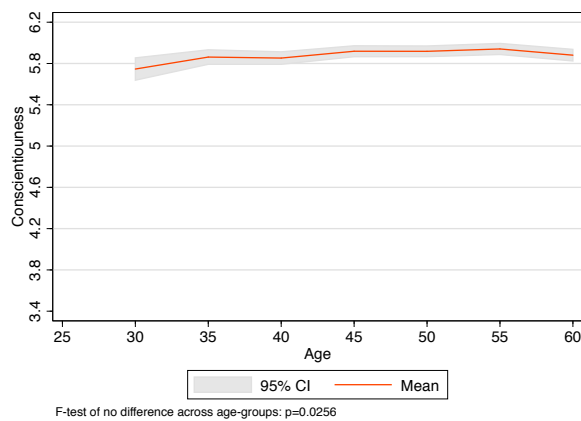
Figure 5: Mean values for Big-Five personality traits over age groups for 2005



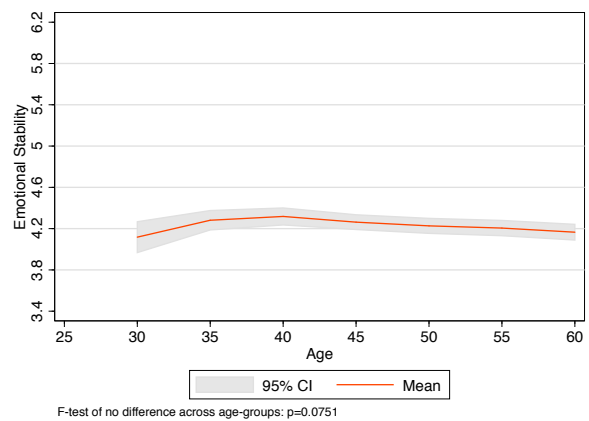
(a) Extraversion



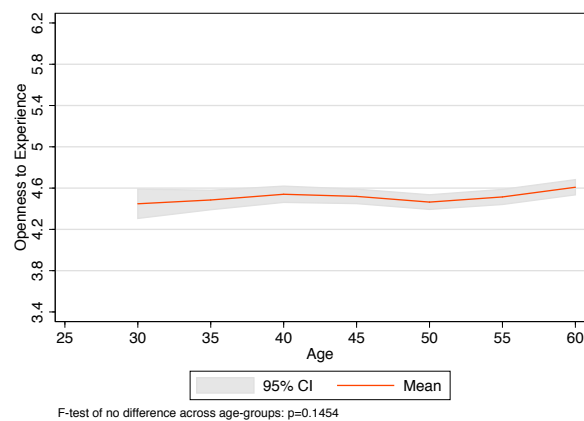
(b) Agreeableness



(c) Conscientiousness



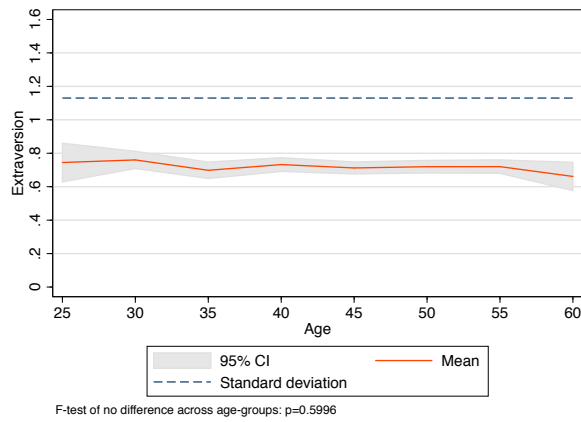
(d) Emotional stability



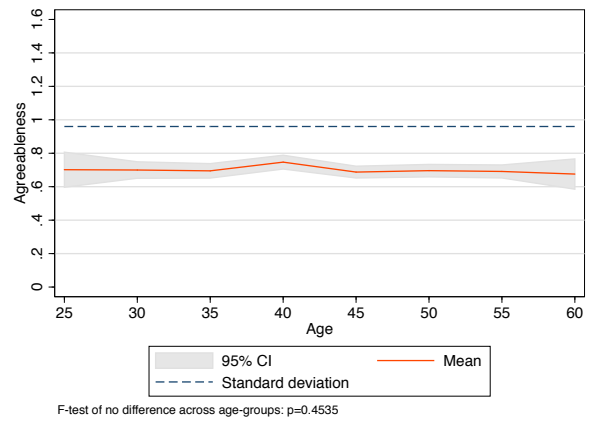
(e) Openness to experience

Note: Age groups are defined as 25 = 25-29; 30 = 30-34; 35 = 35-39; 40 = 40-44; 45 = 45-49; 50 = 50-54; 55 = 55-59; 60 = 60-64

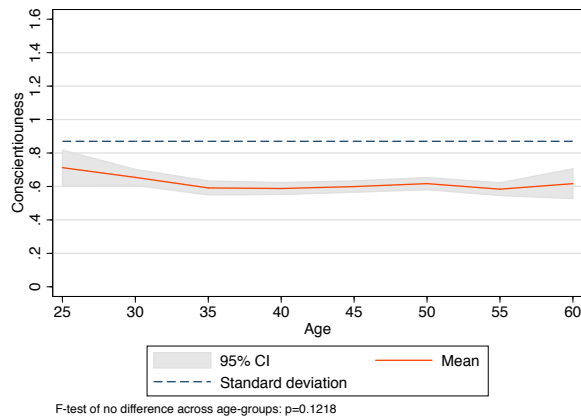
Figure 6: Mean values for Big-Five personality traits over age groups for 2013



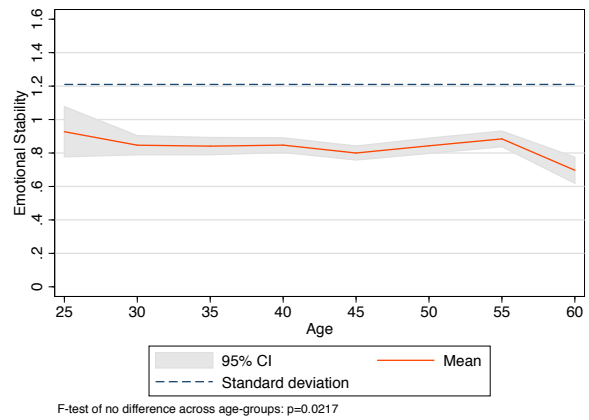
(a) Extraversion



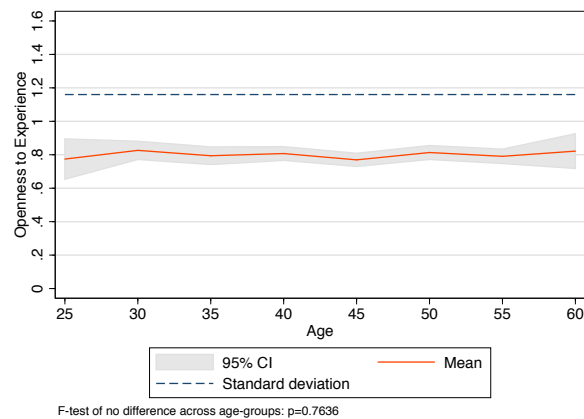
(b) Agreeableness



(c) Conscientiousness



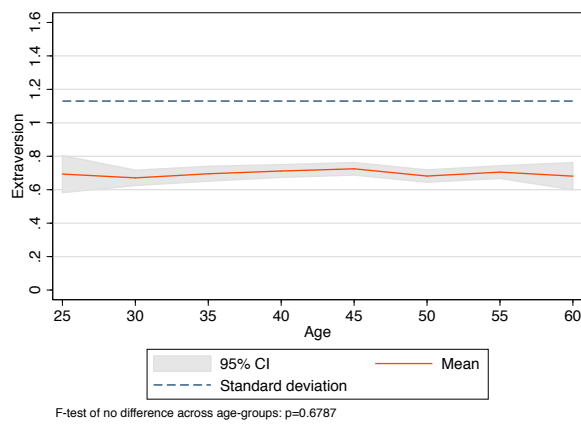
(d) Emotional stability



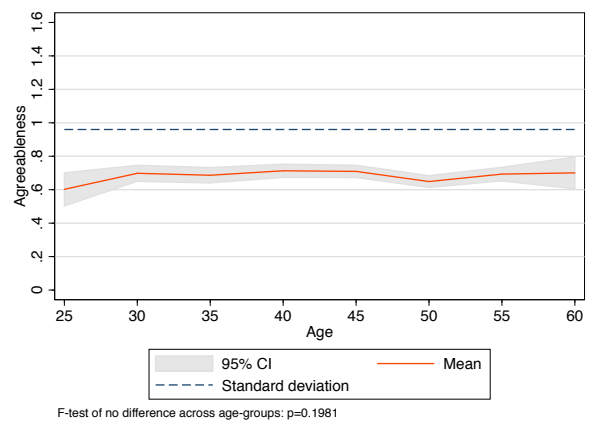
(e) Openness to experience

Note: Age groups are defined as 25 = 25-29; 30 = 30-34; 35 = 35-39; 40 = 40-44; 45 = 45-49; 50 = 50-54; 55 = 55-59; 60 = 60-64

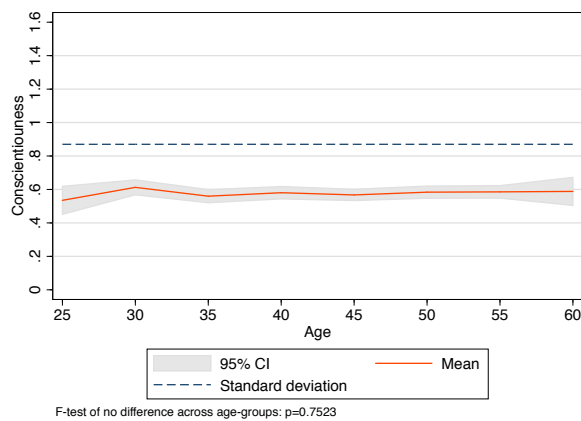
Figure 7: Absolute changes in Big-Five personality traits between 2005 and 2009



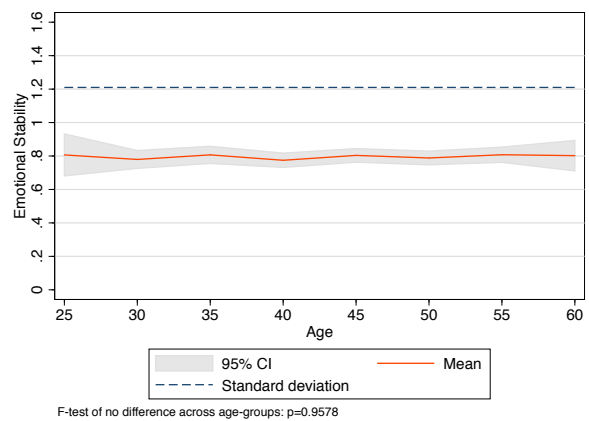
(a) Extraversion



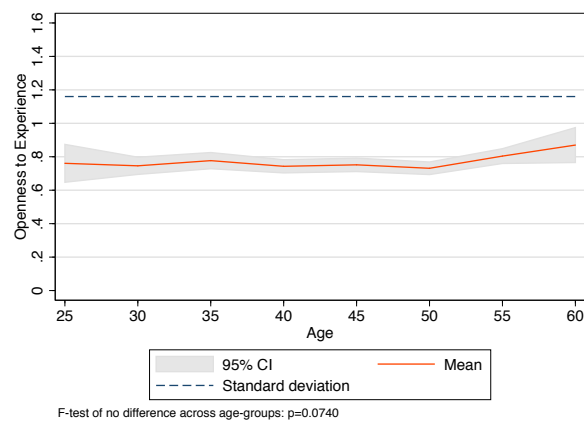
(b) Agreeableness



(c) Conscientiousness



(d) Emotional stability



(e) Openness to experience

Note: Age groups are defined as 25 = 25-29; 30 = 30-34; 35 = 35-39; 40 = 40-44; 45 = 45-49; 50 = 50-54; 55 = 55-59; 60 = 60-64

Figure 8: Absolute changes in Big-Five personality traits between 2009 and 20013

Table 10: Number of adverse life events between 2005 and 2013 by gender

	Men	Women	Combined
Death of a spouse	11	42	53
Death of father	237	240	477
Death of mother	233	192	425
Death of a child	3	3	6
Death a household m.	17	9	26
Stroke	29	25	54
High blood pressure	707	575	1282
Diabetes	164	91	255
Cancer	76	114	190
Disability	161	161	322

Notes: Data taken from SOEP wave 2005 to 2013. The pooled sample consists of 2,189 men and 2,085 women.

Table 11: Estimated effects of combined family and combined health events by gender

	Women					Men				
	Ext	Agree	Consc	Emstab	Open	Ext	Agree	Consc	Emstab	Open
Death of a spouse	-0.07 (0.15)	-0.05 (0.18)	-0.05 (0.16)	0.29 (0.18)	-0.14 (0.12)	0.15 (0.42)	0.17 (0.40)	0.17 (0.34)	0.11 (0.31)	0.14 (0.26)
Death of father	0.08 (0.06)	-0.05 (0.06)	0.05 (0.06)	-0.03 (0.06)	0.03 (0.07)	-0.04 (0.07)	0.08 (0.07)	0.03 (0.07)	-0.02 (0.06)	-0.00 (0.07)
Death of mother	0.07 (0.07)	-0.04 (0.08)	0.04 (0.08)	0.08 (0.08)	-0.05 (0.08)	0.06 (0.07)	-0.02 (0.07)	0.00 (0.07)	0.07 (0.07)	0.18** (0.07)
Death of a child	-0.19 (0.74)	0.35 (0.62)	0.43** (0.20)	-0.80*** (0.09)	-2.05*** (0.44)	0.14 (0.27)	0.57 (0.37)	-0.30 (0.37)	-0.73*** (0.28)	0.32 (0.46)
Death a household m.	0.12 (0.31)	-0.07 (0.61)	0.47 (0.45)	-0.48 (0.37)	-0.76** (0.34)	-0.52 (0.35)	-0.09 (0.24)	0.24 (0.28)	-0.24 (0.23)	0.11 (0.23)
Stroke	0.03 (0.23)	0.62*** (0.19)	-0.47** (0.20)	-0.05 (0.21)	-0.12 (0.15)	0.15 (0.24)	0.41* (0.23)	-0.26 (0.25)	-0.10 (0.18)	0.13 (0.24)
High blood pressure	-0.01 (0.05)	0.03 (0.05)	0.06 (0.05)	0.02 (0.05)	-0.01 (0.05)	0.04 (0.05)	0.03 (0.05)	0.03 (0.05)	-0.03 (0.05)	0.00 (0.05)
Diabetes	0.09 (0.12)	0.11 (0.12)	-0.01 (0.11)	0.10 (0.12)	0.17 (0.12)	0.04 (0.08)	-0.11 (0.09)	-0.04 (0.08)	-0.18** (0.09)	0.12 (0.08)
Cancer	0.05 (0.10)	0.02 (0.10)	0.06 (0.10)	-0.12 (0.09)	-0.08 (0.10)	0.09 (0.12)	-0.02 (0.10)	0.08 (0.11)	-0.12 (0.12)	0.12 (0.11)
Disability	-0.04 (0.09)	0.08 (0.09)	-0.03 (0.08)	-0.17* (0.09)	0.01 (0.09)	-0.06 (0.09)	-0.00 (0.09)	-0.06 (0.09)	-0.04 (0.09)	-0.14 (0.09)

Notes: ***, ** and * denote significance at the 1%, 5% and 10%, respectively. Every entry represents a single regression on the respective trait with additional controls: age, relationship status, migration background, education, employment and net income. Standard errors in parenthesis. The analysis is based SOEP data with a sample of 2,189 men and 2,085 women