I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 10561

Involuntary Job Loss and Changes in Personality Traits

Silke Anger
Georg Camehl
Frauke Peter

FEBRUARY 2017

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 10561

Involuntary Job Loss and Changes in Personality Traits

Silke Anger
IAB, University of Bamberg and IZA

Georg Camehl
DIW Berlin

Frauke Peter
DIW Berlin

FEBRUARY 2017

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Involuntary Job Loss and Changes in Personality Traits*

Economists consider personality traits to be stable, particularly throughout adulthood. However, evidence from psychological studies suggests that the stability assumption may not always be valid, as personality traits can respond to certain life events. Our paper analyzes whether and to what extent personality traits are malleable over a time span of eight years for a sample of working individuals. Furthermore, we specifically look at changes in personality traits after a major adverse life event: involuntary job loss. We use data from the German Socio-Economic Panel Study (SOEP) from 2004 to 2014 – a period over which individuals' Big Five personality inventory was measured three times. Our dataset allows us to exploit detailed employment information, particularly reasons for job termination and unemployment spells. We focus solely on plant closures as a reason for job termination. Job loss due to plant closure is widely used as a relatively exogenous event to identify causal effects. Our results suggest that personality traits are indeed malleable during adulthood. Although the Big Five measures are relatively stable within the overall population of workers, we find an increase in openness, that is, the willingness to seek new experiences, for the average displaced worker. This increase, however, is fully driven by individuals with high educational attainment and by those who find a new job immediately after dismissal. The other dimensions of the Big Five personality inventory remain nearly unchanged after an involuntary job loss. Our findings hold for a number of robustness checks and are supported by the results of a falsification test using a placebo treatment.

JEL Classification: I12, I18, K32, C33

Keywords: involuntary job loss, personality traits, matching

Corresponding author:
Georg Camehl
DIW Berlin
Mohrenstr. 58
10117 Berlin
Germany
E-mail: gcamehl@diw.de

* We are grateful to the editors and two anonymous referees from this journal for very helpful feedback and suggestions to improve the manuscript. We thank the participants of the 7th IWAEE conference, the SOEP 2016 conference, the IWH workshop on unemployment 2016, and the annual meeting of the German Economic Association 2016 for useful comments and discussions. We gratefully acknowledge helpful editorial assistance from Adam Lederer. The usual disclaimer applies.

1. Introduction

The assumption of stable personality traits is important in the economic literature. While standard economic theories treat personality traits as unobserved characteristics, empirical analyses take them into account as unobserved time-invariant factors. Some studies include measures of personality traits to show their importance for predicting social and economic success (Heineck and Anger, 2010; Mueller and Plug, 2006; Wichert and Pohlmeier, 2010). Likewise, in order to rule out reverse causality, these models have to assume stability of personality traits, as they measure them at only one point in time. The strict stability assumption in the economic literature is against common sense that individuals change their traits, preferences, expectations, and behavior in response to life experiences. This notion of malleable personality traits is closely related to the contextual view in the psychological literature, according to which personality traits are affected by life events (Srivastava et al., 2003). In contrast, economic studies have adopted the biological view in the psychological literature, according to which personality traits are "set like plaster" (McCrae and Costa, 1994).

However, if an individual's personality traits respond to economic shocks over the life cycle, this has implications for economic models and empirical results. It is important to elucidate whether changes in personality traits occur and whether they are an outcome of specific events. This is also of social importance because changes in personality traits may also affect future economic and social outcomes. An increasing number of economic studies suggest that non-cognitive skills, which include personality traits, are important predictors of educational attainment and labor market success. For example, Heckman et al. (2013) show that non-cognitive skills obtained early in life explain more of the variance in later outcomes than cognitive skills. Moreover, from a policy point of view, if institutional settings could indirectly affect personality traits, for example, by relieving economic shocks, changes in personality traits should be included in cost-benefit analyses when evaluating policy actions.[1]

This paper aims at analyzing whether workers' personality traits are stable and how stable they are over time. Using data from the German Socio-Economic Panel Study (SOEP) from 2004 to 2014, we investigate changes in personality traits, focusing on a sample of workers who were initially employed and have not experienced any unemployment spell. Furthermore, we specifically look at changes in personality traits

[1] In contrast to other factors, which may be expected to affect personality traits, such as social events and health events, policymakers have a stronger influence on institutional factors.

after one particular life event. Job displacement is a major adverse life event, as it threatens the physical, mental, and social existence of an individual. Even compared to other negative life events, such as death of a partner or divorce, unemployment has very strong effects on well-being.[2] Displaced workers who cannot quickly find re-employment face increasing difficulties in re-entering the labor market (Abraham et al., 2016), and there is still need for a better understanding of the factors that contribute to this state dependence in unemployment. Personality changes may explain long-term unemployment if personality traits are adversely affected by shocks during the working life. Our analysis, therefore, exploits different measurements of personality traits over time, comparing individuals' "initial" personality traits to personality traits after job loss. The novel research idea of this paper is to focus on an event with relatively exogenous variation, namely, involuntary job loss due to plant closure, and to analyze its effects on an individual's personality.

Our paper complements previous research on stability and change in personality traits, which is traditionally found in the psychological literature. Many of these studies use small or selective samples, measure a small sub-set of non-cognitive skills, or are restricted to specific age groups (for an overview, see Roberts et al., 2006). More recent research on the stability of personality traits is based on large representative datasets, as a result of the introduction of psychological measures into large panel surveys, such as the Household, Income and Labour Dynamics in Australia Survey (HILDA) and the German Socio-Economic Panel Study (SOEP).

We improve on previous studies on the stability and change of personality traits in several ways. First, we exploit a relatively long time span of eight years and three measurements of personality traits. While Cobb-Clark and Schurer (2012) for Australia and Specht et al. (2011) for Germany examine changes in the Big Five personality traits between two measurements over a four-year period,[3] we are able to investigate rather long-term changes and to apply panel methods by pooling two periods of four years.[4]

[2]For example, Clark et al. (2008) show that unemployment has the strongest effect on life satisfaction compared to other negative life events. Job loss is also shown to trigger pecuniary and non-pecuniary consequences that may even spill over to their partners and children (see, for example, studies by Charles and Stephens, 2004; Huff-Stevens and Schaller, 2011; Lindo, 2011; Marcus, 2013, 2014; Oreopoulos et al., 2008; Peter, 2016; Rege et al., 2011, 2009; Schaller and Zerpa, 2015). In this strand of literature, job loss due to plant closure is classified as an exogenous shock, which allows us to rule out endogenous selection and omitted variable bias.

[3]Studies on the stability of other non-cognitive skill measures, such as locus of control and risk preferences, also exist but are not the focus of this paper.

[4]Where one could argue that even longer time spans would be optimal, we consider an eight-year or four-year period after job loss to be a reasonable compromise, given that there may also be development

Our study compares well with the median time span of six years of psychological studies on changes in personality traits reported by Roberts et al. (2006), who also show that larger changes are found in studies with longer time spans.

Second, we complement studies that sum up multiple life events in two measurement categories - positive and negative life events - (Cobb-Clark and Schurer, 2012, 2013) by focusing on one specific, well-defined shock. This is important, as there may be heterogeneous effects for individuals who experience different events over the (working) life course. We pick job loss as a possible event in the life course, as this is the most striking negative event in an individual's work life, affecting a sizable fraction of workers each year. We build on the existing literature that shows that unemployment leads to a long-term decrease in life satisfaction (even after re-employment and more pronounced than other social life events, such as death of the partner) and test whether personality traits are also affected by such a striking event.

Third, we advance findings for Germany (Specht et al. (2011) and Boyce et al. (2015)) by utilizing an identification strategy that allows us to estimate causal effects. The general unemployment status and any other types of job loss may be endogenous, and individuals' personality traits may be affected by previous unemployment history. Therefore, we focus solely on workers who are employed at the time of the initial measurement of personality traits and who have no previous unemployment experience. Furthermore, we restrict job losses to those due to plant closures, which are less likely to be endogenous than other types.

Finally, we provide added value to the literature by using refined econometric methods. We compare individuals who lose their jobs due to plant closure to similar individuals who remain employed by the way of entropy balancing, a novel matching estimator (Hainmueller, 2012) that is more efficient than standard matching techniques. Further, by contrasting individuals' personality traits pre- and post-job loss, our empirical strategy takes into account selection on unobserved factors that are time-invariant. In addition, we further estimate the robustness of our results to omitted variable bias with the method proposed by Oster (2013, 2016). This method assesses the potential bias from unobserved factors. We hereby exploit the assumption that the bias from observed factors provides information about this unobserved bias, as the method assumes some kind of proportionality between both biases.

---

of the personality traits due to aging over even longer periods. However, using econometric fixed effects methods in long-running panels is based on the implicit assumption that personality traits are fixed throughout the entire longitudinal study, which may be far more than eight years.

While we examine job loss as an explanatory factor of changes in personality traits, there is a small body of literature that finds an effect of personality traits on unemployment. Existing research shows that openness is associated with increased unemployment duration, which might partly stem from selection into more insecure jobs or the possibility that open individuals are more likely to accept job offers that deviate significantly from their previous position (Uysal and Pohlmeier, 2011; Viinikainen and Kokko, 2012). Studies in this stream of literature focus on unemployment experience, on the unemployment level in general, and on the duration of unemployment, which all might indicate potential channels of the effect of job loss on personality traits. However, firms and employers might not always induce unemployment experience. Plant closure as a way to end a job is unlikely to be driven by workers' openness or emotional stability.

It is *ex ante* unclear if and how involuntary job loss affects an individual's personality traits. First, it is not obvious if changes in personality traits can always be labeled as "positive" or "negative." On one hand, it depends on an individual's initial level of a personality trait whether a further increase or decrease is advantageous. For example, even for a personality trait with a positive connotation, such as conscientiousness, a positive change could be undesirable if the individual is already at the extreme. On the other hand, whether a change in personality is "good" or "bad" may well depend on individual circumstances. For example, a personality set that puts high weight on being agreeable may not be advantageous for specific situations or roles in an individual's life. Even in the case of worker displacement, there may be both negative and positive effects, depending on the circumstances surrounding the job loss. While we tend to associate job loss with mostly adverse effects, due to related economic uncertainties, losing a job may also "improve" personality traits. For instance, losing an unfavorable job may possibly increase a worker's emotional stability by reducing stress or pain. Likewise, displacement may force individuals to be more flexible and open-minded in order to find a new job, which may lead to higher openness and could benefit the individual in the future.

Our findings show that the Big Five measures of personality traits are relatively stable for the overall population of workers, even over a time span of eight years. The largest change occurs for emotional stability, for which we measure a mean-level increase of less than ten percent of a standard deviation over the four-year period and only a slightly higher increase over the eight-year period. In contrast to the stability of personality traits for the average worker, we find that personality traits change in case of job loss. Our results suggest that involuntary job loss following a plant closure leads to an increase in openness for the average displaced worker and, to some extent, to a change

in emotional stability, whereas the other dimensions of the Big Five personality inventory remain unchanged. The increase in openness is sizable (about 20 percent of a standard deviation) and statistically significant, whereas the effect on emotional stability is smaller and only marginally significant in models that do not control for individuals' initial levels of personality traits. Moreover, our findings point to strong heterogeneous effects. The increase in openness following a job loss is entirely driven by displaced workers who have a high level of education and by those who immediately find another job and thus have a "smooth" job-to-job transition. Controlling for an individual's initial level of the Big Five personality traits delivers similar results. The findings also hold for a number of further robustness checks and are supported by the results of a falsification test using a placebo treatment.

We conclude that studies analyzing the impact of personality traits on educational or labor market outcomes should utilize personality traits measured prior to the desired outcome to avoid reverse causality or simultaneity bias. This paper demonstrates that the stability of personality traits cannot be assumed for the entire working-age population.

The remainder of the paper is structured as follows: Section 2 discusses the related literature on job loss and personality traits. Section 3 presents the data, defines the sample, and summarizes the descriptive findings on the stability of personality traits. It also explains the construction of the treatment and control group for the empirical analysis. Section 4 describes the empirical strategy. Section 5 discusses the estimation results, and Section 6 shows findings of robustness tests before Section 7 concludes.

2. Previous Research

Many of the economic studies on the returns to non-cognitive skills specifically look at the effects of personality traits on outcomes such as educational attainment, health, and labor market success. In order to identify causal effects, most authors assume that personality traits are stable in adulthood. If personality traits were not stable, reverse causality would threaten the validity of their identification strategies. Although a few studies acknowledge that personality traits might exhibit small changes in some traits over the life cycle (see for example Wichert and Pohlmeier, 2010), they still assume stability of personality traits in their analyses.

Economists base their assumption of stable personality traits on the *biological* view in the psychological literature, according to which personality traits are stable during adult life, as they arise mainly from genes and are influenced only by the environment during childhood and youth ("*plaster hypothesis*"). The biological interpretation of traits

emphasizes that personality measures are less likely (if at all) to change due to events experienced over the life cycle. For instance, looking at mean-level changes of the Big Five personality traits suggests that they are fairly stable across adulthood (e.g. McCrae and Costa, 1994). However, there are also contradicting views in the psychological literature that assume that personality traits are more malleable. According to the *contextual view*, individuals change their traits, preferences, expectations, and behavior depending on their life experiences (Srivastava et al., 2003). These contradicting views have existed for decades in the psychological literature but have never been exhaustively empirically tested due to a lack of appropriate representative data.

However, some studies show that an individual's personality traits may be affected and subsequently changed by life events in early and middle adulthood (Borghans et al., 2008; Heckman, 2011; Srivastava et al., 2003). Srivastava et al. (2003), for example, use large-scale data from an online personality test in the United States and Canada and compare mean-level changes in a cross-section, differentiating between the age group from 21 to 30 versus the age group from 31 to 60. They find mean-level changes and conclude that the course of development in adulthood is different for different traits, with some variations by gender.

The psychological literature on the stability of personality traits has been recently complemented with analyses based on large and nationwide representative panel datasets, which have incorporated repeated measurements of personality traits since the early 2000s. One of these few studies that specifically investigate the stability of personality traits with longitudinal data is Cobb-Clark and Schurer (2012). They analyze the stability of the Big Five personality traits using nationally representative data from the Household, Income and Labour Dynamics survey (HILDA) in Australia. They compare mean-level changes in personality traits over time and analyze whether or not personality traits become more pronounced in a particular group of the population (individuals aged 25 to 64). In addition, they also compare individual personality traits between two points in time by examining their relationship with life events, such as divorce, changes in employment, or changes in income, and a person's personality traits before and after the event. Cobb-Clark and Schurer (2012) show that, for some events, such as experiencing up to five negative employment shocks, individuals become more open to new experiences. Although personality traits are not fixed, their findings point to the stability of the Big Five personality traits among working-age adults, as mean-level changes are rather small and individual changes are not economically meaningful. In addition, Cobb-Clark and Schurer (2013) report similar findings with respect to another personality trait, individuals' locus

of control. This trait changed only slightly over time (with changes being concentrated among young and old individuals) and seemed to be unaffected by positive or negative life events.

Using representative data from the German Socio-Economic Panel Study (SOEP), Specht et al. (2011) analyze mean-level changes and the rank-order stability of the Big Five personality traits in a heterogeneous sample of adults. They show that personality traits change throughout the lifespan, with larger changes found for those of a young age or older age than for middle-aged individuals. Furthermore, they find that larger changes are correlated with major life events, such as changes in relationships, changes in household size, and job-related changes.

While Specht et al. (2011) and Cobb-Clark and Schurer (2012, 2013) look at different life events, including one's first job, marriage, childbirth, and unemployment, Boyce et al. (2015) examine solely the influence of unemployment on changes in personality traits using SOEP data. They look at mean-level changes and take into account both the incidence and duration of unemployment. Their results indicate not only reductions in agreeableness and openness but also reductions in conscientiousness for women following unemployment. They also show that changes in personality traits differ if an individual remained unemployed or had re-entered employment after job loss. However, the study by Boyce et al. (2015) cannot rule out reverse causality because prior unemployment experiences that may affect personality traits are not controlled for and because unemployment may be induced by a worker's (change in) personality traits.

Importantly, analyses of unemployment's effects on the stability of personality traits need to consider existing studies that find an effect of personality traits on unemployment. Viinikainen and Kokko (2012) show that higher openness is associated with an increased cumulative duration of unemployment over the life course. They find that individuals with higher scores on openness are more likely to experience more frequent unemployment spells. This might stem partly from selection into jobs with a higher probability of job loss or the possibility that open individuals are more likely to accept job offers that deviate from their previous positions and skill levels (Uysal and Pohlmeier, 2011). This suggests that unemployment or job loss might be caused by personality traits. Looking at different life events affecting the stability of personality traits without accounting for the potential selection of individuals in certain events might render spurious results.

Thus, this paper aims for a more refined approach to obtain causal effects. The analysis draws on job loss by plant closure with a clear restriction of the sample to those individuals who have not had any unemployment spells prior to their "initial" measurement of the Big

Five personality trait level in our dataset. This allows us to assume that individuals follow similar trends prior the measurement of personality traits and job loss. We combine this with an advanced matching method and additional measurements of personality traits compared to the previous literature. *Ex ante*, it is not obvious how job loss due to plant closure affects personality traits. Plant closure might lead to changes in personality traits because individuals react either to anticipated labor market problems or to stress caused by the experience of loss itself. Since we examine effects using only plant closure as the cause of job termination, we are confident that reverse causality does not threaten our identification strategy. In addition, the present study looks at the differential effects of job loss on changes in personality traits by individuals' unemployment experience after plant closure to address potential endogeneity with regard to personality traits.

In summary, we complement existing studies by testing the contextual view that personality traits are also influenced by an individual's social environment and experiences throughout the life course, using a large longitudinal representative dataset and focusing on one specific event. Previous studies identified rather small or no changes in individuals' personality traits, while looking at the average stability of personality traits (Boyce et al., 2015; Cobb-Clark and Schurer, 2012; Specht et al., 2011). Average changes in the population analyzed in previous studies may have absorbed strong effects that are valid only for a fraction of the working-age population. This paper goes beyond these analyses by examining a specific subgroup of individuals, i.e., employed workers without previous unemployment experience, and by isolating one single striking event in an individual's work life, i.e., involuntary job loss.

3. Data

Our analyses are based on the nationally representative German Socio-Economic Panel Study (SOEP), the largest and longest-running household panel survey in Germany (Wagner et al., 2007), which has been carried out since 1984. The initial sample included over 12,000 respondents in about 6,000 households, with every household member aged 17 or older interviewed. Over the years, various new subsamples have been added to the survey, approximately doubling the initial sample size and limiting potential bias arising from selective attrition. The SOEP includes detailed information on demographics and socio-economic characteristics of the survey respondents, such as education, occupation, and income. Starting in 2000, the SOEP began to systematically include psychological instruments in its questionnaires.

3.1. Personality traits

In the SOEP, personality traits are measured using a modified version of the Five Factor Model by McCrae and Costa (1996, 1999). Items comprising the five basic psychological dimensions (Big Five) *openness to experience, conscientiousness, extroversion, agreeableness,* and *emotional stability* are included in the 2005, 2009, and 2013 SOEP waves. Since fully fledged personality tests cannot be implemented in a large-scale panel survey, each respondent self-rated his or her personality based on a set of 15 questions, with three questions capturing each personality dimension (Dehne and Schupp, 2007). All questions were answered on 7-point Likert type scales (1 – "does not apply to me at all" to 7 – "applies to me perfectly"). Table 1 includes the definition of each dimension of the *Big Five* personality traits mentioned in Almlund et al. (2011). These definitions already suggest how adult personality traits might be impacted by an involuntary job loss due to plant closure. For example, the dimension *openness to experience* summarizes an individual's preference for learning new content, whereas *conscientiousness* points to an individual's ambition to take responsibility. *Extroversion* refers to individuals who enjoy interacting with their surroundings, and *agreeableness* is interpretable as a preference for cooperation. *Emotional stability* is related to the ability to handle stress efficiently.

[Table 1 about here]

We sum the relevant items determining each dimension of the five personality traits. The scores of the personality traits range from 1 to 7, with a higher value representing a higher score on the respective personality trait. Table A.1 shows the summary statistics of personality traits measured at 2005/2009 and 2009/2013. The means range from 4.3 (emotional stability) to 6.0 (conscientiousness), with a standard deviation of approximately one for each personality trait dimension.

Next, we show how stable personality traits are, on average, in our sample of workers over a time span of four and eight years, respectively. First, we compare mean-level changes over the observed four-year period. Panel A of Table 2 shows that, over this particular time span (measured between 2005/2009 and 2009/2013), very small changes in the mean level of all personality traits are observed. This suggests that personality traits of the analyzed population of individuals change slightly over time for the average population of workers. Even over a time span of eight years (Panel B), the Big Five measures of personality traits are relatively stable. The largest change occurs for emotional stability, for which we measure a mean-level increase of 0.08 score points (which corresponds to less than ten percent of a standard deviation) in the four-year period and of 0.14 score

points in the eight-year period.[5] To illustrate the distribution of change in personality traits, we show in the appendix the histogram of the mean-level change in our most stable personality trait, openness, over the four-year period (see Figure A.1). Figure A.1 shows a considerable range of both positive and negative changes in the openness score of working individuals over a four-year period. The wide distribution of values supports the hypothesis that average changes in a population may disguise effects that are valid for only a fraction of the population. Therefore, changes occurring for a specific subgroup of the working-age population might not be detectable if only looking at the overall distribution, i.e., mean-level changes.

[Table 2 about here]

In addition, we address the correlations between the first measurement point and the second measurement point of the Big Five personality traits. These correlations are typically high (~ 0.6) (see Table A.2 in the appendix), but there is a change between the first and second measurements that remains unexplained. Thus, in our analysis of potential stability, we examine if there are other factors that may causally influence the remaining part. The time span that we consider is rather long-term over the life course, as we analyze several years between individuals' responses to the personality traits items. A short-term assessment of stability, on the other hand, looks at differences in measured personality traits after a few days or weeks (Asendorpf, 2007). We investigate a four-year period (pooled) because this allows us to address changes in or the stability of individuals' personality traits, while avoiding the development of personality traits due to aging over even longer periods.

3.2. Construction of the treatment and control group

To assess the stability of personality traits, we compare the Big Five personality traits of individuals who experience an involuntary job loss to those of individuals who remain employed for at least four years. Individuals may become unemployed due to plant closure at any time between the two survey waves in which personality traits are measured. Hence, there are two treatment periods: 2005-2009 and 2009-2013. Individuals who work in 2005/2009 and then experience job loss due to plant closure before the next measurement of personality traits enter the treatment group. Workers who lose their jobs for a reason other than plant closure during the respective time period are

[5]The intra-individual changes of personality traits are addressed in the following analysis of how adverse life events, particularly plant closures, affect the stability of personality traits.

removed from the sample. Thus, individuals in the control group work during the whole four-year period between the two measurements. Individuals in the treatment group lose their jobs but could start working again afterwards. Therefore, individuals in the treatment group could experience multiple job losses.[6] In our sample, 4 percent of working individuals lose their job involuntarily in the observation periods, with an average duration of unemployment after plant closure equaling 3.7 months. Since the second measurement of personality traits for the treatment group occurs after plant closure, the treatment effects we will estimate later on can be interpreted as an average over the job loss incidence, unemployment experience, and unemployment duration. As we pool the two time periods, an individual can be included in the sample once or twice. If a person is included in the control group in the first period, she can be part of either the control group or the treatment group in the second period. However, if the person is included in the treatment group in the first period, she can be in the sample for the second period only if she experienced no unemployment spell after her job loss.[7]

[Figure 1 about here]

Figure 1 provides an overview of our sample construction and depicts at what points in time we measure plant closure and personality traits. We argue that plant closure is less likely to be endogenous in the context of personality traits even if some individuals with favorable personality traits may change jobs before the plant closure takes place. We use plant closure as an event to assess the stability of personality traits for two reasons. First, the treatment group comprises all individuals who report a job loss due to plant closure within a survey year, which includes early leavers or job changers, as well as those with longer unemployment duration. This is in line with Schwerdt (2011), who points out that, for administrative data, early job leavers of plant closures should be included in the treatment group. Given the results of Schwerdt (2011), we further distinguish our results of job loss on personality traits by using the experience of unemployment in the heterogeneity analysis. This allows us to identify a potential cost of job loss with regard

[6] On average, individuals in the treatment group experience 1.25 job losses over the 2005 to 2009 period, so multiple job loss is relatively rare.

[7] Since our sample is restricted to individuals who participate in at least two surveys in which personality traits are measured, our estimates may be biased due to selectivity into the sample. However, Richter et al. (2014) show that personality has minor effects on panel attrition. They find only very small negative effects of openness on panel dropout. Furthermore, their correlations refer to levels of personality measures, and not to changes, which we are interested in. However, we keep in mind the possibility that unfavorable personality changes may lead to higher attrition, which would imply that we may underestimate the effects of job loss on personality traits.

to changes in personality traits. Second, we see no differences in the personality trait dimensions measured prior to job loss by treatment status (see Table 3).

Table 3 shows a first descriptive comparison of personality traits between the control group and the treatment group after job loss. The personality trait openness differs by the experience of plant closure, as individuals experiencing a job loss have a higher level of openness than individuals who remain employed. The raw comparisons of means suggest that individuals who experience an involuntary job loss are 0.19 score points (approximately 17 percent of a standard deviation) more open to a new experience after job displacement.

[Table 3 about here]

3.3. Sample selection

As mentioned above, both treatment and control groups only include workers in regular employment at the time of the first personality trait measurement. This leads to a starting sample of 8,816 observations. Furthermore, we include only individuals without previous (i.e., prior to the first personality trait measurement in 2005/2009) unemployment experience. This ensures that there are no differences in personality traits by plant closure in individuals' starting level of the Big Five. This restriction further reduces the sample size. In a next step, we restrict the sample to individuals aged between 18 and 60 years, as personality traits are likely to be more malleable for very young and old age groups. In addition, individuals outside this age group are very unlikely to work or experience plant closure in Germany. Similarly, civil servants and self-employed persons are excluded from the sample. For civil servants, plant closure as a reason for job loss is implausible, whereas it is highly likely to be endogenous for the self-employed. Thus, these observations are dropped from the sample. Lastly, a number of observations are dropped due to item-nonresponse in the conditioning variables.[8] This restriction to non-missing information on all outcome measures and the relevant conditioning variables leads to a final sample size of 3,904 observations.[9]

3.4. Conditioning variables

The set of variables used to match persons without job loss to those with job loss is crucial for the identification strategy. We choose our conditioning variables based on

[8]Only 658 individuals were dropped due to item-nonresponse.

[9]In the fixed effects models, this becomes more strict as the conditioning variables have to be available both pre- and post-treatment, reducing the sample size to 3,450 observations.

other empirical studies investigating the effect of job loss (among others, for example, Marcus, 2013, 2014; Oreopoulos et al., 2008; Peter, 2016; Rege et al., 2011, 2009). All variables used are taken from the pretreatment interview in 2004 or 2008, respectively, and depict individual, household, and regional characteristics prior to involuntary job loss. These variables describe individuals' labor market history, their education, and their demographic characteristics. In addition, we match on indicators for each survey period and the different SOEP subsamples. Table A.3 in the appendix contains the full list of conditioning variables. In all regression-adjusted matching models, we include all control variables that are likely to affect both personality traits and plant closure. Due to the panel structure of our data, we account for the starting level of personality traits, i.e., traits prior to job loss, measured in either 2005 or 2009. Hence, we can compare individuals with similar personality traits. Moreover, in some waves, the SOEP includes information on often-unobserved variables, meaning that we can, for example, match on subjective well-being measures, including satisfaction with ones' health, as well as on perceived job security, industry sectors, and county-level unemployment rates prior to job loss.

Table 4 shows the means of selected conditioning variables prior to personality measurement for both treatment and control groups. Column 1 depicts the means of the unmatched control group and compares those to the means of the treatment group shown in column 2. The similarity between treatment and control groups is assessed by testing the mean differences (column 3). Table 4 presents all relevant variables except for survey and subsample indicators. Table A.3 in the appendix provides information for all conditioning variables and further compares the means of the unmatched control group with the means of the control group reweighted by entropy balancing,; i.e., with the matched control group. The similarity between treatment and control groups is shown by the standardized bias. The standardized bias (SB) depicts the percentage difference of the sample means in the treatment and the control groups before and after matching and is a percentage of the square root of the average of the sample variances in both groups ($SB_s = 100 \cdot \frac{\overline{s_1}-\overline{s_0}}{\sqrt{\frac{1}{2}(\sigma^2_{s1}+\sigma^2_{s0})}}$), where $\overline{s_1}$ and $\overline{s_0}$ are the means of treatment and control groups, respectively, and σ^2_{s1} and σ^2_{s0} the corresponding variances.[10] Moreover, Table 4 illustrates that the work experience of individuals who lose their jobs due to plant closure differs in several aspects. For instance, treated individuals have less full-time work

[10]Table A.3 shows that, after matching, the control group has the same mean as the treatment group for all variables and the standardized bias equals zero for all relevant characteristics.

experience on average, work less often in large firms, and work less often in the service sector. Furthermore, they more often have a migration background, on average have fewer years of schooling, and are more likely to worry about their job security. All in all, this shows that individuals experiencing plant closure live in more insecure circumstances. However, we can take into account all the above-mentioned characteristics in our models. If, in addition to the conditioning variables, other unobserved factors influence personality traits and the probability to experience job loss due to plant closure, we are able to assess their necessary impact by the method proposed by Oster (2013), as described in section 6.

[Table 4 about here]

4. Empirical strategy

We aim to identify the stability of personality traits in light of an adverse economic shock. We investigate the effect of involuntary job loss by plant closure on personality traits. Our identification strategy combines matching with individual's "initial level" of personality traits prior to job loss. Equation 1 illustrates the relationship of involuntary job loss on personality traits by controlling for individuals' "initial level" of personality traits:

$$Y_{1,i} = \beta_0 + \beta_1 T_i + \beta_2 Y_{0,i} + X_i' \beta_3 + \varepsilon_i \tag{1}$$

where $Y_{1,i}$ denotes the individual's i personality traits measured after the treatment to in 2009/2013, T_i is defined as binary treatment variable that equals 1 if an individual loses her job due to plant closure between 2005 and 2009 or 2009 and 2013, respectively, $Y_{0,i}$ comprises the individual's i personality traits measured prior treatment in 2005/2009, and X_i is the vector of conditioning variables. In most specifications, we control for individuals' starting personality traits ($Y_{0,i}$) in order to assess changes in personality traits.

The most straightforward method to estimate β_1 is ordinary least squares (OLS), if the selection on observables assumption is fulfilled, i.e., all variables related to both plant closure and personality traits have to be included in the analysis. Furthermore, for estimates to be consistent, OLS requires that the relationship between involuntary job loss and personality traits be linear, an assumption that cannot be easily verified. Lastly, OLS requires homogenous treatment effects over the population. The treatment effect identified by OLS is weighted by the variance of the treatment within subgroups,

yielding a weighted average that is not our parameter of interest (see, for example, Cobb-Clark and Crossley, 2003). Similar to OLS, matching is based on the assumption that all relevant variables that influence both personality traits and involuntary job loss are observed. Matching allows us to identify heterogeneous treatment effects, as well as an average treatment effect on the treated (see Equation 2 below).

We apply a rather novel matching estimator: entropy balancing (Hainmueller, 2012). We examine individuals' personality traits before and after plant closure and compare those who lose their jobs (treatment group) to those who remain employed (control group). Entropy balancing enables us to make the control group similar to the treatment group, as it re-weights the control group, i.e., those employees without an involuntary job loss, so that they have the same mean and variance for all included variables as the treatment group.[11] This technique is more efficient than propensity score matching, as it never renders a worse balance between treatment and control groups.[12] Moreover, entropy balancing selects the weighting scheme in which the weights deviate as little as possible from uniform weights. Entropy balancing also spares the iteration process needed by propensity score methods. It is not necessary to estimate the propensity score, check for covariate balance and readjust the propensity score model to achieve a better balance. Finally, compared to other matching applications, entropy balancing balances not only the mean of variables but also their variance or higher moments. Figure A.2 and Table A.3 in the appendix depict the advantage of entropy balancing over other matching methods, as treated and controls have absolutely identical means on all conditioning variables after matching with entropy balancing, as the standardized bias is very close to zero percent (shown in Figure A.2 and column 5 of Table A.3).

However, like propensity score matching, the estimates from entropy balancing also refer to a subpopulation of the sample. This is similar to the common support assumption with propensity score matching, albeit the sample used by entropy balancing is less restrictive. We can interpret estimates from entropy balancing as causal only if the set of conditioning variables includes all covariates that simultaneously affect involuntary job loss due to plant closure and post-job loss personality traits. The utilization of rich and longitudinal data provides us with observations of individuals' personality traits after job loss as well as four years prior. In addition, we specify whether individuals are employed full-time or part-time prior to job loss. This way, we compare individuals with

[11] We use the Stata command *ebalance* provided by Hainmueller and Xu (2013).

[12] It also reduces the covariate imbalance for all variables compared to the raw difference (see Table A.3 in the appendix). In addition, it is fully non-parametric and does not rely on functional form assumptions.

similar employment trajectories before plant closure. We also include information that is often unobserved in other datasets, such as individuals' job security. Family, socio-economic, and demographic characteristics, such as education levels, income, and family composition, are also accounted for through a large set of variables. Finally, we add regional indicators and industry sector information to capture disparities in economic conditions. In short, our matching strategy relies on an extensive set of observables to capture work conditions prior to job loss.

We estimate the effect of job loss due to plant closure on personality traits using weights obtained from entropy balancing and controlling for the set of conditioning variables. This regression-adjusted matching approach increases the precision of the estimation, as conditioning variables help to explain the variance in the outcome. Equation 2 shows the average treatment effect of the treated (ATT):

$$ATT = \sum_{t \in T} W_t \left[(Y_{1t} - x_t \hat{\beta}) - \sum_{c \in C} W_{t,c} (Y_{0c} - x_c \hat{\beta}) \right] \tag{2}$$

where $W_{t,c}$ is the weight placed on individual c of the control group to be comparable to individual t of the treatment group and includes the weight obtained from entropy balancing. W_t equals one in the estimation of the ATT for members of the treatment group.

We balance treatment and control groups with and without $Y_{0,i}$ for each personality trait dimension separately. Thus, the weight $W_{t,c}$ re-weights individuals based on their starting level of personality traits and without this initial level. Furthermore, we control for factors that might increase the probability of job loss; for example, we include previous employment experience, further general characteristics, and regional factors, as well as county-level unemployment rates. Standard errors are clustered at the level of the individual, as they could enter the model twice (see Section 3.2).

Our estimation strategy relies on the assumption that all relevant factors influencing involuntary job loss and personality traits are observed. Thus, omitted variable bias remains a threat to identification. Although we already include levels of personality traits prior to job loss, we further test the robustness of our results by using the method proposed by Oster (2013, 2016). While all relevant conditioning variables originate from the period prior to treatment and the prior measurement of individuals' "initial" level of personality traits, other events might simultaneously occur in the four-year period and might be correlated with both personality trait levels and job loss. Because a subset of such events, e.g., changes in household composition or different health conditions, is likely

to be affected by the treatment and, hence, would not be an optimal control variable, we use the method of Oster (2013, 2016) instead. This method allows us to estimate how much influence unobserved factors might have. In addition, we further address intra-individual changes in personality traits and estimate a panel fixed effects model.

5. Results

After having shown the descriptive findings on the stability of personality traits in Section 3 for the average worker in our sample, we now turn to differences between subgroups of workers who do or do not experience job loss. To begin with, Table 5 shows that individuals who experience an involuntary job loss have significantly higher scores on openness and, to a lesser extent, on emotional stability.

The first column reports the coefficient of involuntary job loss using matching with a full set of controls in addition to time and state fixed effects. The pattern already evident in Table 3 is confirmed: individuals who experience plant closure become more open on average. Furthermore, there is a marginally significant effect on emotional stability. After job loss, persons seem to be more emotionally stable, which Table 3 does not show. On the other hand, Table 3 shows that individuals have slightly lower means in emotional stability prior to job loss, so the effect in Table 5 could also be a mechanical result of matching without taking into account levels before job loss, meaning that the slight pretreatment differences in emotional stability are reversed. Our second specification seeks to rule out such problems by also matching on the pretreatment levels of personality traits. Results are reported in the second column of (Table 5) and still suggest that personality traits are not entirely stable, as involuntary job loss changes an individual's "openness'.[13] The coefficient on emotional stability is no longer significant but has the same magnitude as the pretreatment differences shown in Table 3.

As a last model, we examine an individual-level fixed effects model. The results are displayed in column 3 of Table 5. The influence of job loss on openness is still statistically significant, thus indicating that this personality trait changes, but we lose some efficiency.[14] In this specification, the coefficient for emotional stability is close to zero, indicating that some time-invariant unobserved effects are responsible for the significant positive result obtained in column 1 of Table 5.

[13]For the sake of brevity, we do not show the full tables including all coefficients even if some of the additional regressors have statistically significant effects on the personality trait measures. For example, openness is higher for females and increases with age, firm size, education, and life satisfaction.

[14]This is both due to the diminished sample size and the different choice of model.

[Table 5 about here]

Heterogeneous effects

Different types of workers may show different reactions to a job loss. For example, there may be variation in the response to the treatment according to qualification: low-skilled displaced workers may worry about finding a new job, whereas high-skilled displaced workers may be more resilient or even enjoy a job interruption if they are confident that they will easily regain employment. This means that the personality traits of different types of workers may be affected differently by shocks.[15] It may even be the case that contrary effects for different subgroups may offset each other, hence leading to zero findings for the whole sample, i.e., disguising the causal effects of involuntary job loss on personality.

In a first step, we investigate heterogeneous effects by educational attainment. If highly educated individuals have different strategies for coping with the exogenous shock of job loss (e.g., different search strategies), education level could influence the relationship between involuntary job loss and personality changes. We distinguish individuals by the years of schooling they attained. If they attained 13 or more years, we label them as high-education individuals; if they attained less, we label them as low-education individuals[16]. We perform entropy balancing separately for each subgroup, e.g., the group of high-education individuals with involuntary job loss are compared to nearly similar individuals without job loss based on the set of pre-determined conditioning variables.

Table 6 shows that the effect of increased openness after job loss is only statistically significant for individuals with a comparatively high level of education (columns 1 and 2). Only highly educated individuals become more open after losing their jobs. We interpret this result as evidence for adaption to the new reality of having to find a new job, which seems to be easier for highly educated individuals. A possible explanation would be that their qualifications are more easily applicable to jobs that are outside of their previous field of employment. In addition, education is correlated with the overall probability of quickly finding a new job and, thus, managing a smooth transition, the effect of which is depicted in columns 3 and 4 of Table 6.[17]

[Table 6 about here]

[15] Note that the level of these personality traits might also differ by these characteristics.

[16] In the German context, this leaves a relatively large group of individuals who took up vocational training after 10 years of schooling.

[17] See Table A.4 in the appendix for the correlation between education and no unemployment experience after plant closure.

Next, we differentiate our analysis by workers' unemployment experience after the involuntary job loss (Table 6, columns 3 and 4). We split the sample in two: those workers who find immediate reemployment after the job loss (no unemployment experience) and those who experience unemployment.[18] We find that only individuals who have not experienced any unemployment spell are, on average, more open after losing their previous jobs due to plant closure. However, experiencing unemployment after involuntary job loss may be endogenous, and therefore, we cannot determine whether this interaction effect with experienced unemployment is truly causal. Although it is reasonable that individuals may change their personalities after experiencing a successful "switch" in jobs, another possibility would be that only a positive selection of individuals (who have higher openness scores directly after job displacement) manage a smooth transition to another job. One argument against this second explanation is that the regional unemployment rate for individuals who make the smooth transition is significantly lower than for individuals who do not (again, see Table A.4 in the appendix). In this case, dismissed workers in regions with low unemployment are more likely to manage a smooth transition, regardless of their personality traits directly after job displacement, and they become more open because they were able to find a new job and may have to adapt to the new job environment.[19] In any case, not managing a direct job-to-job transition means that applicants with some unemployment experience have slightly less desirable non-cognitive skills than successful job searchers but no different personality traits than those who remained in their jobs.

To check the robustness of this result, we redefine no unemployment experience in a way that also includes short unemployment spells after a job loss. Some dismissed workers may find a job not directly after but rather shortly after the job loss or may even know at the time of the plant closure that they would be able to start at a new firm after a short employment break. Hence, we additionally define re-employment after one month of unemployment as direct job-to-job transition without unemployment experience. The group of dismissed workers with such a short unemployment spell is very small (less than 5 percent), and our findings are virtually unchanged.

[18] In our sample, 71 percent of high-educated individuals have an immediate job after displacement, whereas this figure is 52 percent for the low-educated.

[19] In general, mobility in Germany is very low; this implies that workers are less likely to move to another labor market with better conditions directly after job loss. Thus, we presume that dismissed individuals become more open after experiencing a successful transition to another job.

Dynamics

An additional question is whether openness changes permanently or if the effect of job loss is transitory. While we cannot provide detailed analyses on this question, we can provide some descriptive evidence. Since personality traits are measured only every four years in our dataset, we cannot show the individual trajectories of personality traits directly before and after job loss. However, as job loss occurs at different points in time, independent of the personality trait measurement, we can show mean-levels of personality traits of the treated population relative to job loss. In other words, we look at the levels of personality traits of all individuals whose personality traits were measured, e.g., three years prior to job loss, then of all individuals whose personality traits were measured two years prior job loss and so forth to those whose personality traits were measured some years after job loss. Since the timing of the personality trait measurement is exogenous to job loss, the data constitutes a repeated cross-section. Figure 2 displays the means of openness relative to job loss. Previous to job loss, means do not change over the years. Thus, there is also no evidence of an anticipation effect. At the measurement directly after job loss (labeled "1 year" in the graph), openness is higher, but over the subsequent years, it tends to decrease again.[20]

[Figure 2 about here]

6. Robustness Checks

First, we address the robustness of our results regarding our choice of specification. Table 7 presents the results of these tests. In column 2 of Table 7, we also report the results of OLS regressions as a benchmark case. In this model specification, we find that job loss leads to a significant increase in individuals' openness, as well as to greater emotional stability. Furthermore, we also address issues related to the specification of the treatment itself. Although we restrict our sample to individuals who have not experienced any job loss or unemployment before the first measurement of the Big Five personality traits, we perform a falsification test. We examine if a job loss that occurs between 2009 and 2013 affects individuals' Big Five personality traits measured in 2005, i.e., one of the starting levels of individuals' personality traits in our sample. In doing so, we restrict the sample to individuals who participated in the survey over the eight-year period, i.e., answered

[20] In line with the results of our analyses, the dynamics for the other four personality traits relative to job loss are nearly flat and show no significant increase or decrease between one year before job loss and one year after.

the Big Five battery in 2005 and provided employment trajectories from 2005 until 2013. The sample size drops from 3,904 to 1,660 observations. However, the main sample requirement is still valid for this sub-sample, as these individuals have not experienced any unemployment spells prior 2005. The placebo regression allows us to provide credibility to the use of matching and its selection on observables assumption, since we cannot directly test if we include all relevant variables that influence changes in personality traits and the probability of job loss. When we estimate this placebo treatment, we find no effect on individuals' personality traits. For all personality trait dimensions, the effect is insignificant and close to zero (see column 3 in Table 7). This supports the descriptive finding that, prior to job loss, personality traits are similar for both treatment and control groups, meaning that they follow a similar trend before treatment.

[Table 7 about here]

Another possibility to test the plausibility of the assumption of no relevant selection on unobserved factors is the method proposed by Oster (2013, 2016). As pointed out in the empirical strategy, other events could occur simultaneously to job loss between the measurements of personality traits. Examples are changes in household composition, changes in relationships, or changes in health conditions. These events could be affected by the treatment and, hence, may not be optimal control variables. Since we cannot be sure that we control for all relevant variables, we assess the size of the potential influence of omitted variables that would explain the obtained effects of job loss on the change of personality traits using the method by Oster (2013, 2016). [21] This method exploits the fact that the bias from observed factors informs to some extent about the bias of unobserved factors by assuming proportionality of the two biases. Estimating movements in coefficients and R-squared, this method allows us to identify how large the explanatory power of unobserved variables would have to be to render the estimated treatment effect insignificant. A desirable result would be that the power of any unobserved factors would have to be very large for this to happen. Oster (2013) advances the method suggested by Altonji et al. (2005) to estimate the bias of unobserved factors. The method in Altonji et al. (2005) examines differences of coefficients between models to identify this bias. However, the method does not take into account movements in the R-squared. Since we realize that unobserved factors may potentially affect both the selection into plant closure

[21] We are nonetheless aware that this task is difficult and the applied method only hints at the potential bias of unobserved factors.

and our outcome variables, we investigate the sensitivity of our results with respect to this dimension.

Table 8 shows that estimating the treatment effect by controlling for only year and state fixed effects (column 1), compared to regression-adjusted matching (column 2), yields similar effect sizes. This is a first indication that our results are unlikely to be driven by omitted variable bias. However, simply comparing coefficients in different specifications is not sufficient to assess the stability of our treatment effects. Oster (2013) points out that comparing differences in coefficients cannot detect the quality of the control variable; hence, it is necessary to consider the corresponding movement in R-squared when adding further control variables to assess their quality.

In order to identify the potential impact of omitted variable bias, we calculate the R-squared from a hypothetical regression of the outcome on the treatment, observed and unobserved variables. In general, this hypothetical R-squared equals one, which suggests that the outcome can be fully explained by the treatment variable and a complete set of controls (consisting of observed and unobserved factors). Besides assuming that this hypothetical R-squared equals one, Oster (2013) proposes a rule of thumb to estimate the equivalent R-squared$_{max}$ of the specific outcome used. Furthermore, we calculate the suggested value of proportionality (δ) for which our treatment effect equals zero (β=0) with an assumed R-squared$_{max}$=2.2*R-squared$_{estimated}$. In her paper, Oster argues that the results are robust to omitted variable bias if δ>1.

For our main specification, we find a δ equal to 5.5 for openness.[22] This indicates that the selection on unobserved variables would have to be nearly six times as important as the included control variables to render the effect of involuntary job loss equal to zero. For the other personality trait dimensions, our estimates of δ are all > 1, except for the dimension emotional stability. This indicates that the estimates of job loss influencing the stability of the "openness" personality trait are robust to omitted variable bias. The same is valid for the other personality traits that remain unchanged after job loss: conscientiousness, extroversion, agreeableness, and emotional stability. Together with the results from the fixed effects model above, we conclude that there is no causal effect of involuntary job loss on emotional stability, but there is one on openness. Importantly, the identified set [$\hat{\beta}$, $\hat{\beta}'$(min2.2*R-squared$_{estimated}$, 1, 1)] for job loss on openness does not include zero. The bias-adjusted coefficient is only slightly smaller in magnitude than the controlled effect. Thus, our findings can be considered robust against omitted variables. In the Appendix,

[22]The estimates of δ and the identified set are calculated using the Stata command *psacalc* provided by Oster (2013).

we also provide estimates of δ and the identified set comparing the basic and main models without controlling for the personality trait levels prior to job loss in both specifications (Table A.5). The results remain similar to those shown in Table 8.

[Table 8 about here]

7. Conclusion

This paper analyzes whether personality traits are stable over a time span of almost a decade for a sample of working individuals. Moreover, we specifically look at changes in personality traits after a major adverse life event: involuntary job loss. To analyze whether a job loss causally impacts an individual's personality traits, we restrict our sample to employed workers who have never been unemployed before and focus on involuntary job loss due to plant closure. Using data from the German Socio-Economic Panel Study (SOEP), which provides three measures of personality traits over a time span of eight years, we apply entropy balancing matching and panel fixed effects.

Our findings show that the Big Five measures of personality traits are relatively stable for the average population of workers, even over a time span of eight years. The largest change occurs for emotional stability, for which we measure a mean-level increase of nearly ten percent of a standard deviation over the four-year period and a slightly higher increase over the eight-year period. Using regressions with and without pre-treatment personality traits and regression-adjusted matching, we find that job loss due to plant closure leads to higher scores on the personality trait dimension of openness. This finding is entirely driven by workers with higher levels of educational attainment, i.e., those who have a college degree, and those who are immediately employed after the job loss, i.e., those who do not experience unemployment following the job loss (job-to-job transition).

Given the richness of the data, a large set of confounding variables can be used to find nearly identical pairs. However, it is still possible that some individual characteristics that are difficult to measure may lead to job loss. Thus, we estimate a fixed effects model to control for unobserved heterogeneity, and we assess the robustness of our results to omitted variable bias by applying a novel method proposed by Oster (2013). According to these analyses, our findings on the effect of involuntary job loss on personality traits are robust to omitted variable bias. Moreover, when examining a placebo treatment as a falsification test, we find no effect on individuals' personality traits.

The finding that job loss significantly increases an individual's openness score contrasts previous findings that identify no change in personality traits after life events such as

unemployment, divorce, and marriage (Boyce et al., 2015; Cobb-Clark and Schurer, 2012, 2013; Specht et al., 2011). However, unlike previous studies, we restrict our sample to working individuals without any unemployment experience and focus on an exogenous life event, and therefore, we are able to identify causal effects. Furthermore, this paper looks at moderating factors, namely, education and reemployment, and in addition to OLS controlling for pretreatment personality trait levels, we use entropy balancing and a method to address omitted variable bias, which allows us to account for selection both on observables and on unobservables.

While the finding that involuntary job loss is associated with a positive change in openness may seem counterintuitive, we explain in more detailed analyses how a negative shock such as job loss can have a seemingly positive outcome: The effect is driven by individuals who experienced job loss due to plant closure but who had no subsequent unemployment spell. In other words, the effect results from a forced job change due to plant closure, after which reemployed individuals had to adapt to new job environments. Furthermore, we find this effect only for individuals with above-average educational attainment, which is again related to positive employment prospects after job loss. Apart from the positive effect on openness, the other personality traits remain nearly unchanged after involuntary job loss.

By analyzing the stability of personality traits in-depth, our paper adds to three strands of the literature. First, we contribute to studies on the stability of personality traits based on longitudinal data (Cobb-Clark and Schurer, 2012; Specht et al., 2011) by showing that the findings of stability over the whole population may disguise differential effects for individuals with different experiences in working life. Hence, we point to the importance of looking at heterogeneous changes in different subsamples. Second, we add to the economics literature on wage determination, which traditionally treats non-cognitive skills and other unobserved factors as time-invariant. Our contribution to this literature is that we show that personality traits can, in fact, be malleable, which means the assumption of time-invariant unobserved skills in wage estimations must be treated with caution. While this assumption seems reasonable for the average worker, our findings point to time-variant personality traits of some groups of displaced workers. Third, our findings contribute to the strand of literature on state dependence in unemployment, even if we are not able to offer an explanation for state dependence. Displaced workers who do not immediately regain employment do not seem to change their personality traits in a negative way.

We conclude that researchers in economics and related disciplines should consider that personality traits are not completely stable for all individuals. Studies analyzing the impact of personality traits on educational and labor market outcomes should utilize personality traits measured prior to the desired outcome to avoid reverse causality or simultaneity bias; in addition, they should ensure that the initial levels of personality traits are unaffected by factors related to the desired outcome. This paper demonstrates that the stability of personality traits cannot be assumed for the entire working-age population.

References

Abraham, K. G., Haltiwanger, J. C., Sandusky, L. K., Spletzer, J. R., 2016. The consequences of long term unemployment: Evidence from matched employer-employee data. IZA Discussion Paper No. 10223, IZA, Bonn.

Almlund, M., Duckworth, A. L., Heckman, J., Kautz, T., 2011. Personality Psychology and Economics. In: Hanushek, E. A., Machin, S., Wössmann, L. (Eds.), Handbook of the Economics of Education. No. 4. North Holland, Amsterdam, pp. 1–181.

Altonji, J. G., Elder, T. E., Taber, C. R., 2005. Selection on observed and unobserved variables: Assessing the effectiveness of catholic schools. Journal of Political Economy 113, 151–184.

Asendorpf, J. A., 2007. Psychologie der Persönlichkeit. Heidelberg: Springer.

Borghans, L., Duckworth, A. L., Heckman, J., ter Weel, B., 2008. The economics and psychology of personaltiy traits. Journal of Human Resources 43, 972–1059.

Boyce, C. J., Wood, A. M., Daly, M., Sedikides, C., 2015. Personality change following unemployment. Journal of Applied Psychology 100 (4), 991–1011.

Charles, K. K., Stephens, Jr, M., 2004. Job displacement, disability, and divorce. Journal of Labor Economics 22 (2), 489–522.

Clark, A., Diener, E., Georgellis, Y., Lucas, R. E., 2008. Lags and leads in life satisfaction: a test of the baseline hypothesis. Economic Journal 118 (529), F222–F243.

Cobb-Clark, D., Crossley, T., 2003. Econometrics for evaluation: An introduction to recent developements. The Economic Record 79 (247), 491–511.

Cobb-Clark, D., Schurer, S., 2012. The stability of big five personality traits. Economics Letters 115 (1), 11–15.

Cobb-Clark, D., Schurer, S., 2013. Two economists' musings on the stability of locus of control. Economic Journal 123, 358–400.

Dehne, M., Schupp, J., 2007. Persönlichkeitseigenschaftennlichkeitsmerkmale im Sozio-oekonomischen Panel (SOEP): Konzept, Umsetzung und empirische Eigenschaften. Research Notes No. 26, DIW Berlin, Berlin.

Hainmueller, J., 2012. Entropy balancing: A multivariate reweighting method to produce balanced samples in observational studies. Political Analysis 20 (1), 25–46.

Hainmueller, J., Xu, Y., 2013. Ebalance: A stata package for entropy balancing. Journal of Statistical Software 54 (7), 1–18.

Heckman, J., Pinto, R., Savelyev, P., 2013. Understanding the mechanisms through which an influential early childhood program boosted adult outcomes. American Economic Review 103 (6), 2052–2086.

Heckman, J. J., 2011. The american family in black & white: A post-racial strategy for improving skills to promote equality. Daedalus 140 (2), 70–89.

Heineck, G., Anger, S., 2010. The returns to cognitive abilities and personality traits in Germany. Labour Economics 17 (3), 535–546.

Huff-Stevens, A., Schaller, J., 2011. Short-run effects of parental job loss on children's academic achievement. Economics of Education Review 30 (2), 289–299.

Lindo, J. M., 2011. Parental job loss and infant health. Journal of Health Economics 30 (5), 869–879.

Marcus, J., 2013. The effect of unemployment on the mental health of spouses: Evidence from plant closures in germany. Journal of Health Economics 32 (3), 546–558.

Marcus, J., 2014. Does job loss make you smoke and gain weight? Economica 81 (324), 626–648.

McCrae, R., Costa, P. J., 1996. Toward a new generation of personality theories: Theoretical contexts for the five-factor model. In: Wiggins, J. (Ed.), The Five Factor Model of Personality: Theoretical Perspectives. Guilford, New York, pp. 51–87.

McCrae, R., Costa, P. J., 1999. A five-factor theory of personality. In: Pervin, L. A., John, O. (Eds.), Handbook of Personality: Theory and Research. Guilford, New York, pp. 139–153.

McCrae, R. R., Costa, P. T., 1994. The stability of personality: Observation and evaluations. Current Directions in Psychological Science 3, 173–175.

Mueller, G., Plug, E., 2006. Estimating the effect of personality on male-female earnings. Industrial and Labor Relations Review 60 (3), 3–22.

Oreopoulos, P., Page, M., Huff Stevens, A., 2008. The intergenerational effect of worker displacement. Journal of Labor Economics 26 (3), 455–483.

Oster, E., 2013. Unobservable selection and coefficient stability: Theory and validation. NBER Working Paper No. 19054, NBER, Cambridge Massachusetts.

Oster, E., 2016. Unobservable selection and coefficient stability: Theory and validation. Journal of Business Economics and Statistics *forthcoming*.

Peter, F., 2016. The effect of involuntary maternal job loss on children's behaviour and non-cognitive skills. Labour Economics 42, 43–63.

Rege, M., Telle, K., Votruba, M., 2011. Parental job loss and children's school performance. The Review of Economic Studies 78 (3), 1–28.

Rege, M., Votruba, M., Kjetill, T., 2009. The effect of plant downsizing on disability pension utilization. Journal of the European Economic Association 7 (4), 754–785.

Richter, D., Koertner, J., Sassenroth, D., 2014. Personality has minor effects on panel attrition. Journal of Research in Personality 53, 31–35.

Roberts, B. W., Walton, K. E., Viechtbauer, W., 2006. Patterns of mean-level changes in personality traits across the life course: A meta-analysis of longitiudinal studies. Psychological Bulletin 132 (1), 1–25.

Schaller, J., Zerpa, M., 2015. Short-run effects of parental job loss on child health. NBER Working Paper No. 21745, NBER.

Schwerdt, G., 2011. Labor turnover before plant closure: "Leaving the sinking ship" vs. "captain throwing ballast overboard". Labour Economics 18, 93–101.

Specht, J., Egloff, B., Schmukle, S. C., 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, 862–882.

Srivastava, S., John, O., Gosling, S., J., P., 2003. Development of personality in early and middle adulthood: Set like plaster or persistent change? Journal of Personality and Social Psychology 84 (5), 1041–1053.

Uysal, S. D., Pohlmeier, W., 2011. Unemployment duration and personality. Journal of Economic Psychology 32 (6), 980–992.

Viinikainen, J., Kokko, K., 2012. Personality traits and unemployment: Evidence from longitudinal data. Journal of Economic Psychology 33, 1204–1222.

Wagner, G. G., Frick, J. R., Schupp, J., 2007. The german socio-economic panel study (soep) - scope, evolution, and enhancements. Schmollers Jahrbuch 127 (1), 139–169.

Wichert, L., Pohlmeier, W., 2010. Female labor force participation and the big five. ZEW Discussion Paper 10-003, ZEW, Mannheim.

Tables and figures

Figure 1: Overview of the sample construction

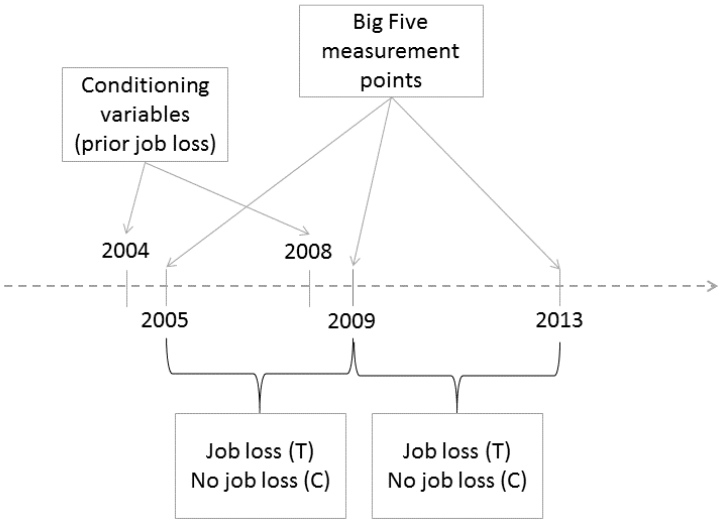
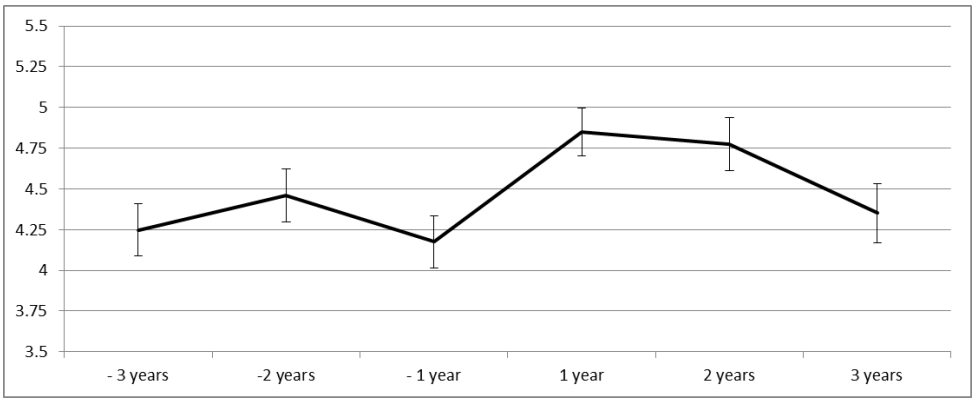


Figure 2: Mean levels of openness in relative time



Note: Relative time is measured in terms of time distance to job loss. The point "−3 years" shows the mean openness of all individuals who lost their jobs three years before the interview, including the personality traits question. For each relative time point, there is a different sample, as personality traits are measured only every four years and individuals experience job loss at different points in time. The scores of openness range from 1 to 7, with a higher value representing higher openness. The vertical lines indicate the 95% confidence intervals for the means at each relative time point. Source: SOEPv30 (2004-2014), own calculations.

Table 1: Definition of personality traits

Personality Trait	Definition
Openness (to Experience)	Tendency to be open to new cultural or intellectual experiences
Conscientiousness	Tendency to be organized, responsible, and hardworking
Extroversion	Refers to sociableness, activeness, assertiveness, tendency to orientate one's energies to the outer world of people
Agreeableness	Tendency to act in cooperation, an unselfish manner, and flexibility
Emotional stability (Neuroticism)	Different facets of anxiety, insecurity, impulsiveness, and vulnerability

Source: Information taken from Almlund et al. (2011).

Table 2: Mean-level changes for the population of workers

	Mean	Std. deviation	Percentile of the distribution				
			5th	25th	50th	75th	95th
Panel A: Mean-level changes over a four-year period:							
Openness	−0.02	1.01	−1.67	−0.65	0.00	0.67	1.67
Conscientiousness	−0.06	0.81	−1.33	−0.33	0.00	0.33	1.33
Extroversion	−0.05	0.92	−1.67	−0.65	0.00	0.65	1.33
Agreeableness	−0.08	0.92	−1.67	−0.65	0.00	0.33	1.33
Emotional stability	0.08	1.06	−1.67	−0.65	0.00	0.67	1.67
Panel B: Mean-level changes over eight-year period:							
Openness	−0.04	1.09	−1.83	−0.67	0.00	0.67	1.67
Conscientiousness	−0.10	0.85	−1.67	−0.67	0.00	0.33	1.33
Extroversion	−0.08	0.96	−1.67	−0.67	0.00	0.67	1.33
Agreeableness	−0.10	0.97	−1.67	−0.67	0.00	0.33	1.33
Emotional stability	0.14	1.12	−1.67	−0.67	0.00	0.67	2.00

Note: This table describes the mean-level changes of the Big Five personality traits of the population of workers who had no unemployment experience prior the first measurement of the Big Five over two time spans: 1. four-year period (Panel A) and 2. eight-year period (Panel B). Panel A depicts the mean-level change of personality traits of individuals measured either between 2005 and 2009 or between 2009 and 2013. Panel B compares the Big Five personality traits over an eight-year period comparing a sub-population of workers who provided information on the levels of their personality traits in 2005 and 2013. For the four-year period, the sample size is equal to N=3,904, and for the eight-year period, it is equal to N=1,754. The levels of the personality trait measures range from 1 to 7, with a higher value representing a higher score on the respective personality trait. Source: SOEPv30 (2004-2014), own calculations.

Table 3: Overview of personality traits and selected conditioning variables by involuntary job loss

	Mean		
	No plant closure	Plant closure	Mean differences
Personality traits prior to job loss:			
Openness	4.40	4.45	0.05
Conscientiousness	6.00	6.02	0.02
Extroversion	4.79	4.80	0.01
Agreeableness	5.33	5.36	0.03
Emotional stability	4.28	4.20	−0.08
Personality traits post-job loss:			
Openness	4.38	4.57	0.19**
Conscientiousness	5.94	5.98	0.04
Extroversion	4.74	4.80	0.07
Agreeableness	5.25	5.33	0.07
Emotional stability	4.36	4.34	−0.02
N	3736	168	3904

Note: This table describes the outcome variables of the treatment and control groups measured at two points in time, either 2005/2009 (before job loss) and 2009/2013 (after job loss). The first column presents the means for the control group and the second those of the treatment group. Column three shows the mean differences. The scores of the personality traits range from 1 to 7, with a higher value representing a higher score on the respective personality trait. Source: SOEPv30 (2004-2014), own calculations. Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 4: Overview of selected conditioning variables by involuntary job loss

	Mean		
	No plant closure	Plant closure	Mean differences
Individual characteristics prior to job loss:			
Age	43.07	43.14	0.07
Female	0.44	0.50	0.06
Migration background	0.14	0.20	0.06**
Married	0.69	0.73	0.04
Number of children	0.94	0.89	−0.05
Single	0.09	0.08	−0.01
Household income (in 1000)	3.30	3.02	−0.28*
Urban	0.48	0.46	−0.01
Region (East=1)	0.24	0.24	−0.01
Regional unemployment rate	9.51	9.70	0.19
Years of schooling	12.71	12.46	−0.25
Vocational degree	0.77	0.70	−0.07**
College degree	0.25	0.20	−0.05
Life satisfaction	7.19	7.16	−0.03
Health satisfaction	2.36	2.49	0.14**
Work experience			
Year full time	18.00	16.59	−1.41*
Tenure (in years)	14.17	13.52	−0.65
Firm size			
Firm size (<5)	0.05	0.15	0.10***
Firm size (5-20)	0.13	0.17	0.04
Firm size (20-200)	0.28	0.30	0.02
Firm size (>200)	0.54	0.38	−0.16***
Worries about job security			
Low worries about job security	0.41	0.30	−0.10***
Medium worries about job security	0.45	0.45	−0.00
High worries about job security	0.14	0.25	0.11***
Industry sector			
Production and industry	0.37	0.43	0.06
Services w/o public sector	0.37	0.45	0.08**
Services w/ public sector	0.26	0.12	−0.14***
N	3736	168	3904

Note: This table describes a subset of all conditioning variables for the treatment and control groups. The first column presents the means for the control group and the second those of the treatment group. Column three shows the mean differences. Source: SOEPv30 (2004-2014), own calculations, significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 5: The effect of involuntary job loss on personality traits

	Involuntary job loss		
	Regression-adjusted matching		Panel Fixed Effects
	(1)	(2)	(3)
Personality traits			
Openness	0.224**	0.164**	0.201*
	(0.093)	(0.078)	(0.116)
R^2	0.12	0.41	0.02
Conscientiousness	0.029	0.016	-0.006
	(0.059)	(0.056)	(0.095)
R^2	0.14	0.30	0.01
Extroversion	0.064	0.063	-0.029
	(0.076)	(0.060)	(0.092)
R^2	0.10	0.44	0.01
Agreeableness	0.040	0.047	-0.063
	(0.071)	(0.063)	(0.111)
R^2	0.12	0.32	0.01
Emotional stability	0.122*	0.091	0.012
	(0.073)	(0.065)	(0.113)
R^2	0.21	0.39	0.01
Personality traits *prior* job loss	No	Yes	Yes
N	3906	3904	3450

Note: Each cell depicts the effect of involuntary job loss on post-job loss personality traits. The scores of the personality trait range from 1 to 7, with a higher value representing a higher score on the respective personality trait. All regressions include time and state fixed effects. Models (1) and (2) include all conditioning variables as controls. They are labeled regression-adjusted matching models, as they depict weighted regressions utilizing the weights obtained from entropy balancing and comprise all conditioning variables as covariates. In this table, models (2) and (3) account for individuals' pre-job loss levels of personality traits. Source: SOEP v30 (2004-2014), own calculations. Robust standard errors in parentheses, significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 6: Heterogeneous effects of involuntary job loss on personality traits

	Regression adjusted matching			
	Low education	High education	Job change w/o unempl. exp.	Job change w/ unempl. exp.
	(1)	(2)	(3)	(4)
Personality traits				
Openness	0.069	0.347***	0.213***	0.111
	(0.093)	(0.106)	(0.076)	(0.104)
Conscientiousness	-0.031	0.064	0.036	0.003
	(0.067)	(0.088)	(0.063)	(0.079)
Extroversion	0.071	0.098	0.039	0.065
	(0.074)	(0.095)	(0.068)	(0.089)
Agreeableness	0.022	0.079	0.032	0.068
	(0.077)	(0.093)	(0.072)	(0.091)
Emotional stability	0.017	0.170**	0.132*	0.064
	(0.080)	(0.080)	(0.070)	(0.093)
Personality traits *prior* job loss	Yes	Yes	Yes	Yes
N	2500	1404	3833	3807

Note: Each cell depicts the effect of involuntary job loss on post-job loss personality traits. The scores of the personality trait range from 1 to 7, with a higher value representing a higher score on the respective personality trait. All regressions include time and state fixed effects. All models include all conditioning variables as controls, as they depict coefficients obtained from regression-adjusted matching, i.e., weighted regressions utilizing the weights obtained from entropy balancing with all conditioning variables as covariates. In this table, all models control for individuals' prior-job loss levels of personality traits. Source: SOEP v30 (2004-2014), own calculations. Robust standard errors in parentheses, significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 7: Sensitivity analysis on specification issues

	Reg.-adjusted matching	Ordinary least squares	Placebo regression
	(Main)	(2)	(3)
Personality traits			
Openness	0.164**	0.158*	-0.041
	(0.078)	(0.081)	(0.129)
R^2	0.41	0.40	0.10
Conscientiousness	0.016	0.027	0.004
	(0.056)	(0.060)	(0.086)
R^2	0.30	0.32	0.08
Extroversion	0.063	0.056	0.044
	(0.060)	(0.064)	(0.115)
R^2	0.45	0.44	0.07
Agreeableness	0.047	0.052	-0.095
	(0.063)	(0.068)	(0.096)
R^2	0.32	0.33	0.09
Emotional stability	0.091	0.117*	-0.019
	(0.065)	(0.069)	(0.117)
R^2	0.39	0.39	0.18
Personality traits *prior* job loss	Yes	Yes	No
N	3904	3904	1660

Note: Each cell depicts the effect of involuntary job loss on post-job loss personality traits. The scores of the personality trait range from 1 to 7, with a higher value representing a higher score on the respective personality trait. All regressions include time and state fixed effects. Model (2) presents the benchmark regression obtained from ordinary least squares (OLS) and includes all conditioning variables as controls. Model (3) depicts the effect of involuntary job loss between 2009 and 2013 on individuals' personality traits measured in 2005. This model is the placebo regression of the assessed influence of plant closure on the stability of personality traits. Source: SOEP v30 (2004-2014), own calculations. Robust standard errors in parentheses, significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

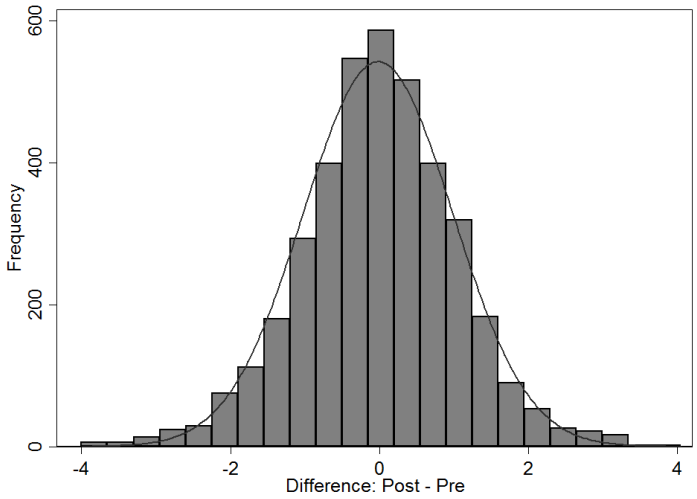
Table 8: Estimates of involuntary job loss on personality traits with pretreatment personality traits – assessing the bias of unobservables

			Identified set of β			
	Basic	Main	Upper bound	Lower bound	δ	$\lvert\delta > 1\rvert$
Personality traits						
Openness	0.202**	0.164**	[0.202]	[0.135]	5.5	✓
	(0.083)	(0.078)				
R^2	.39	.41				
Conscientiousness	0.038	0.016	[0.038]	[-0.012]	0.6	
	(0.065)	(0.056)				
R^2	.31	.31				
Extroversion	0.066	0.063	[0.066]	[0.060]	18.3	✓
	(0.067)	(0.060)				
R^2	.43	.44				
Agreeableness	0.070	0.047	[0.070]	[0.017]	1.6	✓
	(0.072)	(0.063)				
R^2	.32	.32				
Emotional stability	0.053	0.091	[0.053]	[0.217]	-0.7	
	(0.078)	(0.065)				
R^2	.37	.39				

Note: Each cell depicts the effect of involuntary job loss on personality traits. The scores of the personality trait range from 1 to 7, with a higher value representing a higher score on the respective personality trait. All regressions include year and state fixed effects. The first column includes only the treatment variable, and the second column presents the regression-adjusted matching results. The fifth column shows how strong the influence of unobserved factors has to be (in comparison to observed controls) in order to pull the effect to zero in the adjusted matching step. Columns three and four comprise the bounds of the found treatment effect and do not include zero for any personality trait dimension besides emotional stability. In column five, the value of proportionality $|\delta > 1|$ is depicted. The last column indicates whether δ is greater to 1 and thus indicates a robust result to omitted variable bias according to Oster (2013). Source: SOEP v30 (2004-2014), own calculations. Robust standard errors in parentheses, significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

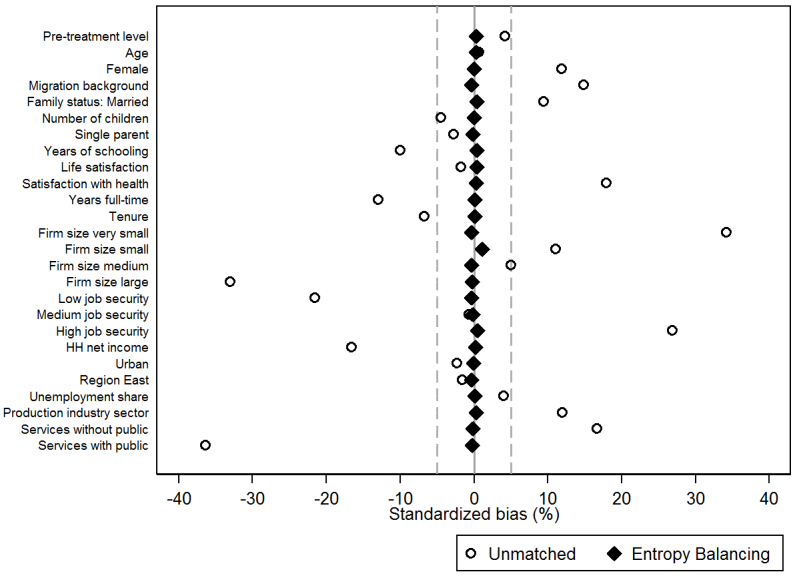
Appendix

Figure A.1: Histogram of the mean-level change in openness



Note: This figure shows the distribution of the mean-level change in openness over a four-year period. The mean-level change of openness over a four-year period is -0.02. The levels of openness range from 1 to 7, with a higher value representing a higher score on openness. Source: SOEPv30 (2004-2014), own calculations.

Figure A.2: Reduction in standardized bias of conditioning variables by entropy balancing



Note: In addition to the depicted conditioning variables, matching occurred based on state and time fixed effects, as well as separate dummies for the sample; see Table A.2 in the appendix for a complete list of matching variables used for entropy balancing. Source: SOEPv30 (2004-2014), own calculations.

Table A.1: Summary statistics of personality traits 2005/2009 and 2009/2013

Variable	Mean	Std. Dev.	Min.	Max.
A. Personality traits, first measurement (2005/2009)				
Openness	4.41	1.15	1	7
Conscientiousness	5.99	0.85	2.7	7
Extroversion	4.79	1.11	1	7
Agreeableness	5.34	0.98	1	7
Emotional stability	4.28	1.19	1	7
B. Personality traits, second measurement (2009/2013)				
Openness	4.39	1.14	1	7
Conscientiousness	5.94	0.85	2.3	7
Extroversion	4.74	1.11	1	7
Agreeableness	5.26	0.97	1.3	7
Emotional stability	4.36	1.18	1	7

Note: N=3,904. This table depicts summary statistics of personality traits at two measurement points. Panel A contains initial measurements of personality traits (wave 2005 for individuals who participate between 2005 and 2009, wave 2009 for individuals who participate between 2009 and 2013). Panel B comprises measures for the second measurement point (wave 2009 for individuals with initial levels in 2005 and wave 2013 for those with initial levels in 2009). The scores of the personality trait range from 1 to 7, with a higher value representing a higher score on the respective personality trait. Source: SOEPv30 (2004-2014), own calculations.

Table A.2: Correlation of personality traits comparing the first (2005/2009) and second (2009/2013) measurement point

	Personality traits measured 2005/2009				
	Openness	Conscientiousness	Extroversion	Agreeableness	Emotional stability
Personality traits measured 2009/2013					
Openness	**0.6111**	0.1004	0.2673	0.1145	0.0441
Conscientiousness	0.1074	**0.5470**	0.1480	0.1785	0.0709
Extroversion	0.2651	0.1591	**0.6515**	0.0742	0.1125
Agreeableness	0.0993	0.1783	0.0664	**0.5587**	0.1094
Emotional stability	0.0367	0.0932	0.0867	0.0882	**0.6018**

Note: N=3,904. This table describes the correlation of personality traits of individuals measured either between 2005 and 2009 or between 2009 and 2013. The first measurement point in the year 2005 or 2009 also marks the pre-job loss period for treated individuals. The scores of the personality traits range from 1 to 7, with a higher value representing a higher score on the respective personality trait. Source: SOEPv30 (2004-2014), own calculations.

Table A.3: Appendix: Descriptive statistics - before and after matching

	Mean treated	Mean controls		Standard. Bias (%)	
Variable		Unmatched	Matched (EB)	Unmatched	Matched (EB)
Individual characteristics:					
Age	43.4	43.1	43.4	3.4	−0.1
Female	0.5	0.4	0.5	9.4	−0.1
Migration Background	0.2	0.1	0.2	12.2	0.2
Family status Married	0.7	0.7	0.7	8.6	0.1
Number children	0.9	0.9	0.9	−5.9	−0.1
Family status Single	0.1	0.1	0.1	−5.6	−0.0
Years schooling	12.4	12.7	12.4	−12.3	−0.1
Life satisfaction	7.1	7.2	7.1	−3.1	−0.1
Satisfaction with health	2.5	2.4	2.5	17.2	−0.1
Working experience:					
Years full-time	16.7	18.0	16.7	−11.8	−0.0
Tenure	13.3	14.2	13.3	−9.1	−0.1
Firm size very small	16.6	4.8	16.5	38.7	0.2
Firm size small	16.1	12.7	16.1	9.5	−0.0
Firm size medium	30.7	28.1	30.7	5.7	−0.1
Firm size large	36.7	54.4	36.7	−36.1	−0.1
Low job security	31.2	40.6	31.1	−19.7	0.2
Medium job security	43.7	45.0	43.8	−2.6	−0.1
High job security	25.1	14.4	25.2	27.2	−0.1
HH characteristics:					
HH income	3.0	3.3	3.0	−20.5	−0.1
Urban	0.5	0.5	0.5	5.4	0.1
Region East	0.2	0.2	0.2	−4.5	−0.1
Unemployment share	9.6	9.5	9.6	2.6	−0.1
Industry sector:					
Production industry sector	42.2	37.0	42.2	10.7	−0.1
Services without public	46.7	37.1	46.7	19.6	0.1
Services with public	11.1	25.9	11.1	−39.0	−0.0
Sample:					
Sample A	20.6	25.3	20.6	−11.1	−0.1
Sample B	7.0	3.9	6.9	13.6	0.4
Sample C	14.1	14.0	14.1	0.3	−0.0
Sample D	3.0	3.4	3.0	−2.3	−0.0
Sample E	6.0	3.9	6.0	10.0	−0.0
Sample F	39.2	35.1	39.2	8.5	−0.1
Sample G	7.5	9.7	7.5	−7.8	−0.0
Sample H	2.5	4.7	2.5	−11.9	−0.0
Federal states:					
Schleswig Holstein	3.0	2.4	3.0	3.7	−0.0
Hamburg	3.5	1.9	3.5	9.8	−0.0
Lower Saxony	9.5	7.3	9.6	8.2	−0.0
Nordrhein Westphalia	23.6	20.9	25.3	6.5	−3.9
Hesse	8.5	7.2	6.9	4.8	6.1
Rhineland Palatine	2.0	5.5	2.0	−18.5	−0.0
Baden Wurttemberg	12.6	14.1	12.5	−4.5	0.3
Bavaria	14.6	16.1	14.6	−4.3	−0.0
Berlin	2.5	3.6	2.5	−6.5	−0.0
Brandenburg	1.5	3.5	1.5	−12.7	−0.0
Mecklenburg Pomerania	0.0	1.9	0.0	−19.8	−0.7
Saxony	6.0	7.6	6.0	−6.2	−0.0
Saxony Anhalt	6.0	4.0	6.0	9.4	−0.0
Thuringia	6.5	3.9	6.5	11.9	−0.0
Survey periods:					
Survey Period 2005 2009	53.3	58.1	53.2	−9.7	0.1
Survey Period 2009 2013	46.7	41.9	46.8	9.7	−0.1

Note: EB=entropy balancing. Summary statistics for treated, unmatched and matched controls. The first two columns present the means of selected variables before treatment for treated and controls. The third column displays the re-weighted control group according to entropy balancing (EB). The last two columns display a measure for the quality of the matching process, namely, the standardized percent bias: it is the difference of the sample means in the treatment and the matched control samples as a percentage of the square root of the average of the sample variance in both groups. The last column shows the standardized percent bias after matching.

Table A.4: Overview of personality traits and selected conditioning variables for the treatment group by unemployment experience

	Mean		
	Job change (no unempl. experience)	Unemployment experience	Mean differences
Personality traits prior to job loss:			
Openness	4.51	4.37	0.15
Conscientiousness	5.97	6.09	−0.12
Extroversion	4.95	4.60	0.35**
Agreeableness	5.40	5.31	0.09
Emotional stability	4.20	4.20	0.00
Personality traits post-job loss:			
Openness	4.66	4.44	0.22
Conscientiousness	5.95	6.01	−0.07
Extroversion	4.87	4.72	0.15
Agreeableness	5.33	5.32	0.01
Emotional stability	4.37	4.31	0.06
Individual characteristics prior to job loss:			
Age	42.25	44.35	−2.10
Female	0.55	0.44	0.11
Migration background	0.15	0.25	−0.10
Married	0.72	0.75	−0.02
Number of children in HH	0.91	0.87	0.03
Single	0.06	0.11	−0.05
HH income (in 1000)	3.12	2.90	0.22
Years of schooling	12.89	11.87	1.02***
Vocational degree	0.67	0.75	−0.08
College degree	0.25	0.13	0.12*
Urban/rural	0.48	0.44	0.05
Region (1=East Germany)	0.19	0.31	−0.12*
Regional unempl. rate	9.06	10.57	−1.51**
Overall life satisfaction	7.11	7.23	−0.11
Satisfaction with health	2.47	2.52	−0.05
Work experience			
Year full time	15.22	18.46	−3.24*
Tenure (in years)	12.89	14.39	−1.50
Firm size			
Firm size (<5)	0.16	0.13	0.04
Firm size (5-20)	0.16	0.17	−0.00
Firm size (20-200)	0.29	0.32	−0.04
Firm size (>200)	0.38	0.38	0.00
Worries about job security			
Low worries about job security	0.36	0.23	0.14*
Medium worries about job security	0.45	0.44	0.02
High worries about job security	0.19	0.34	−0.15**
Industry sector			
Production and industry	0.38	0.49	−0.11
Services w/o public sector	0.44	0.46	−0.02
Services w/ public sector	0.18	0.04	0.13***
N	97	71	168

Note: This table describes a subset of conditioning variables for the treatment group differentiated by unemployment experience after job loss. The first column presents the means for the control group and the second those of the treatment group. Column three shows the mean differences. The personality traits are also differentiated by treatment for both periods, prior to and after job loss. The scores of the personality trait range from 1 to 7, with a higher value representing a higher score on the respective personality trait. Source: SOEP v30 (2004-2014), own calculations, significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table A.5: Estimates of involuntary job loss on personality traits – assessing bias of unobservables w/o initial personality trait levels

			Identified set of β			
	Basic	Main	Upper bound	Lower bound	δ	$\lvert\delta > 1\rvert$
Personality traits						
Openness	0.229**	0.224**	[0.229]	[0.266]	-3.9	✓
	(0.101)	(0.093)				
R^2	.017	.12				
Conscientiousness	0.044	0.029	[0.044]	[0.017]	2.4	✓
	(0.070)	(0.059)				
R^2	.013	.14				
Extroversion	0.093	0.064	[0.093]	[0.062]	25.5	✓
	(0.083)	(0.076)				
R^2	.012	.10				
Agreeableness	0.073	0.040	[0.073]	[0.001]	1.0	✓
	(0.082)	(0.071)				
R^2	.011	.12				
Emotional stability	-0.004	0.122*	[-0.004]	[0.286]	-0.7	
	(0.091)	(0.073)				
R^2	.0072	.21				

Note: Each cell depicts the effect of involuntary job loss on personality traits. The scores of the personality trait range from 1 to 7, with a higher value representing a higher score on the respective personality trait. All regressions include year and state fixed effects. The first column includes only the treatment variable, and the second column presents the regression-adjusted matching results without the "initial level" of personality traits prior to job loss. The fifth column shows how strong the selection on unobservables has to be (in comparison to observed controls) in order to pull the effect to zero in the adjusted matching step. Columns three and four comprise the bounds of the found treatment effect and do not include zero for any personality trait dimension other than emotional stability. Source: SOEP v30 (2004-2014), own calculations. Robust standard errors in parentheses, significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.