Who experiences subjective job insecurity due to digital transformation in Germany?[1]

Wer erlebt subjektive Arbeitsplatzunsicherheit durch die digitale Transformation in Deutschland? [1]

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Conflict of Interests

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Abstract

In many countries, digitalization is accompanied by disruptive changes in the labor market, including polarization in employment and wages as well as a decrease in employment growth. However, little is known about the individual (micro-level) consequences of digitalization, especially regarding differently affected subgroups. In this study, we investigate the relevance of digitalization, as measured by the task-based substitution potential of occupations, for individuals' subjective job insecurity (SJI), focusing on differences between individuals with different socio-demographic and subjective-affective characteristics. We use large-scale cross-sectional data on employed persons from the German Socio-Economic Panel Study (SOEP) of 2013. Our linear regression models show that individuals in occupations with a high substitution potential report higher levels of SJI, compared to those with a low substitution potential. Moderation analyses reveal that the positive correlation between substitution potential and SJI concerns only certain social groups: older workers (46-55 years), employees with low and medium educational qualifications, and employees with a higher degree of neuroticism. Thus, the overall correlation between digitalization and SJI masks social inequalities in the extent to which people are affected by digital transformation.

In vielen Ländern geht die Digitalisierung mit disruptiven Veränderungen auf dem Arbeitsmarkt einher, darunter eine Polarisierung von Beschäftigung und Löhnen sowie ein Rückgang des Beschäftigungswachstums. Über die individuellen Folgen der Digitalisierung ist wenig bekannt, insbesondere im Hinblick auf die unterschiedliche Betroffenheit sozialer Gruppen. In dieser Studie untersuchen wir die Relevanz der Digitalisierung, gemessen durch das aufgabenspezifische Substitutionspotenzial von Berufen, für die subjektive Arbeitsplatzunsicherheit von Individuen. Unser Fokus liegt auf Unterschieden zwischen Individuen mit verschiedenen soziodemografischen und subjektiv-affektiven Merkmalen. Für die empirischen Analysen verwenden wir Querschnittsdaten von Erwerbstätigen aus dem Sozio-oekonomischen Panel (SOEP) von 2013. In Übereinstimmung mit der bisherigen Forschung zeigen unsere linearen Regressionsmodelle, dass Personen in Berufen mit hohem Substitutionspotenzial höhere Werte von subjektiver Arbeitsplatzunsicherheit berichten, verglichen mit Personen in Berufen mit niedrigem Substitutionspotenzial. Unsere Moderationsanalysen zeigen, dass die positive Korrelation zwischen hohem Substitutionspotenzial und subjektiver Arbeitsplatzunsicherheit nur bestimmte soziale Gruppen betrifft: ältere Arbeitnehmer*innen (46-55 Jahre), Arbeitnehmer*innen mit mittlerer und geringer Bildung und Arbeitnehmer*innen mit einem hohen Grad an Neurotizismus. Hinter dem positiven Zusammenhang zwischen Digitalisierung und subjektiver Arbeitsplatzunsicherheit verbergen sich also soziale Ungleichheiten im Ausmaß der individuellen Betroffenheit vom digitalen Wandel.

1 Introduction

Digital technologies increasingly permeate our daily working life. The use of digital technologies offers opportunities to increase the efficiency of companies and economies and is considered indispensable in a globalized world. On the downside of digitalization are far-reaching changes in the labor market. The fear of job substitution by machines and algorithms is very dominant in the scientific, political, and public debate. Corresponding to such fears, recent research on the occupational and industry level found that the use of digital technologies is accompanied by a polarization in employment and wages (Autor/Dorn 2013; Goos/Manning/Salomons 2009), as well as a decrease in employment growth (Dengler/Matthes 2018).

Less is known about micro-level outcomes of digitalization, most notably individuals' subjective job insecurity (SJI), understood as "the perceived powerlessness to maintain desired continuity in a threatened job situation" (Greenhalgh/Rosenblatt 1984). SJI has become an essential part of the implicit psychological contract between employer and employee and is seen as a fundamental parameter of the modern employer-employee relationship (Sok/Blomme/Tromp 2013). In line with recent research, we understand SJI as a result of the interaction between the objective situation and an individual's subjective characteristics (Sverke/Hellgren 2002). SJI is thus a broader and more complex concept than objective job insecurity. Due to differences in individuals' subjective perception of outcomes and their different subjective characteristics, individuals faced with similar situations of objective job insecurity may report very different levels of SJI (Lee/Huang/Ashford 2018). Consequently, SJI has been shown to be a significant precursor of a larger set of outcomes than is objective insecurity. These outcomes include physical and psychological well-being of the person directly affected by SJI (De Witte/Pienaar/De Cuyper 2016) as well as their family members (Mauno/Cheng/Lim 2017); workplace attitudes (Sverke/Hellgren/Näswall 2006); family and consumption decisions (Kreyenfeld 2010; Lozza/Libreri/Bosio 2013); and generalized social trust (Nguyen 2017). Moreover, SJI has been found to have a longer-lasting impact on these outcomes (Helbling/Kanji 2018). Finally, we expect perceived processes of economic and social change to be reflected much earlier at the individual level in subjective perceptions. In contrast, associations between digitalization and the objective employment situation and the conditions at the macro level are likely to be observed only with a time lag (mostly as a result of legal regulations). Therefore, expected labor market changes may be reflected earlier in SJI, which makes SJI an interesting and important dimension of digitalization and its impact on everyone's life.

The public debate is strongly dominated by the belief that objective job insecurity has been rising in recent decades due to, amongst other things, technological progress (Otterbach/Sousa-Poza 2016). Moreover, based on data from several online surveys that are considered representative for the German population, almost 40% of survey respondents feel unsure about and left behind by digitalization (Kirchner 2017). In line with that, a number of cross-sectional studies point to a positive association between individuals' beliefs that their own workplace will be replaced by digital technology in the future and their level of SJI for Germany

(Droste 2020) and between perceived automation and SJI especially for individuals with repetitive jobs in the USA (Coupe 2019). In addition, a recent longitudinal study from Germany (Dengler/Gundert 2021) and a cross-sectional study from the UK (Gallie et al. 2017) found evidence that objective measures of digitalization and technological change are associated with SJI. However, previous studies did not analyze whether the association between digitalization and SJI differs by social groups. Identifying social inequalities in the extent to which people are affected by digital transformation might help employers and policymakers to provide targeted support to affected groups. We tap into this research gap and analyze subgroup differences in the association between digitalization and SJI in Germany, a country with a strong social contract, including a high level of employee protection.

Our study proceeds in two steps. First, we examine the relationship between digitalization – measured as tasked-based substitution potential of occupations (substitution potential in the following, cf. Dengler/Matthes 2018) – and SJI in Germany. In a second step, we complement past research and analyze whether the relationship between digitalization and SJI is driven by particular social groups. We use large-scale cross-sectional data on more than 7,000 employed persons aged 18-65 from the German Socio-Economic Panel Study (SOEP) of 2013.

2 Definition and predictors of SJI

2.1 Definition of SJI

There is no clear consensus about the definition of SJI among scholars. While some scholars understand SJI as a unidimensional or global concept, others see it as multidimensional. Followers of the unidimensional approach focus on insecurity as perception about job loss (Probst 2003; Borg/Elizur 1992; Huang et al. 2012). Followers of the multidimensional approach include the loss of desired job features, such as payment or company-related benefits in their analysis (Hellgren/Sverke/Isaksson 1999; Greenhalgh/Rosenblatt 1984). We take the global approach here, understanding the costs of job loss as a factor in the translation process from objective risk into SJI rather than being part of the perceived level of job insecurity. Consequently, we control for such workplace-related characteristics in our analyses.

Regardless of the definition applied, a distinction is commonly made between cognitive and affective SJI (Näswall/De Witte 2003; Chung/Mau 2014). Cognitive job insecurity refers to individuals' perception of the likelihood of losing their job in the near future. Affective job insecurity refers to individuals' worries and fears about their job's security or about losing their job. The article of Lee, Huang, and Ashford (2018) presents a good overview of the various measures of SJI in empirical studies since 2003.

Many of the studies we mention below analyze only one of the two dimensions of SJI,[2] generally the cognitive one (Muñoz de Bustillo/de Pedraza 2010; Erlinghagen 2008; Debus/König/Kleinmann 2014; Lübke/Erlinghagen 2014; Green/Felstead/Burchell 2000). Other studies

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[2] Some of these studies combine their cognitive measure of SJI with other measures of SJI, such as employment insecurity (e.g., Lübke/Erlinghagen 2014; Erlinghagen 2008).

combine the cognitive and affective dimensions into an index of SJI (Liu et al. 2019; Rosenblatt/Ruvio 1996; De Cuyper et al. 2012; De Witte/Näswall 2003), and some studies comparatively analyze cognitive and affective SJI (Borg/Elizur 1992;Anderson/Pontusson 2007; Klandermans/Hesselink/van Vuuren 2010). The latter studies concluded that cognitive and affective job insecurity are separate yet related dimensions, as the cognition of job loss is a premise for worries about job loss but does not necessarily result in such worries. Consequently, more recent studies (Hipp 2016; Dengler/Gundert 2021; Anderson/Pontusson 2007) model cognitive job insecurity as a predictor or predecessor of affective job insecurity. We analyze affective SJI as our main outcome variable while including cognitive SJI as a control.

2.2   Explaining SJI

Previous research agrees that SJI is the result of a multidimensional process, including the objective situation and individual characteristics (Sverke/Hellgren 2002; Muñoz de Bustillo/de Pedraza 2010; Keim et al. 2014; Lee/Huang/Ashford 2018). While SJI can emerge in situations without an objective threat to job security (Rosenblatt/Ruvio 1996), most researchers agree that objective and subjective insecurity build on each other (Chung/Mau 2014). This means that an individual translates an objectively threatening situation – for example, an economic or company crisis – into a subjective perception of that situation. In our case, digitalization is the objectively threatening situation individuals might be exposed to. Whether individuals perceive an objective situation as insecure or risky depends on their translation of the situation. The translation process is moderated by the individual's subjective-affective or psychological characteristics as well as their previous experiences and abilities to cope with such a situation, i.e., their socio-demographic characteristics (Muñoz de Bustillo/de Pedraza 2010).

Socio-demographic characteristics are those resources that can be expected to influence the individual's marketability positively or negatively, such as education, skill level, or age. Moreover, socio-demographic characteristics work also as predictors of SJI. Unfortunately, previous research rarely differentiates between predictors and moderators of SJI. Relevant socio-demographic characteristics that affect SJI have been found at various analytical levels, primarily the levels of companies and individuals. These studies reveal that blue-collar, less educated, older workers, and persons with a migration background exhibit higher levels of SJI because of their bad employment situation (Kalleberg 2011; Näswall/De Witte 2003; Liu et al. 2019). Also, some studies found women to experience higher levels of SJI than men (Stier/Yaish 2014; Näswall/De Witte 2003), which may be caused by gender roles, gender-based specialization, and the associated statistical discrimination against women. Other studies, however, did not find such gender differences (Erlinghagen 2008; Muñoz de Bustillo/de Pedraza 2010; Hipp 2016).

Additionally relevant are the economic and family situations of the individuals. Those with a higher income can better compensate for the negative consequences of job loss (Erlinghagen 2008). At the same time, a higher income is related to higher job loss costs and a lower

probability of finding another job with the same income (Muñoz de Bustillo/de Pedraza 2010). Individuals with dependent children can be expected to show higher levels of SJI under similar objective conditions compared to individuals without dependent children. Related findings are inconclusive, however (Erlinghagen 2008).

Subjective-affective characteristics are personality traits or predispositions such as neuroticism (as the opposite of emotional stability), locus of control and negative affectivity, self-esteem, emotional exhaustion, and perceived employability (Debus/König/Kleinmann 2014; De Cuyper et al. 2012; Huang et al. 2012; Låstad et al. 2014; Tivendell/Bourbonnais 2000). Studies suggest that under similar objective circumstances, individuals exhibit higher levels of SJI when they are less emotionally stable, perceive having less control over their future, tend to interpret events negatively, have low self-esteem, are emotionally exhausted, and find themselves less employable.

Concerning the *objective situation*, studies indicate relevant predictors for SJI at the company and individual level. These predictors include individuals' work characteristics, such as job tenure and contract type, but also previous employment characteristics. The relationship between job tenure and SJI was found to be U-shaped: employees with very short and with very long job tenures show higher levels of SJI (Erlinghagen 2008; Green/Felstead/Burchell 2000). While workers with a short firm tenure are usually less protected by the company, workers with long firm tenure have often made private long-term investments, such as purchasing a home or establishing a social network and have also accumulated company-specific human capital as well as entitlements, which are associated with high costs in the case of job loss (Erlinghagen 2008). Workers with temporary contracts are considered to be less attached to and less protected by their company, and this is correlated with higher levels of SJI (Debus/König/Kleinmann 2014; Keim et al. 2014; Erlinghagen 2008). Previous negative employment experiences are expected to be related to higher levels of SJI, as they lower the individual's chances of a permanent labor market re-entry. This has been validated for previous unemployment periods (Muñoz de Bustillo/de Pedraza 2010; Erlinghagen 2008).

Studies focusing on the company level point to the relevance of firm size, company performance, union membership, and economic sector. Employees in larger firms can be expected to experience lower levels of SJI because of the greater importance of internal labor markets and have greater powers of resistance in periods of economic insecurity or crisis (Erlinghagen 2008). While poor company performance is associated with a higher SJI, the presence of a union and working in the public sector predict lower levels of SJI (Anderson/Pontusson 2007; Debus/König/Kleinmann 2014; Keim et al. 2014; Muñoz de Bustillo/de Pedraza 2010).

However, changing labor market conditions due to globalization and digitalization processes (Billon/Lera-Lopez/Marco 2010; Dengler/Matthes 2018) also draw our attention to the relevance of *higher-level structural characteristics of labor markets*, such as occupational qualities, that can affect the SJI of specific or entire working populations. Most studies that analyze

the relationship between changing labor market conditions and SJI focus on the structural conditions of labor markets. These studies point to cross-country differences in SJI and show that SJI increases with rising unemployment rates and decreases with the existence of employment protection legislation (Anderson/Pontusson 2007; Lübke/Erlinghagen 2014). However, these studies do not account for the relevance of digitalization, which other scholars see as a fundamental source of change in the labor market that may also underlie differences in unemployment rates (Billon/Lera-Lopez/Marco 2010). Moreover, changing labor market conditions, including unemployment and digitalization, may not necessarily affect entire nations but may be restricted to specific occupations (Dengler/Matthes 2018). In this regard, Gallie et al. (2017) analyze cognitive SJI (job tenure insecurity) and job status insecurity, using data from the 2012 British Skills and Employment Survey. They take a company's use of advanced technologies as an indicator for technological change and show that a higher usage is related to higher levels of cognitive SJI, but not job status insecurity.

Dengler and Gundert (2021) perform a longitudinal analysis using data from the German household panel study "Labour market and social security" (PASS), and find that digital transformation — measured as task-based substitution potential of occupations — impacts on cognitive but not affective SJI. They suggest that moderating effects of individual coping strategies, human resources, or the organizational context might explain the discrepancy between their findings for cognitive and affective SJI. We pick up on this and will explore potential subgroup differences between digitalization and SJI in a cross-sectional context.

3   The present study

While previous studies established a positive association between digitalization and SJI (Gallie et al. 2017; Dengler/Gundert 2021), there is a lack of knowledge concerning potential social inequality in the association between digitalization and SJI. The aim of our study is twofold: First, we examine the relationship between digitalization and SJI for Germany, using data from the German Socio-Economic Panel Study (SOEP). Second, we investigate whether the relationship between digitalization and SJI is consistent across social groups or, to the contrary, is driven by specific social groups. Our study thus addresses possible social inequalities in the way people are affected by digital change.

We connect digitalization to SJI by investigating the relationship between the task-based substitution potential of occupations in 2013 (Dengler/Matthes 2018) and individuals' affective SJI. Following Muñoz de Bustillo and de Pedraza (2010), we expect heterogeneity in the relationship between an objective threat and affective SJI along socio-demographic and subjective-affective variables. The relationship between an objective threat, i.e., digitalization in our case, and affective SJI should be moderated by those variables that are likely to affect the individual's experiences and abilities to cope with the objective threat. For our empirical analyses, we select two key inequality dimensions, age and education, and one subjective-affective characteristic,

namely neuroticism, as examples. We use large-scale data on 7,070 employed persons from the German Socio-Economic Panel Study (SOEP) of 2013.

As illustrated in Figure 1, we understand affective SJI to be the result of individuals' translation of the objective situation of digital transformation (substitution potential) they are faced with (path I) moderated by their socio-demographic (path II) and subjective-affective characteristics (path III). In line with recent studies (Hipp 2016; Dengler/Gundert 2021; Anderson/Pontusson 2007), we model cognitive SJI as a predictor or precursor of affective SJI.

—Figure 1 about here—

While digitalization has been found to evoke both negative and positive feelings, we understand substitution potential to measure an uncertain future and thus expect to find a positive relationship between substitution potential and SJI (*hypothesis 1*). Based on our theoretical considerations and previous research findings, we expect the positive relationship between substitution potential and SJI to be more pronounced among older *(hypothesis 2)* and less educated employees *(hypothesis 3)*. Moreover, we assume the positive relationship between substitution potential and SJI to be stronger among more neurotic persons, with neuroticism as a measure of individuals' subjective-affective predispositions (*hypothesis 4*).

4 Data, variables, and methods

4.1 Data

We use data from the SOEP Version 35 (2019) to investigate the relationship between digitalization and SJI. The SOEP is a multidisciplinary household panel study that, using an annual questionnaire beginning in 1984, captures a representative sample of the German adult population living in private households (Goebel et al. 2019). We deploy the sample's 2013 wave because our digitalization measure is only valid for that year. We use the subsamples A-K[3], which include our subjective-affective variables. Moreover, we restrict our sample to individuals aged between 18 and 65, who work more than 19 hours per week and earned at least one euro per hour. We drop from our sample individuals who indicated they were in vocational training or were enrolled in education as their main activity, as well as self-employed individuals. After excluding cases with missing values, our sample contains 7,070 individuals. Since we analyze individuals within occupations, we correct the standard errors for clustering at the occupational level. Both data preparation and our analyses are carried out with Stata 16.1 MP.

4.2 Variables

Affective SJI is operationalized via worries about job security. Respondents were asked on a 3-point scale (1, very concerned, 2, somewhat concerned, and 3, not concerned at all) "What about the following areas – are you worried about them? About the security of your workplace." We

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[3] This means that we exclude the samples M1 (migration sample 2013, which was designed to improve the representation of migrants living in Germany) and I_E, I_2 and I_3 (innovation samples 1998, 2009, 2012, 2013). For more information about these subsamples see Gerstorf and Schupp (2014).

inverted this scale for our analyses, with the highest value referring to the highest level of affective SJI. We use the question "How likely is it that the following career changes will occur for you within the next two years: That you lose your job?" to measure *cognitive SJI*. Answers were coded on an 11-point scale from 0, "will definitely not occur" to 100, "will definitely occur," where each scale value corresponds to a 10 % increase in SJI.

Digitalization. Applying a task-based approach, Dengler and Matthes (2018) created a measure of substitution potential on the occupational level and found that 15% of German occupations are at risk of automation. Moreover, they show their substitution potential measure to be negatively related to employment growth between 2013 and 2016 (see Acemoglu/Restrepo 2020; Dauth et al. 2017; Autor/Dorn 2013; Goos/Manning/Salomons 2009; Spitz-Oener 2006; Antonczyk/Fitzenberger/Leuschner 2009 for consequences of alternative measures of digitalization on employment and wage polarization). We operationalize digitalization via the substitution potential of occupations created by Dengler and Matthes (2018). This variable measures the percentages of approximately 8,000 different tasks that can potentially be replaced by computers or computer-controlled machines for each of the 3,900 occupations in Germany in 2013 based on the occupational expert database BERUFENET of the Federal Employment Agency, which is similar to the US O*NET database. The substitution potentials were independently researched by three coders and are based exclusively on technical feasibility. This means that even if a task is classified as replaceable, it will not necessarily be replaced in the next few years, because, for example, legal or ethical barriers or a fast flexibilization of human labor might prevent this. To determine the degree of digitalization or computerization, Dengler and Matthes (2018) consider the number of routine tasks in an occupation, i.e., the share of tasks that can potentially be replaced by computers or computer-controlled machines according to the BERUFENET data. They illustrate their method using the example of a "salesperson." A salesperson typically performs six core tasks. Four of these tasks can be performed by computers. Consequently, a salesperson has a substitution potential of about 67%.

We merge the measure of digitalization with the SOEP 2013 data based on the individuals' occupations, which are coded in both datasets according to the German classification of occupations (Kldb2010: Paulus/Matthes 2013). We use the first three and the fifth digit of the Kldb2010 classification for our matching procedure. To account for a potential non-linear relationship between digitalization and affective SJI, we categorize the scale into low (0–30%), medium (31–70%), and high (71–100%) substitution potential. This categorization is also used by Dengler and Matthes (2018).

Age. The age variable is derived from the individuals' date of birth. Because we expect to find a non-linear relationship between age and SJI, we included age as a categorical variable with five categories: 1: 18-25 years; 2: 26-35 years; 3: 36-45 years; 4: 46-55 years; 5: 56-65 years.

Level of education. Educational level was originally measured by the CASMIN scale (Brauns/Steinmann/Haun 2000), which we recoded into the categories low (1a, 1b, 1c), medium (2a, 2b, 2c_gen, 2c_voc), and high (3a, 3b).

Neuroticism. The neuroticism scale is part of the so-called "Big Five Inventory (BFI)" (John/Srivastava 1999) and is based on the three items "I am a worrier," "I am nervous", and "I am relaxed, able to deal with stress" that are answered on a 7-point scale (1, does not apply at all to 7, applies fully). Based on these three items (Cronbach's $\alpha = 0.62$), we construct a sum index, where the scale of the last item was inverted so that high values measure low neuroticism. For our analyses, we divided the variable into three groups using percentiles (split points for the medium category are scale points 3 and 4).

Control variables. In order to rule out a possible confounding of the association between digitalization and SJI, we control in the models for sex, living in former West or East Germany, born in Germany or abroad, social status based on the "International Socio-Economic Index of Occupations (ISEI)" (Ganzeboom/Treiman 2003), firm tenure, company size, fixed-term or open-ended contract, working in the public or private sector, and the unemployment rate by occupations. The unemployment rate indicator was measured at the occupational level and is based on the values of the German Federal Employment Agency (BA) (Bundesagentur für Arbeit 2015; 2013).

Table A1 in the appendix contains our descriptive statistics.

4.3   Method

Our analytical strategy is twofold; first, we use ordinary least square regression models to investigate the association between SJI and substitution potential. In order to take the hierarchical structure of the data into account (persons within occupations), we make use of a Huber-White sandwich estimator of variances to obtain cluster-robust standard errors. Since we are not interested in evaluating variances at the different levels, we refrained from applying hierarchical models. We also standardize our dependent variable and all continuous independent variables. In a second step, we run moderation analyses within the framework of ordinary least square regression. We estimate interaction effects between substitution potential and age, education, and neuroticism, to analyze differences in the association between SJI and substitution potential across subgroups.

5   Results

5.1   Does higher substitution potential predict higher SJI?

We start our analyses by looking at the association between substitution potential and affective SJI, while controlling for cognitive SJI and a set of variables at the individual and occupational level. Table 1 shows our results; all bivariate relationships can be found in Table A2 in the appendix. The bivariate association between substitution potential and affective SJI in Model 1

(Table 1) shows that compared to individuals working in occupations with low levels of substitution potential, persons working in occupations with high substitution potential report a 0.41 standard deviation higher level of affective SJI (SE = 0.074, p < 0.001). We also tested the bivariate relationship between affective SJI and a continuous version of substitution potential, which shows that the higher the substitution potential, the higher affective SJI (B = 0.13, SE = 0.028, p < 0.001). However, our results presented in Table 1 suggest that this relationship is largely driven by individuals in occupations with a high substitution potential. Model 2 shows that the relationship between substitution potential and affective SJI slightly decreases when controlling for cognitive SJI. Thus, the relationship between substitution potential and affective SJI is partly mediated by cognitive SJI. The relationship between substitution potential and affective SJI remains stable after controlling for the other covariates – as reported in Model 3 – and supports our first hypothesis proposing a positive relationship between substitution potential and SJI.

—Table 1 about here—

5.2 Does the association between substitution potential and SJI vary by age, educational level, and neuroticism?

Table 1 (Model 3) also shows the association between affective SJI and our focal socio-demographic and subjective-affective variables. Our results reveal that workers with low educational levels report statistically significant higher values of affective SJI than those with high educational levels (B = 0.21, SE = 0.035, p < 0.001). We also found that older workers (46–55; B = 0.09, SE = 0.025, p < 0.001) show higher values of SJI compared to workers aged 36–45. Concerning the relationship between SJI and neuroticism, our results reveal that less neurotic workers also report lower values of affective SJI (B_{low} = –0.30, SE = 0.025, p < 0.001; B_{med} = –0.19, SE = 0.027, p < 0.001) as compared to highly neurotic workers. We also tested this relationship by treating neuroticism as continuous variable, leading to the same results (B = 0.14, SE = 0.011, p < 0.001).

In a next step, we investigate whether our socio-demographic and subjective-affective variables moderate the relationship between substitution potential and affective SJI. For this purpose, we introduced interaction terms between substitution potential and our respective socio-demographic and subjective-affective variables as shown in Table 2 (full regression results are reported in Table A3 in the appendix). As can be seen, we do not find any statistically significant interaction effects between substitution potential and our socio-demographic and subjective-affective variables. Thus, the positive relationship between substitution potential and SJI does not increase with age, education, and the level of neuroticism.

—Table 2 about here—

However, a more detailed analysis of the predictive margins might reveal significant differences in the association between substitution potential and affective SJI across subgroups. First, predictive margins allow us to directly estimate the relationship between substitution potential and affective SJI for each of the groups (e.g. individuals with low educational

qualifications). Second, by comparing the confidence intervals of different groups (e.g., individuals with low vs. medium educational qualifications) we can see whether any group differences in the association between substitution potential and affective SJI are statistically significant. Figures 2 to 4 illustrate the results of the association between substitution potential and affective SJI for each of the social groups under study (the point estimates and corresponding SEs can be found in Table A4 in the appendix). Most notably, our results suggest that a positive relationship between substitution potential and SJI is found only for certain groups of people. In the following, we go into the results in detail.

—Figures 2 to 4 about here—

Looking at Figure 2, we see that among all age groups the SJI is statistically significantly increased for older persons (46–55 years) working in occupations with medium (B = 0.08, SE = 0.032, p < 0.01) and high (B = 0.15, SE = 0.060, p < 0.05) substitution potential. In contrast, for younger persons (26–35 years), the estimates show that affective SJI is statistically significantly decreased for those in occupations with low (B = –0.09, SE = 0.039, p < 0.05) and medium (B = –0.11, SE = 0.036, p < 0.01) substitution potential. Moreover, among individuals working in occupations with medium substitution potential, those aged 46–55 statistically significantly differ in their SJI from those aged 26–35. We understand these findings to partially support our second hypothesis that older workers (i.e., those aged 46–55 years) show a more pronounced relationship between substitution potential and SJI, with the restriction that this applies only to those in occupations with medium and high substitution potential.

Figure 3 reveals that workers with low educational qualifications show a statistically significant positive association of SJI and substitution potential across all levels of substitution potential (B = 0.25, SE = 0.055, p < 0.001 for high substitution potential). Individuals with medium levels of education report a statistically significant positive association between substitution potential and affective SJI at high levels of substitution potential (B = 0.08, SE = 0.036, p < 0.05), and a statistically negative association at low levels of substitution potential (B = –0.06, SE = 0.023, p < 0.05). Just as workers with medium educational qualifications, workers with high educational qualifications show a statistically significant negative association of SJI and substitution potential at low levels of substitution potential (B = –0.11, SE = 0.023, p < 0.001). For low and medium substitution potential, the confidence intervals of the low educated compared to the medium and high educated do not overlap, implying that the group differences in SJI are statistically significant. With high substitution potential, the lowest and highest educational groups do not statistically differ. However, the large confidence intervals of the highly educated group (with high substitution potential) are most likely the result of the small number of cases in this group. The effect sizes of the three educational groups at high substitution potential are considerable though. Low and medium educated workers in occupations with high substitution potential show a significant positive association with SJI. This positive relationship, however, is statistically significant only for workers with low educational qualifications. We take our findings as partial support for our third hypothesis: the positive

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relationship between substitution potential and SJI is more pronounced for the low educated, with the caveat that this is only true for those in occupations with low and medium substitution potentials.

Figure 4 illustrates our findings for neuroticism. We can see that workers with high levels of neuroticism report statistically significantly increased levels of SJI at all levels of substitution potential (B = 0.24, SE = 0.058, p < 0.001 for high substitution potential). Workers with low levels of neuroticism show statistically significantly decreased levels of SJI at low and medium levels of substitution potential (B = –0.16, SE = 0.022, p < 0.001 for low substitution potential). Workers with medium levels of neuroticism show no statistically significant relationship between substitution potential and SJI at any level of substitution potential. The confidence intervals of highly neurotic persons do not overlap with medium and low neurotic workers at low and medium levels of substitution potentials. In sum, our results partially support our fourth hypothesis, suggesting that the positive relationship between substitution potential and SJI is more pronounced for highly neurotic workers, with the restriction that this applies only to those in occupations with low and medium substitution potential.

5.3 Sensitivity Analyses

We performed several robustness checks. First, we estimated multilevel models that cluster persons within occupations. The unconditional models show only little variance of affective SJI between occupations (ICC = 0.07). Moreover, the relationship between substitution potential and affective SJI from a multilevel model controlling for all covariates differs only slightly from the results reported above (Table 1, Model 3) B_{med} = 0.04, SE = 0.026, p = 0.125; B_{high} = 0.15, SE = 0.044, p < 0.001). Second, since the measurement of affective SJI is ordinal, we also estimated an ordered logistic regression model. The results can be found in Table A5 in the appendix and support our results presented in Table 1. Third, we tested how restricting the sample to those earning at least one euro per hour and working more than 19 hours per week affected our results. Without this restriction, our sample increased by 10%, while the relationship between substitution potential and affective SJI remained the same (B_{med} = 0.04, SE = 0.026, p = 0.098; B_{high} = 0.15, SE = 0.042, p = 0.001, see Table 1, Model 3). Fourth, since 2013 was a year of low economic development (Federal Statistical Office Germany 2020), we considered worries about personal and general economic developments as covariates in the models. The regression results for the association between substitution potential and affective SJI reported above (Table 1, Model 3) changed only slightly (B_{med} = 0.04, SE = 0.025, p = 0.089; B_{high} = 0.13, SE = 0.039, p = 0.001). Concerning group differences in the association between substitution potential and affective SJI, we also tested for the contrasts of our predictive margins because comparing confidence intervals in some cases leads to false conclusions (Belia et al. 2005) (see last column in Table A4).

6 Summary and discussion

We investigated whether the relationship between digitalization – measured by task-based substitution potential at the occupational level (Dengler/Matthes 2018) – and affective SJI of individuals at the micro-level. The main objective of our study was to research the heterogeneity of this relationship for different groups of workers regarding their socio-demographic characteristics and subjective-affective dispositions. For this purpose, we combined the representative large-scale cross-sectional data of the SOEP – which provides established measures of SJI – with measures of the substitution potential of occupations derived from the occupational expert database BERUFENET of the Federal Employment Agency.

Summing up our results, we found the following:

(1) Digitalization – measured as occupation-specific substitution potential – is positively related to levels of affective SJI in Germany. This finding is consistent with the research on the downside of digitalization (Dengler/Matthes 2018; Autor/Dorn 2013; Pfaffinger et al. 2020; Acemoglu/Restrepo 2020), which, for example, shows that digitalization results in disruptive changes to labor markets at the economic, occupational, and individual levels. Our findings show that digitalization on the occupational level positively correlates with individuals' affective SJI. In other words, our findings suggest, that digitalization as an objective threat at the macro-level is related to higher subjective fear perceptions at the micro-level. This finding differs from Dengler and Gundert (2021), who found digitalization to increase cognitive but not affective SJI. As explained in section 2.2, our analyses are not directly comparable though.

(2) The positive relationship between digitalization and affective SJI is largely driven by individuals working in jobs with a high risk of being replaced by digital technologies.

(3) Expanding past research, we provide initial evidence for the existence of social inequalities in the relationship between digitalization and SJI. While we found no reinforcement of the association between substitutability potential and affective SJI by age, education, and neuroticism, our study points to key subgroup differences between substitution potential and SJI. Especially older people (46-55 years) working in occupations with medium and high levels of digitalization report a statistically significant positive association between substitution potential and affective SJI, while we found no relationship between these two measures for most other age groups (18–25, 26–35, 36–45, 56–65). Interestingly, we found the expected more pronounced relationship between substitution potential and affective SJI not for the oldest (56-65 years), but only for the second oldest (46-55 years) group. It might be that the affective SJI of the oldest age group is less affected by digitalization because these persons know that they will soon be able to "save themselves into retirement". Moreover, we found a positive association between digitalization and affective SJI for workers with low educational levels for all levels of substitution potential and for medium educated workers in occupations with a high degree of substitution potential. Those with high educational levels are largely unaffected

in their affective SJI by digitalization. Furthermore, digitalization and affective SJI are positively related especially among workers with high degrees of neuroticism, while for workers with low degrees of neuroticism digitalization is associated with lower levels of affective SJI.

(4) Within the group of individuals working in occupations with high levels of substitution potential, subgroup differences tend to become weaker with respect to socio-demographic and subjective-affective affective variables. In other words, when substitution potential is high, more and more employees feel insecure about their jobs regardless of their socio-demographic and subjective-affective characteristics.

7 Limitations and future research

Using a large scale and representative sample of German employees combined with data on occupation-specific substitution potential, our study's major contribution is to demonstrate that the consequences of digitalization as measured by substitution potential of occupations substantially affect the SJI of specific social groups. Despite the significance of this contribution, there are still limitations that need to be addressed in future research. First, since our measurement of digitalization is only valid for 2013 and does not vary over time, we cannot investigate our research question longitudinally. Therefore, the presented findings are correlational, and correlation does not necessarily imply causation, even if we did use an extensive control function. Second, we were not able to investigate the mechanisms that link substitution potential to SJI. Previous theorizing points to information and rumors about objective risks as a central mechanism (Muñoz de Bustillo/de Pedraza 2010). Fourth, among individuals' socio-demographic characteristics, we selected two key social inequality dimensions as examples, age and education, and one subjective-affective characteristic, neuroticism. Future research might want to examine further subgroups. From a sociological perspective, analyzing the moderating effects of income and wealth would be an obvious step to take. Income and wealth can be considered important resources to cope with digitalization and thus reduce its impact on SJI. Fifth, further analyses are needed to examine the interrelation between SJI and characteristics at the national, occupational, and company levels. For example, it is conceivable that national employment protection policies act as a buffer against the threat of digitalization to job security (Anderson/Pontusson 2007).

8 Implications

Our study shows that individuals are not equally affected by digitalization. Instead, it is especially older, less educated, and more neurotic workers for whom digitalization is related to increased worries about job security. To reduce fears of job loss related to digitalization, social policymakers might directly address these groups. This can be done by showing them the potentials and chances of digitalization and enabling them to adapt to changing occupational structures. Educating and strengthening individuals' (perceived) ability to act is especially relevant

for more neurotic individuals. Digitalization is attended by a fast-changing skill demand and calls for educational systems that allow for more lifelong learning (Saar/Roosma/Martma 2019). Young people must also be educated and prepared for the digitalized labor market by investing in digital skill formation at schools and universities. This involves both integrating digital literacy into the curriculum as well as hiring teachers with the appropriate proficiencies. Finally, policymakers could also more strongly support start-ups and innovative companies in order to promote the creation of new jobs through digitalization.

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10 Appendix

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11 Tables

Table 1: Linear regression on affective subjective job insecurity.

Variable	Model 1 b	Model 1 SE	Model 2 b	Model 2 SE	Model 3 b	Model 3 SE
Substitution potential						
Low (ref.)	-	-	-	-	-	-
Medium	0.13	(0.069)	0.10*	(0.048)	0.04	(0.026)
High	0.41***	(0.074)	0.32***	(0.055)	0.14**	(0.042)
Cognitive SJI			0.49***	(0.014)	0.44***	(0.015)
Women (ref. men)					-0.02	(0.025)
Age						
18–25					-0.07	(0.060)
26–35					-0.05	(0.035)
36–45 (ref.)	-	-	-	-	-	-
46–55					0.09***	(0.025)
56–65					0.01	(0.034)
Living in former West Germany (ref. former East)					-0.16***	(0.026)
Foreign (ref. German)					0.23***	(0.055)
Education						
Low					0.21***	(0.035)
Medium					0.04	(0.028)
High (ref.)	-	-	-	-	-	-
ISEI					-0.05***	(0.016)
Firm tenure (years)					-0.01	(0.013)
Company size						
< 20 (ref.)	-	-	-	-	-	-
20 to < 200					0.10***	(0.030)
200 to < 2000					0.11***	(0.029)
> 2000					0.09**	(0.031)
Fixed term contract (ref. permanent)					0.12**	(0.046)
Civil service (ref. private sector)					-0.19***	(0.026)
Unemployment rate in occupation					0.02	(0.012)
Neuroticism						
Low					-0.30***	(0.025)
Medium					-0.19***	(0.027)
High (ref.)	-	-	-	-	-	-
Constant	-0.10	(0.055)	-0.08*	(0.037)	0.13**	(0.044)
R²	0.02		0.25		0.29	

Data: SOEP v35, year = 2013, N = 7,070, own calculations, unweighted, clustered SEs.
Notes: * p<0.05, ** p<0.01, *** p<0.001. The dependent variable as well as cognitive SJI, ISEI, firm tenure, and unemployment rate are standardized.

Table 2: Interaction effects of substitution potential and age, education, and neuroticism on affective SJI.

Variable	Model 4 b	Model 4 SE	Model 5 b	Model 5 SE	Model 6 b	Model 6 SE
Main associations						
Substitution potential						
Low (ref.)	-	-	-	-	-	-
Medium	0.03	(0.045)	0.08	(0.039)	0.07	(0.047)
High	0.15	(0.076)	0.02	(0.191)	0.12	(0.070)
Age						
18–25	-0.05	(0.102)	-0.07	(0.060)	-0.07	(0.060)
26–35	-0.04	(0.052)	-0.05	(0.035)	-0.05	(0.035)
36–45 (ref.)	-	-	-	-	-	-
46–55	0.08*	(0.035)	0.09***	(0.025)	0.09***	(0.025)
56–65	-0.00	(0.049)	0.01	(0.034)	0.01	(0.035)
Education						
Low	0.20***	(0.035)	0.24***	(0.040)	0.21***	(0.035)
Medium	0.04	(0.028)	0.06	(0.030)	0.04	(0.028)
High (ref.)	-	-	-	-	-	-
Neuroticism						
Low	-0.30***	(0.025)	-0.30***	(0.025)	-0.28***	(0.042)
Medium	-0.19***	(0.027)	-0.19***	(0.027)	-0.17***	(0.042)
High (ref.)	-	-	-	-	-	-
Interactive associations						
Age * Substitution potential						
18–25 * Medium	-0.01	(0.131)				
26–35 * Medium	-0.05	(0.072)				
46–55 * Medium	0.02	(0.053)				
56–65 * Medium	0.04	(0.073)				
18–25 * High	-0.08	(0.165)				
26–35 * High	0.04	(0.114)				
46–55 * High	-0.02	(0.101)				
56–65 * High	-0.03	(0.093)				
Education * Substitution potential						
Low * Medium			-0.08	(0.056)		
Medium * Medium			-0.04	(0.051)		
Low * High			0.11	(0.188)		
Medium * High			0.12	(0.198)		
Neuroticism * Substitution potential						
Low * Medium					-0.05	(0.052)
Medium * Medium					-0.06	(0.055)
Low * High					0.00	(0.073)
Medium * High					0.04	(0.087)
Constant	0.13**	(0.046)	0.12**	(0.045)	0.12*	(0.051)

Data: SOEP v35, year = 2013, N = 7,070, own calculations, unweighted, clustered SEs.
Notes: * p<0.05, ** p<0.01, *** p<0.001. Control variables are cognitive SJI, sex, living in former West or East Germany, born in Germany or abroad, social status, firm tenure, company size, fixed-term or open-ended contract, working in the public or private sector, and the unemployment rate by occupations. The dependent variable as well as cognitive SJI, ISEI, firm tenure, and unemployment rate are standardized.

Table A1: Descriptive statistics.

Variable	Min	Max	Mean	SD	N
Affective SJI	1	3	1.51	0.66	7714
Cognitive SJI	0	100	17.60	23.91	7778
Substitution potential					
Low	0	1	0.47		7666
Medium	0	1	0.42		7666
High	0	1	0.11		7666
Women (ref. men)	0	1	0.48		7828
Age					
18–25	0	1	0.05		7828
36–35	0	1	0.18		7828
36–45	0	1	0.24		7828
46–55	0	1	0.33		7828
56–65	0	1	0.20		7828
Living in former West Germany (ref. former East)	0	1	0.73		7828
Foreign (ref. German)	0	1	0.04		7828
Education					
Low	0	1	0.23		7682
Medium	0	1	0.47		7682
High	0	1	0.29		7682
ISEI	16	90	47.79	16.41	7826
Firm tenure (years)	0	50	12.56	10.89	7820
Company size					
< 20	0	1	0.19		7779
20 to < 200	0	1	0.29		7779
200 to < 2000	0	1	0.24		7779
> 2000	0	1	0.28		7779
Fixed term contract (ref. open-ended)	0	1	0.10		7577
Civil service (ref. private sector)	0	1	0.29		7791
Unemployment rate in occupation	0	65	5.76	6.50	7677
Neuroticism					
Low	0	1	0.36		7811
Medium	0	1	0.32		7811
High	0	1	0.32		7811

Data: SOEP v35, year = 2013, own calculations, unweighted.

Table A2: Bivariate linear regression on affective subjective job insecurity.

Variable	b	SE
Substitution potential		
Low (ref.)	-	-
Medium	0.13	(0.070)
High	0.41***	(0.074)
Cognitive SJI	0.49***	(0.015)
Women (ref. men)	-0.03	(0.042)
Age		
18–25	0.06	(0.068)
26–35	-0.01	(0.041)
36–45 (ref.)	-	-
46–55	0.06	(0.034)
56–65	-0.07	(0.045)
Living in former West Germany (ref. former East)	-0.25***	(0.027)
Foreign (ref. German)	0.33***	(0.069)
Education		
Low	0.40***	(0.062)
Medium (ref.)	0.22***	(0.060)
High	-	-
ISEI	-0.17***	(0.025)
Firm tenure (years)	-0.11***	(0.017)
Company size		
< 20 (ref.)	-	-
20 to < 200	0.04	(0.052)
200 to < 2000	-0.03	(0.042)
> 2000	-0.15**	(0.047)
Fixed term contract (ref. open-ended)	0.50***	(0.068)
Civil service (ref. private sector)	-0.42***	(0.051)
Unemployment rate in occupation	0.12***	(0.023)
Neuroticism		
Low	-0.45***	(0.031)
Medium	-0.25***	(0.033)
High (ref.)	-	-

Data: SOEP v35, year = 2013, N = 7,070, own calculations, unweighted, clustered SEs.
Notes: * $p<0.05$, ** $p<0.01$, *** $p<0.001$. The dependent variable as well as ISEI, firm tenure, and unemployment rate are standardized.

Table A3: Full results of the linear regression on affective subjective job insecurity and interaction effects.

Variable	Model 4 b	Model 4 SE	Model 5 b	Model 5 SE	Model 6 b	Model 6 SE
Substitution potential						
Low (ref.)	-	-	-	-	-	-
Medium	0.03	(0.045)	0.08	(0.039)	0.07	(0.047)
High	0.15	(0.076)	0.02	(0.191)	0.12	(0.070)
Cognitive SJI	0.44***	(0.015)	0.44***	(0.015)	0.44***	(0.015)
Women (ref. men)	-0.02	(0.025)	-0.02	(0.025)	-0.02	(0.025)
Age						
18–25	-0.05	(0.102)	-0.07	(0.060)	-0.07	(0.060)
26–35	-0.04	(0.052)	-0.05	(0.035)	-0.05	(0.035)
36–45 (ref.)	-	-	-	-	-	-
46–55	0.08*	(0.035)	0.09***	(0.025)	0.09***	(0.025)
56–65	-0.00	(0.049)	0.01	(0.034)	0.01	(0.035)
Living in former West Germany (ref. former East)	-0.16***	(0.026)	-0.16***	(0.026)	-0.16***	(0.026)
Foreign (ref. German)	0.23***	(0.055)	0.23***	(0.055)	0.23***	(0.055)
Education						
Low	0.20***	(0.035)	0.24***	(0.040)	0.21***	(0.035)
Medium	0.04	(0.028)	0.06	(0.030)	0.04	(0.028)
High (ref.)	-	-	-	-	-	-
ISEI	-0.05**	(0.016)	-0.05**	(0.016)	-0.05**	(0.016)
Firm tenure (years)	-0.01	(0.013)	-0.01	(0.013)	-0.01	(0.013)
Company size						
< 20 (ref.)	-	-	-	-	-	-
20 to < 200	0.10***	(0.030)	0.10***	(0.029)	0.10***	(0.030)
200 to < 2000	0.11***	(0.029)	0.11***	(0.029)	0.11***	(0.029)
> 2000	0.09**	(0.031)	0.09**	(0.031)	0.09**	(0.031)
Fixed term contract (ref. open-ended)	0.12**	(0.045)	0.13**	(0.046)	0.13**	(0.046)
Civil service (ref. private sector)	-0.19***	(0.026)	-0.19***	(0.026)	-0.19***	(0.026)
Unemployment rate in occupation	0.02	(0.012)	0.02	(0.011)	0.02	(0.012)
Neuroticism						
Low	-0.30***	(0.025)	-0.30***	(0.025)	-0.28***	(0.042)
Medium	-0.19***	(0.027)	-0.19***	(0.027)	-0.17***	(0.042)
High (ref.)	-	-	-	-	-	-
Interactions						
Age * Substitution potential						
18–25 * Medium	-0.01	(0.131)				
26–35 * Medium	-0.05	(0.072)				
46–55 * Medium	0.02	(0.053)				
56–65 * Medium	0.04	(0.073)				

	(1)		(2)		(3)	
18–25 * High	-0.08	(0.165)				
26–35 * High	0.04	(0.114)				
46–55 * High	-0.02	(0.101)				
56–65 * High	-0.03	(0.093)				
Education * Substitution potential						
Low * Medium			-0.08	(0.056)		
Medium * Medium			-0.04	(0.051)		
Low * High			0.11	(0.188)		
Medium * High			0.12	(0.198)		
Neuroticism * Substitution potential						
Low * Medium					-0.05	(0.052)
Medium * Medium					-0.06	(0.055)
Low * High					0.00	(0.073)
Medium * High					0.04	(0.087)
Constant	0.13**	(0.046)	0.12**	(0.045)	0.12*	(0.051)
R^2	0.29		0.29		0.29	

Data: SOEP v35, year = 2013, N = 7,070, own calculations, unweighted, clustered SEs.

Notes: * $p<0.05$, ** $p<0.01$, *** $p<0.001$. The dependent variable as well as cognitive SJI, ISEI, firm tenure, and unemployment rate are standardized.

Table A4: Predictive margins of the association between substitution potential and affective SJI by age, education, and neuroticism on affective SJI.

Variable	b	SE	95% CI	p
Age * Low				
18–25	-0.10	(0.093)	[-0.29, 0.08]	0.861
26–35	-0.09*	(0.039)	[-0.16, -0.01]	*Ref.*
36–45	-0.05	(0.029)	[-0.11, 0.01]	0.484
46–55	0.03	(0.025)	[-0.02, 0.08]	0.009
56–65	-0.05	(0.038)	[-0.13, 0.02]	0.483
Age * Medium				
18–25	-0.08	(0.080)	[-0.24, 0.07]	0.791
26–35	-0.11**	(0.036)	[-0.18, -0.04]	*Ref.*
36–45	-0.02	(0.033)	[-0.08, 0.05]	0.087
46–55	0.09**	(0.032)	[0.02, 0.15]	<0.001
56–65	0.02	(0.042)	[-0.07, 0.10]	0.010
Age * High				
18–25	-0.04	(0.119)	[-0.27, 0.19]	0.359
26–35	0.10	(0.074)	[-0.05, 0.24]	*Ref.*
36–45	0.10	(0.070)	[-0.04, 0.23]	0.977
46–55	0.15*	(0.060)	[0.04, 0.27]	0.536
56–65	0.06	(0.083)	[-0.10, 0.22]	0.744
Education * Low				
Low	0.13***	(0.036)	[0.05, 0.20]	*Ref.*
Medium	-0.06*	(0.023)	[-0.10, -0.01]	<0.001
High	-0.11***	(0.023)	[-0.16, -0.07]	<0.001
Education * Medium				
Low	0.12***	(0.037)	[0.05, 0.20]	*Ref.*
Medium	-0.02	(0.027)	[-0.07, 0.03]	<0.001
High	-0.03	(0.037)	[-0.11, 0.04]	0.003
Education * High				
Low	0.25***	(0.055)	[0.14, 0.36]	*Ref.*
Medium	0.08*	(0.036)	[0.01, 0.16]	0.004
High	-0.09	(0.189)	[-0.47, 0.28]	0.062
Neuroticism * Low				
Low	-0.16***	(0.022)	[-0.20, -0.11]	<0.001
Medium	-0.05	(0.029)	[-0.10, 0.01]	<0.001
High	0.12***	(0.035)	[0.05, 0.19]	*Ref.*
Neuroticism * Medium				
Low	-0.13***	(0.028)	[-0.19, -0.08]	<0.001
Medium	-0.03	(0.030)	[-0.09, 0.03]	<0.001
High	0.19***	(0.030)	[0.13, 0.25]	*Ref.*
Neuroticism * High				
Low	-0.03	(0.035)	[-0.10, 0.04]	<0.001
Medium	0.12	(0.060)	[-0.00, 0.23]	0.104
High	0.24***	(0.058)	[0.13, 0.36]	*Ref.*

Data: SOEP v35, year = 2013, N = 7,070, own calculations, unweighted, clustered SEs.
Notes: * p<0.05, ** p<0.01, *** p<0.001. Control variables are cognitive SJI, sex, living in former West or East Germany, born in Germany or abroad, social status, firm tenure, company size, fixed-term or open-ended contract, working in the public or private sector, and the unemployment rate by occupations. The dependent variable is standardized.

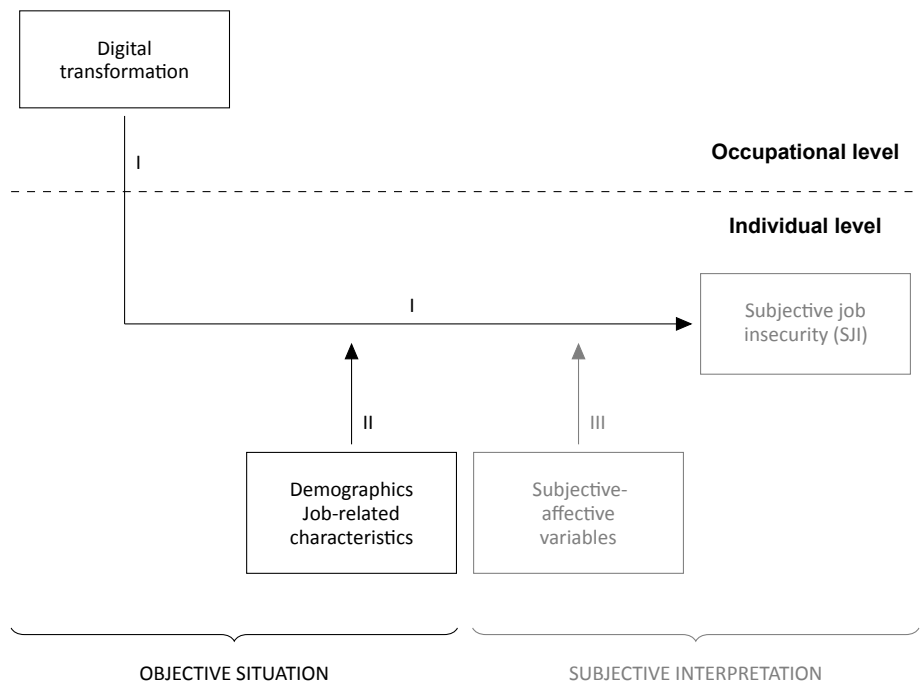**Table A5: Ordered logit model on affective subjective job insecurity.**

Variable	b	SE
Substitution potential		
Low (ref.)	-	-
Medium	0.09	(0.067)
High	0.30**	(0.092)
Cognitive SJI	1.01***	(0.038)
Women (ref. men)	-0.06	(0.066)
Age		
18–25	-0.19	(0.151)
26–35	-0.14	(0.089)
36–45 (ref.)	-	-
46–55	0.23***	(0.066)
56–65	-0.00	(0.090)
Living in former West Germany (ref. former East)	-0.42***	(0.062)
Foreign (ref. German)	0.52***	(0.120)
Education		
Low	0.51***	(0.090)
Medium (ref.)	0.12	(0.077)
High	-	-
ISEI	-0.14***	(0.042)
Firm tenure (years)	-0.03	(0.036)
Company size		
< 20 (ref.)	-	-
20 to < 200	0.24**	(0.074)
200 to < 2000	0.30***	(0.074)
> 2000	0.22**	(0.084)
Fixed term contract (ref. open-ended)	0.28**	(0.107)
Civil service (ref. private sector)	-0.59***	(0.091)
Unemployment rate in occupation	0.04	(0.025)
Neuroticism		
Low	-0.74***	(0.060)
Medium	-0.43***	(0.062)
High (ref.)	-	-
Log likelihood	-5195.85	
Pseudo-R² (McFadden)	0.18	

Data: SOEP v35, year = 2013, N = 7,070, own calculations, unweighted, clustered SEs.
Notes: * p<0.05, ** p<0.01, *** p<0.001. The variables cognitive SJI, ISEI, firm tenure, and unemployment rate are standardized.
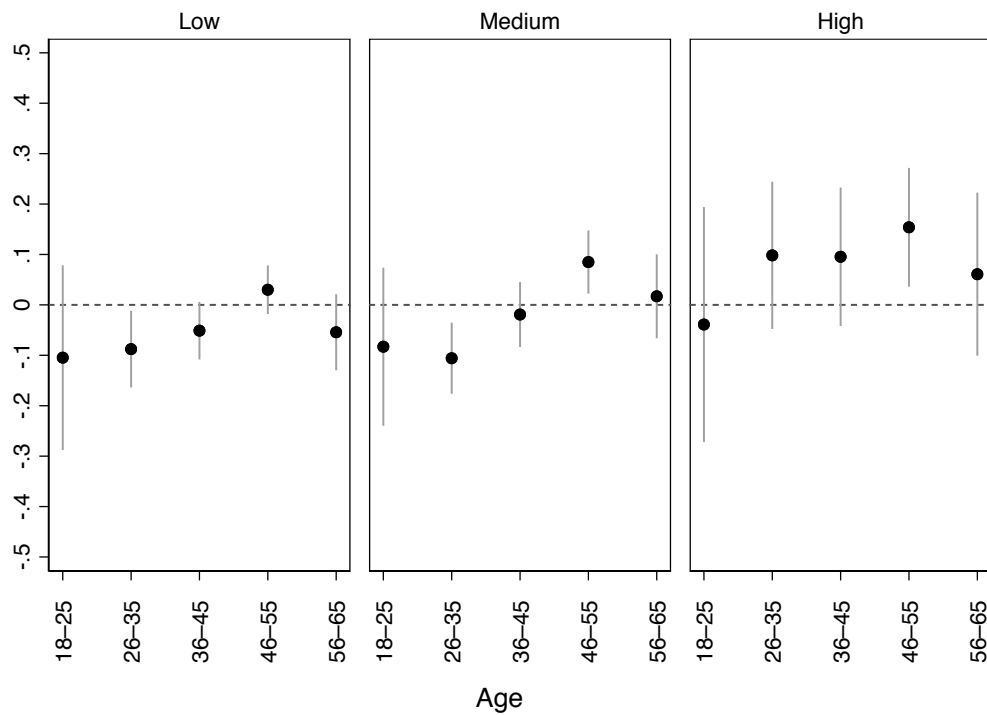
12 Figures

Figure 1: Conceptual framework.

Digital transformation	

Occupational level

Individual level

I

I

II

III

Subjective job insecurity (SJI)

Demographics
Job-related
characteristics

Subjective-
affective
variables

OBJECTIVE SITUATION

SUBJECTIVE INTERPRETATION

Note: Own illustration.

Figure 2: Predictive margins of the association between substitution potential and affective SJI by age.
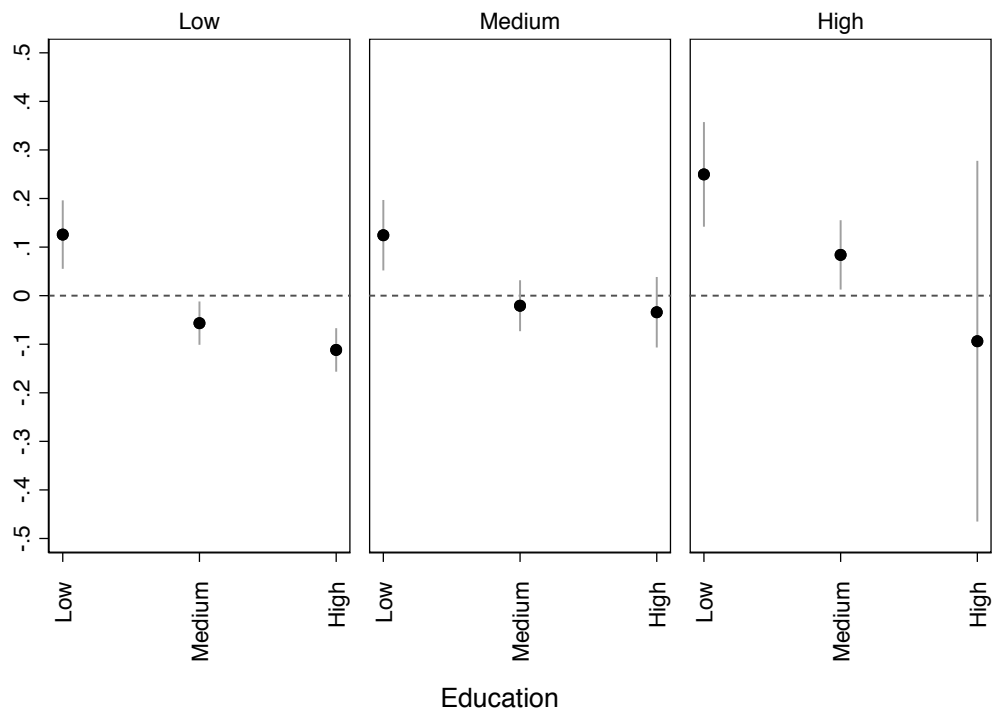

Data: SOEP v35, year = 2013, own calculations, unweighted, clustered SEs.
Notes: 95 % confidence intervals. Control variables are cognitive SJI, sex, living in former West or East Germany, born in Germany or abroad, social status, firm tenure, company size, fixed-term or open-ended contract, working in the public or private sector, and the unemployment rate by occupations.
The dependent variable is standardized.

Figure 3: Predictive margins of the association between substitution potential and affective SJI by level of education.
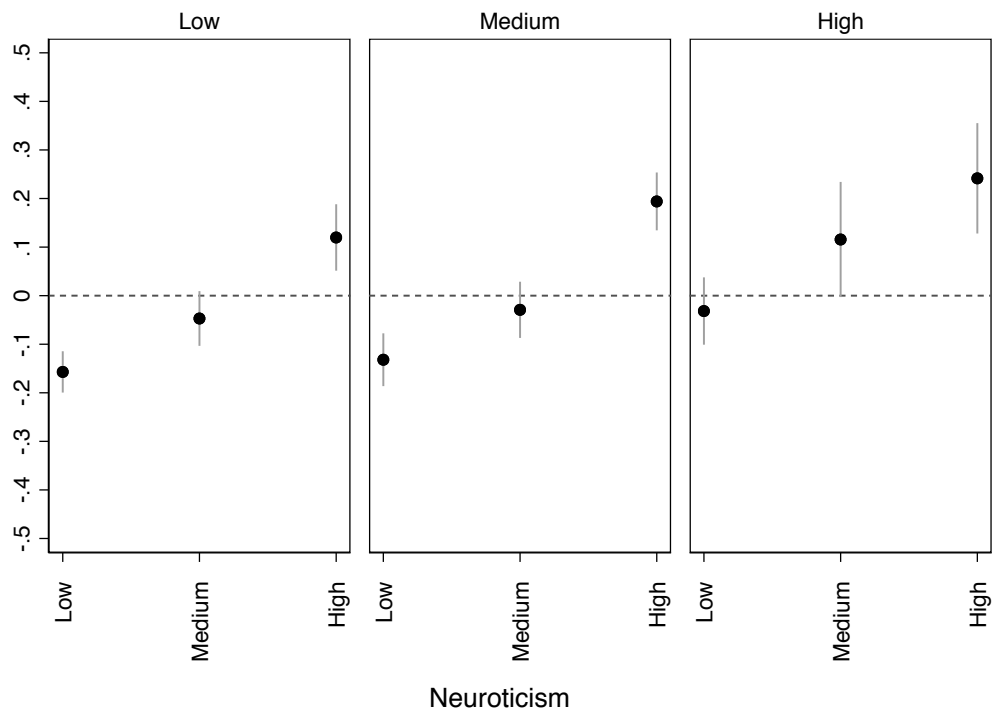

Data: SOEP v35, year = 2013, own calculations, unweighted, clustered SEs.
Notes: 95 % confidence intervals. Control variables are cognitive SJI, sex, living in former West or East Germany, born in Germany or abroad, social status, firm tenure, company size, fixed-term or open-ended contract, working in the public or private sector, and the unemployment rate by occupations.
The dependent variable is standardized.

Figure 4: Predictive margins of the association between substitution potential and affective SJI by level of neuroticism.

Data: SOEP v35, year = 2013, own calculations, unweighted, clustered SEs.
Notes: 95 % confidence intervals. Control variables are cognitive SJI, sex, living in former West or East Germany, born in Germany or abroad, social status, firm tenure, company size, fixed-term or open-ended contract, working in the public or private sector, and the unemployment rate by occupations.
The dependent variable is standardized.