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Worrying about work? Disentangling the relationship between economic insecurity and mental health

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Paul Fiedler

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Worrying about work? Disentangling the relationship between economic insecurity and mental health

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Abstract

Literature encompassing economic insecurity and its relationship with mental health has increased significantly in recent years. While the association of job insecurity and mental health has been researched extensively, less is known about the general relationship between economic insecurity and mental health. This paper analyses the simultaneous influence of six different economic insecurity indicators on mental health focusing on private sector employees. Using German longitudinal micro-data and applying a fixed effects model, this paper finds a significant negative relationship between a broad range of economic insecurity factors and mental health. Specifically, the relationship stems from self-perceived risks such as economic anxiety and job insecurity as opposed to macro-economic anxiety or objective factors, such as workforce reductions or substantial income losses. This strongly suggests that subjective measures of economic insecurity matter more for mental health than objective ones. Furthermore, the empirical results are robust with respect to various model specifications. From a policy perspective, this paper calls for improved provision of mental health services and also an increased awareness of mental health problems combined with generally de-tabooing the discussion of mental health.

JEL Classification: I14, I31, J01

Keywords: mental health, economic insecurity, fixed effects, private sector employees, SOEP

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1. Introduction

Mental health receives increased attention in economic literature. Yet, this topic is predominantly treated as a social taboo (Prince et al., 2007; Seven et al., 2021). Understanding the definition of mental health is as crucial as learning more about its economic influence. Mental health is not only the mere absence of mental disorders but rather "a state of well-being whereby individuals recognize their abilities, are able to cope with the normal stresses of life, work productively and fruitfully, and make a contribution to their communities" (World Health Organization [WHO], 2003, p.7). These four aspects of mental health are important considerations for individuals and have meaningful consequences for economies. That is, any action that impairs an individual's mental health also impairs their ability to contribute to society. Subsequently, investing in better mental health creates multifaceted benefits for individuals and societies. First, better mental health reduces the costs associated with absenteeism and increases employees' productivity and efficiency (WHO, 2003, 2013). Second, improving mental health decreases a major public health problem, lowers health care costs, and reduces health inequalities (McDaid, 2011; WHO, 2003, 2014). Third, individuals diagnosed with mental disorders may be helped earlier with their condition, reducing the number of individuals suffering from these disorders and decreasing their risk of attempted suicide (Too et al., 2019). Lastly, individuals suffering from mental disorders are at a higher risk of committing violent and non-violent crimes compared to individuals without (Hodgins, 2006). By improving their mental health, the likelihood of them committing crimes may be lowered, relieving the executive and judicial system.

Identifying which economic factors are related to worse mental health helps to determine where intervention may be needed. For example, unemployment has repeatedly been linked to and proven to cause worse mental health for individuals (Murphy & Athanasou, 1999; Paul & Moser, 2009) and worries about potential unemployment have also been negatively associated with mental health and well-being (Cheng & Chan, 2008). Nevertheless, worrying about unemployment is one of many sources of economic insecurity – a topic that is more relevant now than ever.[1] Yet, no consensus surrounding its definition exists so far. Combining previous terms, Bossert and D'Ambrosio (2013, p.1018) coin economic insecurity as "the anxiety produced by the possible exposure to adverse economic events and by the

[1] In light of the 2008–2009 financial crisis, people were more insecure about their current and future economic situation (D'Ambrosio & Rohde, 2014) and also feel economically less secure during the COVID-19 pandemic (Bareket-Bojmel et al., 2020). Furthermore, due to the COVID-19 pandemic, increased job insecurity is associated with greater depressive symptoms and financial concerns are linked to higher anxiety symptoms (Wilson et al., 2020).

anticipation of the difficulty to recover from them", which is the definition used in this paper. For example, unemployment is such an adverse economic event, where the fear of becoming unemployed is the anxiety generated by the potential exposure. Nonetheless, many other instances lead to economic insecurity, such as expecting an economic recession, being concerned about increased public debt levels, co-workers being laid off, or fearing a demotion. These worries of adverse events negatively affect the economic security of an individual and are expected to be related to worse mental health.

The relationship between economic insecurity, especially self-perceived (subjective) job insecurity, and mental health is well documented in economic literature. However, to the author's best knowledge, the simultaneous impact of multiple sources of economic insecurity on mental health has been neglected so far. Employing multiple economic insecurity measures at the same time enables to investigate how coinciding economic insecurity events are related to mental health. Therefore, this paper adds to existing literature by disentangling the relationship between economic insecurity and mental health, allowing for a simultaneous influence of various economic insecurity factors. This helps to identify which sources of economic insecurity shape mental health, assisting with the establishment and implementation of intervention programs and cost-effective policies.

Using longitudinal data from the latest version of the German Socio-Economic Panel (SOEP), this paper finds a significant negative association between an array of economic insecurity measures and mental health in private sector employees. It highlights that subjective measures of economic insecurity matter more for mental health than objective indicators.[2] Particularly, self-perceived risks such as economic anxiety, job insecurity, and financial dissatisfaction are all negatively associated with mental health, while workforce reductions or substantial income losses do not exhibit a significant negative relationship. Furthermore, public sector employees and civil servants show weaker relationships between economic insecurity and mental health than private sector employees. Policies aimed at alleviating the negative mental health effects of economic insecurity may raise the productivity levels of vulnerable (private sector) employees and simultaneously increase social welfare.

The following section provides a brief overview of findings from previous studies. Next, section 3 introduces the dataset and describes important variables. Section 4 explains the empirical strategies employed in this paper and section 5 presents the findings along with several robustness checks. Lastly, section 6 summarises, provides policy recommendations, and suggests avenues for future research.

[2] Subjective measures of economic insecurity are based on individuals' feelings and thoughts, whereas objective measures depend on factors that are outside the control and the influence of individuals.

2. Related Literature

A multitude of studies have established a negative causal effect of unemployment on individuals' mental health and wellbeing (Blakely et al., 2003; Cygan-Rehm et al., 2017; Gathergood, 2013; Green, 2011; Stauder, 2019), whereas some studies find no evidence for causality (Roulet, 2017; Salm, 2009; Schmitz, 2011). For a comprehensive review of the relationship between unemployment experience and mental health on an individual level, see the meta-studies by Murphy and Athanasou (1999) as well as Paul and Moser (2009).[3]

Apart from unemployment, worries about potential job loss also relate to worse mental health. While many factors cause economic insecurity, the negative relationship between self-perceived job insecurity and mental health has been documented most extensively in economic and psychological literature. It has been found in Australia, Germany, Great Britain, and many other countries (Burgard et al., 2009; Cheng & Chan, 2008; Cottini & Ghinetti, 2018; Dekker & Schaufeli, 1995; Godin et al., 2005; Klug, 2020; Meltzer et al., 2010; Otterbach & Sousa-Poza, 2016; Watson & Osberg, 2018). Additionally, Bünnings et al. (2017) provide evidence for spillover effects of self-perceived job insecurity on spouses' mental health. That is, if an individual feels insecure about their job, their own and their spouse's mental health are negatively related to job insecurity.

Whereas most studies primarily analyse the mental health effects of work-related economic insecurity, studies focusing on other economic insecurity sources find additional factors that are related to worsened mental health. Kopasker et al. (2018) use British panel data to identify the causal impact of different aspects of economic insecurity. In their analysis, they investigate the effects of self-perceived job insecurity, subjective financial insecurity, and two objective indicators related to income losses. Using a fixed effects model, they find that job and financial insecurity are associated with a decrease in mental health while objective factors do not yield any significant results. Additionally, employing an instrumental variable approach, the authors find a significant negative effect of subjective job insecurity on mental health in men, finding no significant effects in women. However, the different measures of economic insecurity are not taken into account simultaneously potentially biasing their analysis due to endogeneity concerns. These arise when the error term is related to an independent variable, for example when an omitted variable is correlated with the relevant independent variable (Wooldridge, 2019).

[3] On the aggregate level, Frasquilho et al. (2016) conduct a meta-study analysing the impact of higher unemployment rates on population-wide mental health outcomes in several European countries due to the 2008–2009 financial crisis.

Rohde et al. (2016) analyse the individual impact of eight different sources of economic insecurity on mental health in Australia, split up into subjective indicators, objective indicators, and probabilistic indicators. Subjective indicators cover financial dissatisfaction, the ability to raise emergency funds, and self-perceived job insecurity, whereas objective indicators consist of two separate income stream indices. In addition, three probability indicators predicting the likelihood of financial strain, a significant income loss, and unemployment the following year are included in their analysis. Using fixed effects, Rohde et al. (2016) find that subjective indicators yield the strongest negative relation, followed by probabilistic measures, whereas the income stream indices do not display any signs of a relationship with mental health. These results, if generalisable, suggest that subjective factors of economic insecurity matter more for mental health than objective measures. Nonetheless, as in Kopasker et al. (2018), the economic insecurity indicators do not enter the regression estimation simultaneously, potentially rendering their analysis biased due to endogeneity concerns.

In a study using longitudinal data for Germany, Reichert and Tauchmann (2017) hypothesise that firm-specific workforce reductions are negatively linked to individual mental health. Estimating this relationship using a fixed effects approach and focusing on private sector employees, they find evidence supporting their hypothesis. Indeed, workforce reductions within companies are negatively related to the mental health of individuals who continue working at that company. Their findings also seem to be robust and significant against several specifications presented. Additionally, using workforce reduction as a mediating variable for subjective job insecurity, the authors find a more pronounced effect of job insecurity on mental health than in their fixed effects model. However, it is unknown whether the negative relationship between workforce reductions and mental health persists if controlling for the simultaneous influence of other factors of economic insecurity.

3. Data

3.1. Dataset and Sample Restrictions

This paper uses data from the German Socio-Economic Panel (SOEP, 2019). The SOEP is a large-scale, longitudinal household survey, representative of the German population and is collected annually since 1984 (Goebel et al., 2019). It currently covers around 35,000 individuals from roughly 20,000 households (Britzke & Schupp, 2019). The SOEP collects a wide range of information about individuals and households including their financial situation, working environment, mental health status as well as

their attitudes and opinions about various topics. The dependent variable, a mental health indicator, is collected every two years within the SOEP surveys since 2002. This limits the analysis to even-numbered years from 2002 to 2012.[4] Furthermore, this paper only considers working-age individuals, that is from 18 years to 65 years of age. As an additional restriction, only individuals with a continuous employment history between 2002 and 2012 (including the years in between) are considered, to alleviate concerns arising from unemployment in odd-numbered years. The main empirical analysis focuses on employed individuals that are possibly subject to economic insecurity. Therefore, self-employed individuals are omitted from the analysis as they cannot be laid off and work on their own terms. Moreover, civil servants are excluded because they have special legal protection.[5] Similarly, public sector employees are disregarded in the main analysis because they generally have better dismissal protection than private sector employees, though their protection is not as strong as that of civil servants.[6] Lastly, individuals with only one observation throughout the observed period and those with a missing observation in at least one of the variables described below are excluded from the analysis as well. This results in an estimation sample consisting of 3,984 individuals covering 12,567 person-year observations.

While civil servants and public sector employees are not considered in the main analysis, section 5.4 investigates whether heterogeneous effects between these groups exist. Supposing that the dismissal protection of civil servants and public sector employees safeguards them from economic insecurity, it is expected that private sector employees are most vulnerable to economic insecurity, followed by public sector employees, and then civil servants.

3.2. Mental Health Indicator

The dependent variable of the analysis is the mental component summary scale (MCS)[7], a mental health indicator whose information is collected biennially in SOEP surveys since 2002. The MCS is based on 12 questions covering areas such as social functioning, psychological wellbeing as well as general health and is constructed using explorative factor analysis (see Andersen et al., 2007). These questions

[4] One of the independent variables of interest, *workforce reduction*, is only available until 2013 (see section 3.3.1).

[5] Civil servants are protected against dismissal since they dedicate their entire working career to the public service and are thus permanently employed (Federal Ministry of the Interior, 2014).

[6] Although public sector employees are employed based on private law contracts, they have better dismissal protection than private sector employees because specific working conditions for public sector employees are laid down in collective agreements between public employers and the responsible unions (Federal Ministry of the Interior, 2014). This places them between civil servants and private sector employees in terms of dismissal protection.

[7] The terms “mental health score”, “MCS score”, and “MCS” are used interchangeably in this paper.

predominantly cover the period four weeks prior to an individual's interview (see Table A1 in Appendix A). Furthermore, the MCS ranges from 0 to 100, where higher values are indicative of better mental health. Lastly, it is standardised to have a mean of 50 and a standard deviation of 10, based on the SOEP population of the 2004 wave (Andersen et al., 2007). Although the MCS is based on survey questions, it has been demonstrated to be a valid measure of individual mental health and proven to be reliable at detecting the prevalence of depressive disorders (Gill et al., 2007; Salyers et al., 2000; Vilagut et al., 2013).

3.3. Economic Insecurity Variables

Economic insecurity is a complex concept caused by a multitude of events and influenced by objective as well as subjective characteristics (Osberg, 1998). To cover as many of these possible sources, this paper differentiates between six sources of economic insecurity at the individual and the household level. Similar to Rohde et al. (2016), these indicators are selected either due to having been discussed in the relevant literature before or being intuitively connected to the topic. The economic insecurity indicators used in this analysis are split up into two main categories: (1) objective measures, covering workforce reductions and income drops, and (2) subjective measures, consisting of economic anxiety, macroeconomic anxiety, job insecurity, and financial dissatisfaction.

3.3.1. Objective economic insecurity

Workforce reduction Based on the findings of Reichert and Tauchmann (2017) a dichotomous variable, *workforce reduction*, is constructed, specifying how the number of employees at an individual's workplace has changed over the past year. Specifically, it takes the value '1' if a firm-specific reduction of the workforce has taken place and '0' otherwise. An individual working in a company where a workforce reduction occurs may feel less secure about their current job and develop worries about their job safety, presumably relating to worse mental health. However, individuals who experience co-workers losing their jobs need not fear about their job security, provided they do not anticipate being laid off. That is, if one company department reduces its workforce, this does not imply that a person working in a different division also expects their department to lay off employees. Thus, the relationship between *workforce reduction* and mental health is presumed to be either negative or neutral. Information on this variable is not available in 2006 and its collection has stopped after 2013, limiting the data analysis to the SOEP survey waves of 2002, 2004, 2008, 2010, and 2012.

Income drop In addition to *workforce reduction*, this analysis contains a binary indicator related to household income dynamics based on Hacker et al. (2014), similar to Rohde et al. (2016) and Kopasker et al. (2018).[8] The dichotomous *income drop* (ID) variable is constructed as follows:

$$ID_{it} = \begin{cases} 1 & \text{if} \quad y_{ht} < 0.75 \cdot y_{ht-1} \ \wedge \ y_{ht} < \bar{y}_{ht} = \frac{1}{T}\sum_{t=1}^{T} y_{ht} \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

where ID_{it} is the income drop indicator for individual i living in household h in year t, y_{ht} the income of household h in year t, and T the number of years the household is observed between 2001 and 2012.[9] Information from odd-numbered years is used to calculate ID_{it} to compare the current household income to the income of one year prior instead of two years. This creates a more precise measure of income losses. Thus, equation 1 states that *income drop* turns '1' for every individual within a household if the household income decreases by more than 25% compared to the previous year *and* if the current household income is lower than the average household income over the period in which the household is observed. The main idea behind this variable is that an income loss leads to lower financial security and stability, which may cause anxiety and thereby negatively affect mental health.

3.3.2. Subjective economic insecurity

In addition to the two objective indicators, this paper includes four subjective measures of economic insecurity.

Economic anxiety The first set of variables addresses the assessment of an individual's economic situation. It is based on a SOEP survey question asking respondents about their degree of concern with respect to their economic situation (very concerned, somewhat concerned, or not at all concerned). To discern between the extent to which individuals are concerned, three binary variables are constructed– *much economic anxiety*, *some economic anxiety*, and *no economic anxiety*, where the latter serves as the baseline.[10] *Much economic anxiety* takes on a value of '1' if an individual is very concerned about their economic situation and '0' otherwise. Similarly, *some economic anxiety* equals '1' if an individual

[8] This paper focuses on household labour dynamics because certain households have the opportunity to combine resources and pool insecurity risks, serving as a buffer against individual income losses (Osberg, 2015; Romaguera-de-la-Cruz, 2020).

[9] In order to compare the income from 2002 to that of one year prior, 2001 is the first year used in this calculation.

[10] Collapsing the information from this question into a single binary variable leaves the outcome qualitatively unchanged but results in different effect sizes.

is somewhat concerned about their economic situation and '0' otherwise. Lastly, *no economic anxiety* is equal to '1' if an individual is not all concerned about their economic situation and '0' otherwise.

Macroeconomic anxiety Next to economic anxiety, worries about the economy may also affect an individual's mental health.[11] The SOEP survey includes a question asking respondents how concerned they are with the general economic development. Identical to economic anxiety, *much macroeconomic anxiety* equals '1' if an individual is very concerned ('0' otherwise), *some macroeconomic anxiety* is equal to '1' if they are somewhat concerned ('0' otherwise), and *no macroeconomic anxiety* equals '1' if they are not at all concerned about the economy in general ('0' otherwise). Again, *no macroeconomic anxiety* serves as the reference group. Due to the macroeconomic nature of this set of indicators, it serves as a proxy for subjective macroeconomic insecurity and is expected to be negatively related to mental health. In addition to these subjective measures, federal state indicators are used to control for differences in the regional macroeconomic environment (see Table A2 in Appendix A). Similarly, the use of year dummies captures yearly country-wide measures of economic activity, such as the unemployment rate or the gross domestic product.

Job insecurity Self-perceived job insecurity creates concerns about current employment and future income flows, reflecting contemporary as well as prospective worries about economic and financial security. Like the economic anxiety variables, this measure of economic insecurity is based on a survey question asking employed respondents how concerned they are with their job security. *Much job insecurity* is coded to be equal to '1' if an individual states to be very concerned about their job security and '0' otherwise. *Some job insecurity* equals '1' if an individual is somewhat concerned about their job security and '0' otherwise. Moreover, *no job insecurity* is coded analogously and serves as the reference group.[12]

Financial dissatisfaction Finally, this paper also includes a measure of financial dissatisfaction. Respondents of the SOEP are asked to answer how satisfied they are with their current household income, where '0' refers to full dissatisfaction and '10' to complete satisfaction. This 11-point Likert scale is then inverted (the original value is subtracted from 10) to create a measure of financial

[11] Consider an individual anticipating a recession and worrying about higher unemployment rates. Even if an individual is not concerned about their economic situation, the expected changes in the macroeconomic environment might affect friends, relatives, or other people an individual cares about.

[12] Collapsing these three economic insecurity factors into binary regressors such that they equal '1' if an individual reports at least some (many) concerns about the respective variable and '0' if they have no (some or no) concerns, alters the quantitative results marginally but leaves the conclusions qualitatively unchanged.

dissatisfaction equivalent to Rohde et al. (2016), where higher values indicate a lower satisfaction of household income. Financially dissatisfied individuals may have financial worries leading to financial strain, which is a significant stressor of mental health (Sturgeon et al., 2016). Therefore, *financial dissatisfaction* is expected to be negatively related to mental health. Although it is ordinal, it can be approximated as a continuous variable and used in parametric analyses, such as regressions, without qualitatively affecting the outcomes (Johnson & Creech, 1983; Norman, 2010; Sullivan & Artino, 2013).

3.4. Control Variables

Apart from the economic insecurity measures, a broad range of control variables enters the analysis as well. Individual controls capture usual socio-economic characteristics, such as sex, age, or marital status and a vector of household controls covers household-specific features, such as the size of the household. Additionally, work-related controls capture job-related differences, for example, the weekly hours an individual works and their job satisfaction. Lastly, to control for time trends and regional heterogeneity, a set of year dummies and federal state indicators are also included in the analysis. Table A2 in Appendix A provides a comprehensive description of the control variables.

3.5. Summary Statistics

Table 1 reports the descriptive statistics for the main variables of interest. According to it, the average MCS of the sample is around 50.3, close to the overall SOEP mean. Macroeconomic anxiety is the most persistent source of economic insecurity, collectively affecting more than 90 percent of individuals, whereas at least some economic anxiety is reported by nearly 75 percent of respondents. Further, 28 percent of the sample report a workforce reduction occurring at their workplace, and barely 5 percent suffer from an income drop. Job insecurity also matters, affecting roughly 60 percent of the sample. The average financial dissatisfaction level is around 3, implying that individuals seem to be generally content with their household income, though some individuals report being completely dissatisfied with it. Summary statistics for the control variables and the reference group of the economic insecurity variables are in Table A3 in Appendix A. As stated in it, roughly 36 percent of the sample is female, with the average age being 43 years. Close to two-thirds of the sample are white-collar workers and almost all employees work under a permanent contract.

Table 1: Summary statistics of the relevant variables

	Mean	St. Dev.[a]	Median	Minimum	Maximum
Dependent variable					
Mental health score (MCS)	50.342	8.904	51.720	7.736	77.77
Key explanatory variables					
Workforce reduction	0.280	0.449	0	0	1
Income drop	0.051	0.220	0	0	1
Much economic anxiety	0.177	0.382	0	0	1
Some economic anxiety	0.571	0.495	1	0	1
Much macroeconomic anxiety	0.342	0.474	0	0	1
Some macroeconomic anxiety	0.579	0.494	1	0	1
Much job insecurity	0.147	0.354	0	0	1
Some job insecurity	0.461	0.499	0	0	1
Financial dissatisfaction	3.358	1.958	3	0	10

Note. Calculations based on SOEP v35 data (SOEP, 2019). This table covers the dependent variable and key explanatory variables. The sample includes 12,567 observations for 3,984 continuously employed private sector employees. Individuals with less than two responses are excluded. Summary statistics for the covariates are found in Table A3 in Appendix A.
[a] St. Dev. – standard deviation.

4. Empirical Strategy

4.1. OLS Regression Model

To test for the general relationship between economic insecurity and mental health, the MCS is regressed on a set of economic insecurity indicators and vectors of control variables using an ordinary least squares (OLS) estimation, yielding the following regression equation:

$$\begin{aligned} MCS_{it} = \; & \alpha_1 + \beta_1 WR_{it} + \beta_2 ID_{it} + \beta_3 MEA_{it} + \beta_4 SEA_{it} + \beta_5 MMA_{it} + \beta_6 SMA_{it} \\ & + \beta_7 MJI_{it} + \beta_8 SJI_{it} + \beta_9 FD_{it} + X_{it}\delta + X_{ht}\lambda + W_{it}\varphi + Z_i\zeta + \gamma_t + \varepsilon_{it} \end{aligned} \tag{2}$$

where MCS_{it} is the mental health score of individual i in period t and α_1 the constant of the regression. The following nine variables are the economic insecurity indicators, with WR_{it} referring to *workforce reduction*; ID_{it} to *income drop*; MEA_{it} to *much economic anxiety*; SEA_{it} to *some economic anxiety*; MMA_{it} to *much macroeconomic anxiety*; SMA_{it} to *some macroeconomic anxiety*; MJI_{it} to *much job*

insecurity; SJI_{it} to *some job insecurity*; and FD_{it} to *financial dissatisfaction*, all for individual i in period t. Additionally, MCS_{it} is regressed on multiple vectors of control variables that are potentially correlated with mental health. These are X_{it}, a vector of time-varying individual characteristics, such as age or living with a partner; X_{ht}, which includes time-variant household controls; W_{it}, a vector of time-varying work-related controls, such as company size or weekly hours worked; Z_i, a vector of time-consistent individual factors such as sex or migration status; and γ_t, a set of year dummies controlling for time trends. Lastly, ε_{it} is a random error term. To account for potential heteroskedasticity, standard errors are clustered at the household level. Adding controls to the OLS estimation allows for observable differences in individuals. Nevertheless, endogeneity concerns from unobserved heterogeneity such as personality traits or personal characteristics may bias the OLS estimates. Section 5 presents the results.

4.2. Fixed Effects Regression Model

As opposed to the OLS regression, applying fixed effects (FE) eliminates any bias originating from time-invariant variables, thereby reducing endogeneity concerns. Thus, any variable that is constant over time, observed or not, is captured by the fixed effects model. This yields the following FE model:

$$\begin{aligned} MCS_{it} = \; & \alpha_i + \beta_1 WR_{it} + \beta_2 ID_{it} + \beta_3 MEA_{it} + \beta_4 SEA_{it} + \beta_5 MMA_{it} + \beta_6 SMA_{it} \\ & + \beta_7 MJI_{it} + \beta_8 SJI_{it} + \; \beta_9 FD_{it} + \tilde{X}_{it}\delta + X_{ht}\lambda + \widetilde{W}_{it}\varphi + \gamma_t + u_{it} \end{aligned} \tag{3}$$

where MCS_{it} is the mental health score of individual i at period t and α_i an individual fixed effect. Correspondingly, the first nine variables on the right-hand side as well as X_{ht} and γ_t are analogous to the ones from equation 2. The vector of coefficients, ζ, from equation 2 is not determined in the FE estimation because the covariates Z_i do not exhibit any variation throughout time. Additionally, the FE model excludes characteristics that display minor variation over time (*years of education* and its squared term as well as *federal state of residence*) and *age* because of its collinearity with the set of year dummies. This results in reduced sets of individual and work-related controls, $\tilde{X}_{it}$ and $\widetilde{W}_{it}$, respectively. Finally, u_{it} is a random error term and standard errors are clustered at the household-level to account for potential heteroskedasticity.

Although endogeneity concerns can be overcome in the FE estimation, the issue of reverse causality cannot be addressed sufficiently. Whereas it seems likely that economic insecurity harms an individual's mental health, the opposite may be true as well. A person that is mentally less healthy cannot work as efficiently as they would like to, impairing their ability and reducing their productivity at work (WHO,

2003). Superiors observing this behaviour may consider demoting that person. The belief and fear of being demoted may build up anxiety, adversely affecting mental health. This vicious circle would then continue until the employee is either demoted or manages to escape it with the help of outside assistance, such as therapy for example.

4.3. Expected Findings

According to Reichert and Tauchmann (2017), workforce reductions are negatively associated with mental health when considered independently. If their results are robust to controlling for other economic insecurity sources, *workforce reduction* is expected to yield the same outcome in this analysis. However, experiencing a workforce reduction may increase an individual's self-perceived job insecurity at the same time, possibly weakening the relationship between workforce reduction and mental health. Therefore, *workforce reduction* is expected to either exhibit a negative or a neutral relationship with mental health. Similarly, lower financial security resulting from an income loss may cause anxiety and negatively affect mental health. Yet, recent evidence suggests that income losses are not significantly related to worse mental health in fixed effects models (Kopasker et al., 2018; Rohde et al., 2016). Thus, *income drop* is expected to be either significantly negatively associated with mental health or yield a neutral relationship.

Economic anxiety increases an individual's worries about their economic situation, decreasing their perceived economic security and presumedly negatively relating to mental health. Similarly, individuals concerned about the macroeconomic development may build up anxiety due to increased worries about a recession occurring. Individuals fearing a recession may also worry more about their economic situation. Therefore, the simultaneous usage of multiple economic insecurity indicators may capture some of the negative relationship between macroeconomic anxiety and mental health. Job insecurity has consistently been linked to worse mental health when considered independently (Kopasker et al., 2018; Rohde et al., 2016). Accounting for the simultaneous impact of different economic insecurity sources may weaken the negative association with mental health. However, using workforce reduction as a mediating variable for subjective job insecurity, Reichert and Tauchmann (2017) found that self-perceived job insecurity was more negatively associated with mental health than workforce reductions. Thus, it is expected that the relationship between subjective job insecurity and worse mental health persists. Finally, according to the findings of Rohde et al. (2016), *financial dissatisfaction* is also presumed to be negatively related to mental health. Intuitively, individuals currently dissatisfied with their household income may feel financially less secure and be more vulnerable to economic insecurity.

Table 2: Expected relationship between mental health and economic insecurity

Variable	*Expected effect*	*Source*
Workforce reduction	$\beta_1 \leq 0$	Reichert & Tauchmann (2017)
Income drop	$\beta_2 \leq 0$	Kopasker et al. (2018), Rohde et al. (2016)
Economic anxiety	$\beta_3 < \beta_4 < 0$	This paper
Macroeconomic anxiety	$\beta_5 < \beta_6 < 0$	This paper
Job insecurity	$\beta_7 < \beta_8 < 0$	Kopasker et al. (2018), Rohde et al. (2016)†
Financial dissatisfaction	$\beta_9 < 0$	Rohde et al. (2016)

Note. Coefficients refer to those of equation 2 and equation 3.

† Burgard et al. (2009), Cheng & Chan (2008), Cottini & Ghinetti, (2018), Dekker & Schaufeli (1995), Godin et al. (2005), Klug (2020), Meltzer et al. (2010), Otterbach & Sousa-Poza (2016), Reichert & Tauchmann (2017), and Watson & Osberg (2018).

Based on previous findings and intuitive explanations, Table 2 presents and summarises the expected relationship between each economic insecurity measure and the mental health score. Generally, the objective indicators *workforce reduction* and *income drop* are expected to either yield a negative or a neutral relationship with mental health. On the contrary, the subjective economic insecurity measures *economic anxiety*, *macroeconomic anxiety*, *job insecurity*, and *financial dissatisfaction* are all expected to be significantly negatively related to mental health, with more exposure to economic insecurity assumed to generate a stronger negative association.

5. Results

5.1. OLS Estimation Results

Table 3 presents the estimated results from the OLS estimation. These results imply that a broad range of economic insecurity indicators is negatively related to mental health, which is mostly in accordance with expectations. Specifically, income drops, economic anxiety, *some* macroeconomic anxiety, job insecurity, and financial dissatisfaction are all associated with worse mental health. Progressively adding more control variables to the regression has a minor impact on the qualitative conclusions. However, once all covariates are controlled for, workforce reductions seem to be positively associated with mental health, and *some macroeconomic anxiety* is more negatively related to mental health than *much macroeconomic anxiety*. The full regression output for the specification with all control variables included (column 4) is shown in Table B1 in Appendix B.

Table 3: Estimated OLS effects of economic insecurity on mental health

Dependent variable: MCS	(1)	(2)	(3)	(4)
Workforce reduction	-0.224	-0.271	-0.266	0.316*
Income drop	-0.905**	-0.883**	-0.527	-0.785**
Much economic anxiety	-3.040***	-2.965***	-3.192***	-3.069***
Some economic anxiety	-1.520***	-1.528***	-1.575***	-1.571***
Much macroeconomic anxiety	-0.534	-0.735**	-0.428	-0.476
Some macroeconomic anxiety	-0.976***	-1.042***	-0.914***	-0.790**
Much job insecurity	-2.246***	-2.325***	-2.562***	-1.320***
Some job insecurity	-0.999***	-1.034***	-1.136***	-0.675***
Financial dissatisfaction	-0.798***	-0.801***	-0.843***	-0.331***
Year & region controls	No	Yes	Yes	Yes
Individual & household controls	No	No	Yes	Yes
Work-related controls	No	No	No	Yes
Observations	12,567	12,567	12,567	12,567
Adjusted R^2	0.087	0.095	0.112	0.192

Note. Calculations based on SOEP v35 data (SOEP, 2019). Standard errors are clustered at the household level yet unreported. *MCS* – mental health indicator. Column 1 includes no controls. In column 2, a set of year dummies and federal state indicators enter the regression. Column 3 adds controls on the individual level (*sex*, *migration status, age*, *age*^{2}, *years of education*, *years of education*^{2}, *marital status*, *living with a partner*, *losing a close person*, *becoming a parent*, *recently married*, and *recently divorced*) and household level (*number of children 16 and younger*, *household size*, and *yearly net household income*). Lastly, column 4 adds work-related controls (*job dissatisfaction, tenure*, *company size*, *occupation status*, *side job*, *temporary work contract*, *working full-time*, and *weekly hours worked*). Results for covariates are omitted. Table B1 in Appendix B reports regression results for column 4 with all controls included.
Asterisks denote significance levels such that: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The coefficient of *workforce reduction* is insignificantly negative until work-related controls enter the regression. Unexpectedly, the coefficient turns positive, albeit with weak significance, implying that workforce reductions are related to better mental health. This finding suggests that the simultaneous usage of multiple economic insecurity indicators captures the relationship between *workforce reduction* and the MCS score. However, alternative explanations cannot be ruled out. For example, this unforeseen result may be explained by social work relationships because mental health is, inter alia, shaped and influenced by such relationships (Nolen-Hoeksema, 2013). Individuals that have an unhealthy work relationship with a colleague that loses their job may welcome the outcome, improving their mental health. On the other hand, individuals experiencing a workforce reduction may feel more secure about

their current job because they face less internal competition since their laid-off co-workers no longer compete with them. Less internal competition is associated with healthier workplaces (Pfeffer, 2018) and may also relate to better mental health. If either of these hypotheses is true, the fixed effects model should also yield a significant positive association. Lastly, a spurious relationship may drive the results.[13] If such a relationship is driven by time-invariant characteristics, the fixed effects regression should not yield a significant negative coefficient for *workforce reduction*. Nonetheless, this finding contrasts the prior evidence of Reichert and Tauchmann (2017).

Whilst *workforce reduction* yields an unexpected positive relationship with mental health, *income drop* is linked to a significantly lower MCS score. Interpreting this as a shift from the median MCS score (e.g., see Reichert & Tauchmann, 2017), this relation corresponds to shifting the median score to the 46th percentile of the sample population. Further, economic anxiety consistently yields a significant negative association with mental health. Compared to an individual without any economic anxiety, having *much* (*some*) *economic anxiety* is approximately associated with a 3.1-point (1.6-point) reduction in the MCS score. Ceteris paribus, this implies a substantial change in the MCS distribution, moving from the median to the 36th (42nd) percentile of the estimation sample. Whereas *some macroeconomic anxiety* yields a significant negative relationship with mental health, the coefficient of *much macroeconomic anxiety* is not significant and less negative than that of *some macroeconomic anxiety*. This unexpected result may be captured by the simultaneous influence of other economic insecurity measures or by the control variables. For example, if a recession is expected to occur in a given year, many individuals might report *much macroeconomic anxiety*. Accordingly, the set of year dummies may partially capture the supposedly negative relationship between *much macroeconomic anxiety* and mental health. Alternatively, this result could also originate from unobserved or unaddressed factors. If these are constant over time, the fixed effects model should yield results that are in line with expectations.

Proceeding with job insecurity, any form of job insecurity is related to a lower MCS score compared to being job secure, supporting the predictions. Additionally, Table 3 shows that despite using multiple economic insecurity measures, job insecurity remains to be significantly related to worse mental health. Nevertheless, once work-related characteristics are controlled for, the absolute size of the coefficients decreases substantially. This does not call for concern because it is reasonable that subjective job insecurity is influenced by workplace characteristics, such as being in temporary employment. When

[13] Suppose that individuals who are more adaptable and flexible to changes in the workforce have a better average state of mental health. If workforce reductions occur in companies where adaptable and flexible individuals work, the relation with mental health may be driven by the ability to adapt to these situations and not by the workforce reduction.

considering all control variables, *much* (*some*) *job insecurity* is related to shifting the median MCS score to the 43rd (46th) percentile of the sample distribution, all else unchanged. Lastly, *financial dissatisfaction* is also significantly associated with worse mental health. An increase in *financial dissatisfaction* by one unit is related to a decrease in the mental health score by a third of a unit. Ceteris paribus, moving from the median dissatisfaction level to full financial dissatisfaction shifts the median MCS score to the 39th percentile of the estimation sample.

5.2. Fixed Effects Results

The results from the fixed effects model are reported in Table 4, contrasting the OLS results slightly. Nonetheless, economic anxiety, job insecurity, and financial dissatisfaction remain to yield a significant negative relationship with mental health, while workforce reductions, income drops, and macroeconomic anxiety do not show any signs of such a significant negative association. Similar to the OLS findings, the results from the fixed effects model seem to be consistent with respect to gradually adding more control variables. The full regression output for the specification including all covariates (column 3) is presented in Table B1 in Appendix B.

Controlling for time-invariant heterogeneity eliminates the significant positive relationship between workforce reductions and mental health from the OLS estimation. Therefore, the fixed effects model does not yield a negative relationship between *workforce reduction* and mental health. This suggests that the prior significant positive relationship is likely to be either driven by time-consistent variables or captured by coinciding relationships from other economic insecurity measures and mental health. Nevertheless, it does not appear that the relationship is driven by individuals who are pleased with co-workers losing their jobs or who feel more secure about their own jobs due to colleagues being laid off. Even though *income drop* exhibited a significant negative relationship with mental health in the OLS estimation, controlling for time-invariant heterogeneity in the fixed effects model reduces the size of its coefficient and turns it insignificant. This finding matches the expectations and is consistent with the findings of Kopasker et al. (2018) and Rohde et al. (2016). Furthermore, as expected, economic anxiety continues to be negatively related to mental health. However, the coefficients of *much economic anxiety* and *some economic anxiety* decrease in absolute terms by about 40 to 45 percent compared to the OLS estimation, indicating that fixed effects capture a large part of that relationship. For example, such time-invariant factors may be genetics or personality traits. Nonetheless, *much* (*some*) *economic anxiety* is significantly associated with a change from the median MCS score to the 42nd (45th) percentile of the sample population (36th and 42nd percentile for OLS, respectively), all else being equal.

Table 4: Estimated fixed effects of economic insecurity on mental health compared to OLS

Dependent variable: MCS	**Fixed effects**			**OLS**
	(1)	(2)	(3)	(4)
Workforce reduction	-0.094	-0.066	0.041	0.316*
Income drop	-0.486	-0.129	-0.270	-0.785**
Much economic anxiety	-1.950***	-1.876***	-1.714***	-3.069***
Some economic anxiety	-1.019***	-0.973***	-0.956***	-1.571***
Much macroeconomic anxiety	-0.007	-0.157	-0.239	-0.476
Some macroeconomic anxiety	-0.262	-0.343	-0.348	-0.790**
Much job insecurity	-1.434***	-1.531***	-0.931***	-1.320***
Some job insecurity	-0.527***	-0.570***	-0.398**	-0.675***
Financial dissatisfaction	-0.537***	-0.519***	-0.257***	-0.331***
Year controls	No	Yes	Yes	Yes
Individual & household controls	No	Yes	Yes	Yes
Work-related controls	No	No	Yes	Yes
Observations	12,567	12,567	12,567	12,567
Within R^2 (Adjusted R^2 for OLS)	0.027	0.034	0.075	0.192

Note. Calculations based on SOEP v35 data (SOEP, 2019). Standard errors are clustered at the household level yet unreported. *MCS* – mental health indicator. Columns 1-3 present results from the fixed effects model and column 4 results from the OLS regression. Column 4 is included to directly compare the effects between the full fixed effects model and the full OLS estimation. Column 1 includes no control variables. In column 2, a set of year dummies, time-variant individual controls (*age*^{2}, *marital status*, *living with a partner*, *losing a close person*, *becoming a parent*, *recently married*, and *recently divorced*) and household controls (*number of children 16 and younger*, *household size*, and *yearly net household income*) enter the regression. Lastly, column 3 adds work-related controls (*job dissatisfaction*, *tenure*, *company size*, *occupation status*, *temporary work contract*, *working full-time*, *side job*, and *weekly hours worked*). Column 4 includes all covariates from column 3 as well as additional controls that exhibit minor to no variation over time (*sex*, *migration status*, *years of education*, *years of education*^{2}, and *federal state of residence*) and *age*. Results for covariates are omitted. Table B1 in Appendix B reports regression results for columns 3 and 4 with all controls included.
Asterisks denote significance levels such that: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

In contrast, having macroeconomic anxiety is not significantly linked to worse mental health than having no macroeconomic anxiety. However, *some macroeconomic anxiety* remains somewhat more negatively related to mental health than *much macroeconomic anxiety*, despite not displaying any statistical significance. This finding suggests that the significant OLS negative relationship between *some macroeconomic anxiety* and mental health possibly originates from time-consistent characteristics. Additionally, the simultaneous influence of various economic insecurity measures may capture some of

this negative relationship. Continuing with job insecurity, the coefficients of *some job insecurity* and *much job insecurity* are less negative than in the OLS estimation, indicating that some of the relationship is captured by time-consistent factors. Similarly, once including work-related controls, both job insecurity coefficients are smaller in absolute terms. Still, all else unchanged, *much* (*some*) *job insecurity* is related to shifting the median MCS score to the 45th (47th) percentile of the sample distribution (43rd and 46th for OLS, respectively). Finally, identical to the OLS results, dissatisfaction with the household income is associated with a lower MCS score, consistent with expectations. All else being equal, moving from the median dissatisfaction level to full financial dissatisfaction, shifts the median MCS score to the 41st percentile of the estimation sample, compared to the 39th percentile in the OLS estimation.

The results presented in Table 3 and Table 4 show that in both models *much/some economic anxiety*, *much/some job insecurity*, and *financial dissatisfaction* are significantly negatively related to mental health. Allowing for a simultaneous relationship between an array of economic insecurity measures and mental health eliminates the established negative relationship of *workforce reduction* by Reichert and Tauchmann (2017). Furthermore, these results strongly suggest that subjective economic insecurity indicators matter more for individual mental health than objective indicators, matching the findings of Rohde et al. (2016) and Kopasker et al. (2018). Lastly, Table 4 implies that the results from the OLS estimation yield biased estimates due to endogeneity issues originating from time-consistent factors. Therefore, the fixed effects model presents more accurate findings on the relationship between economic insecurity and mental health than the OLS estimation.

5.3. Robustness Checks

Various robustness checks are run to see whether the results differ if assumptions about the sample population change. The regression results of each robustness check are presented in Table B2 in Appendix B for the OLS estimation and in Table B3 in Appendix B for the fixed effects estimation.

Restricting the estimation sample to individuals aged 20 years to 60 years alters the results marginally. The fixed effects model displays no changes, while the statistical significance of *income drop* weakens in the OLS estimation. Second, excluding individuals holding temporary work contracts results in very similar results. In the OLS estimation, the coefficient of *workforce reduction* turns insignificant and the one for *some macroeconomic anxiety* becomes more negative, whereas the results of the FE model remain unchanged. Third, confining the analysis to households earning between 12,000€ and 108,000€ net per year (matching with the 1st and 99th percentile) marginally reduces the significance of *income drop* in the OLS estimation and that of *some job insecurity* in the fixed effects model. Fourth,

focusing on individuals with a household income between the 5th and 95th percentile of the income distribution (16,000€ to 72,000€) turns the OLS coefficient of *workforce reduction* insignificant and weakens the significance of *much/some job insecurity* in the fixed effects model. Fifth, including a binary variable indicating whether an individual has been unemployed before does not change the results of the FE model in any way. However, the significance of *some macroeconomic anxiety* is slightly greater in the OLS estimation. Sixth, including a set of binary variables for holding marginal employment decreases the significance of *income drop* in the OLS estimation but does not change any other estimates at all. Lastly, focusing on individual income dynamics instead of household dynamics alters the results slightly but leaves the overall conclusions unchanged. In the OLS estimation, the coefficients of *workforce reduction* and *income drop* turn insignificant while the ones of *much/some job insecurity* are more negative. In the FE model, *much/some economic anxiety* lose some of its negative relationship with mental health, whereas *much job insecurity* and especially *some job insecurity* increase theirs. However, this robustness check does not consider the possibility of households combining individual incomes to share and pool the risks of economic losses. Nevertheless, subjective economic insecurity measures also display a stronger negative relationship with mental health than objective economic insecurity indicators in this specification.

Overall, the results of this analysis are robust against various modifications to the sample population, with the fixed effects model being more robust than the OLS estimation.

5.4. Heterogeneity by Employment Sector

The previous subsections found a significant negative relationship between mental health and various sources of economic insecurity for private sector employees. However, the presented findings suggest that the OLS estimation suffers from substantial bias stemming from time-variant characteristics. Therefore, Table 5 compares the estimated effects between private sector employees, public sector employees, and civil servants in the fixed effects model, finding considerable heterogeneity in effects. As expected, private sector employees display the greatest range of economic insecurity sources that is negatively associated with mental health (see section 5.2), followed by public sector employees, and then civil servants.

Whereas private sector employees exhibit a significant negative relationship between mental health and job insecurity, this relationship is not found in public sector employees. Furthermore, for public sector employees, workforce reductions, income drops, and macroeconomic anxiety appear to be unrelated to mental health. These variables all yield insignificant coefficients and display signs of weaker

negative relationships with mental health in public sector employees than in private sector employees. Nonetheless, *financial dissatisfaction* is weakly negatively associated with the MCS score, with an effect roughly as large as for private sector employees. On average, the more financially dissatisfied public sector employees are the lower their mental health score. Moreover, *much economic anxiety* and *some economic anxiety* exhibit a stronger negative relationship with mental health in public sector employees than in private sector employees. A public sector employee with a median mental health score that experiences *much economic anxiety* compared to one with *no economic anxiety* moves to the 36th percentile of the public sector MCS distribution (42nd for private sector employees), representing a substantial shift in the mental health score.

Table 5: Estimated fixed effects of economic insecurity on mental health by employment sector

Dependent variable: MCS	(1) Private sector	(2) Public sector	(3) Civil servants
Workforce reduction	0.041	0.173	-0.034
Income drop	-0.270	-0.250	-2.916**
Much economic anxiety	-1.714***	-3.682***	-1.124
Some economic anxiety	-0.956***	-1.266***	-0.341
Much macroeconomic anxiety	-0.239	0.318	-1.389
Some macroeconomic anxiety	-0.348	0.436	-0.444
Much job insecurity	-0.931***	0.627	-0.646
Some job insecurity	-0.398**	0.206	0.015
Financial dissatisfaction	-0.257***	-0.214*	0.147
Controls	Yes	Yes	Yes
Observations	12,567	4,119	1,590
Within R^2	0.075	0.076	0.082

Note. Calculations based on SOEP v35 data (SOEP, 2019). Standard errors are clustered at the household level yet unreported. *MCS* – mental health indicator. Column 1 focuses on private sector employees, column 2 investigates the effects on public sector employees, and column 3 analyses the effects on civil servants. All columns include explanatory variables controlling for time trends, individual characteristics (*age*^{2}, *marital status*, *living with a partner*, *losing a close person*, *becoming a parent*, *recently married*, and *recently divorced*), household characteristics (*number of children 16 and younger*, *household size*, and *yearly net household income*), and work-related differences (*job dissatisfaction*, *tenure*, *company size*, *occupation status*, *temporary work contract*, *working full-time*, *side job*, and *weekly hours worked*). However, column 3 excludes *occupation status* because this does not apply to civil servants. Results for covariates are omitted. Asterisks denote significance levels such that: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Although the mental health of public sector employees is at least partially negatively related to economic insecurity, the mental health of civil servants does not seem to suffer considerably from it. Only a significant income loss is related to worse mental health for them. Since civil servants are employed for their entire working life and are paid according to fixed contracts, their salary is unlikely to be volatile or affected by external factors. Thus, such an income loss is a rare and perhaps unexpected event, for which civil servants may not be adequately prepared. Alternatively, the income drop could originate from a spouse or partner losing a considerable amount of income, spilling over to and affecting the civil servant in the process.

Nonetheless, the results from Table 5 support the hypothesis that private sector employees suffer most from economic insecurity, being affected by a broad range of indicators. Public sector employees' mental health is also affected by economic insecurity, particularly by economic anxiety, whilst civil servants' mental health is barely affected. It appears that the dismissal protection of civil servants and public sector employees safeguards them from economic insecurity compared to private sector employees, but alternative explanations cannot be ruled out.

6. Conclusion

This paper adds to existing literature by investigating and disentangling the relationship between economic insecurity and mental health. Using German panel data and focusing on private sector employees, this analysis finds a significant negative relationship between a broad range of economic insecurity indicators and mental health in the OLS estimation as well as in fixed effects. While the coefficients are smaller in the fixed effects model than in the OLS estimation, the findings strongly suggest that subjective measures of economic insecurity matter more for mental health than objective indicators. Particularly, economic anxiety, subjective job insecurity, and financial dissatisfaction are all negatively related to mental health. In the fixed effects model, individuals experiencing these kinds of economic insecurity move from the median mental health score to the area between the 41st and the 47th percentile of the sample population, all else being equal, indicating substantial shifts. On the other hand, workforce reductions, substantial income losses, and worries about the macroeconomic development do not exhibit a significant negative relationship with mental health. Therefore, whilst allowing for a simultaneous influence of multiple economic insecurity sources on mental health, the present analysis shows that job-related insecurities remain negatively associated with mental health, whereas the

negative relationship between workforce reductions and mental health appears to vanish. Further, the results are shown to be robust against various model specifications.

This paper finds noteworthy heterogeneity in effects regarding the differences between private sector employees, public sector employees, and civil servants. Compared to private sector employees, public sector employees yield a weaker relationship between financial dissatisfaction and mental health and no significant relationship between subjective job insecurity and mental health. Yet, economic anxiety seems to be more adverse for public sector employees' mental health. Seemingly, the institutional characteristics of public sector employees are partially helpful in mitigating the negative relationship between economic insecurity and mental health. Additionally, civil servants, having special legal dismissal protection, do not exhibit any signs of a negative relationship between mental health and subjective economic insecurity. For them, a significant income loss is the only economic insecurity factor that is negatively associated with mental health, presumably because these drops are unexpected.

Nonetheless, the research and analysis presented in this paper have some limitations as well. First, the mental health indicator used in this analysis is not based on a professional diagnosis but rather relies on self-reports. Therefore, recall bias and misreporting may arise, either intentionally or unintentionally. Further, the generalisability may be limited due to the uniqueness of the German labour market arrangement (Rinne & Zimmermann, 2012). Although time-invariant heterogeneity can be controlled for in the fixed effects model, reverse causality concerns cannot be addressed sufficiently. Thus, the interpretation of these results cannot be considered causal. Nevertheless, finding a significant relationship sheds some light on which individuals are more likely to exhibit worse mental health and experience economic insecurity.

Policies aimed at moderating the negative relationship between economic insecurity and mental health may increase individuals' wellbeing, their productivity levels, and boost social welfare. Targeting individuals who are most vulnerable to economic insecurity allows for the implementation of cost-effective measures. This paper finds that private sector employees constitute a group whose mental health seems susceptible/responsive to economic insecurity. Therefore, governments and private sector employers can improve the wellbeing of private sector employees, for instance by establishing stronger dismissal protection. Additionally, employers may provide their employees with resources specifically designed to improve their employees' mental health, such as dedicated areas for employees to relax and regenerate. Such "wellbeing areas" can either be rooms that are designed to be private, safe, and calming or might be green outdoor spaces that give employees the ability to take a walk in nature. Further, companies might supply their employees with a psychologist on-site or set up a hotline where employees

can talk to counsellors. Alternatively, companies can provide their employees with stress management workshops and trainings to better combat stressful situations that cause worse mental health. If proven useful, subsidies could be developed to encourage employers to offer such resources or laws could be established requiring them to do so. Furthermore, from a social policy and public health perspective, improving mental health decreases the prevalence of substance disorders and mental disorders, potentially relieving the executive and the judicial system. Finally, increasing awareness of mental health problems and de-tabooing the discussion of mental health ought to accelerate the process in which these policies can be implemented.

Measuring the effectiveness of these proposed policies is outside the scope of this paper and provides an interesting avenue for future research. Additionally, future research can investigate whether heterogeneous effects by sex or other distinctions exist, to identify more precisely which groups are most susceptible to economic insecurity. Moreover, analysing the relationship between economic insecurity and mental disorders, such as depression, anxiety, or addictive disorders, could provide useful insights to prepare hospitals, therapists as well as mental health institutions in the event of growing economic insecurity. Lastly, taking a closer look as to which (labour market) characteristics mediate the negative relationship between economic insecurity and mental health can provide valuable information to policymakers and employers.

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Appendix A

Table A1: MCS questionnaire in the SOEP survey

Question					
1. When you have to climb several flights of stairs on foot, does your health limit you greatly, somewhat, or not at all?					
2. And what about other demanding everyday activities, such as when you have to lift something heavy or do something requiring physical mobility: Does your health limit you greatly, somewhat or not at all?					
During the last four weeks, how often did you:	Always	Often	Sometimes	Almost never	Never
3. feel rushed or pressed for time?	☐	☐	☐	☐	☐
4. feel down and gloomy?	☐	☐	☐	☐	☐
5. feel calm and relaxed?	☐	☐	☐	☐	☐
6. feel energetic?	☐	☐	☐	☐	☐
7. have severe physical pain?	☐	☐	☐	☐	☐
8. feel that due to physical health problems you achieved less than you wanted to at work or in everyday activities?	☐	☐	☐	☐	☐
9. feel that due to physical health you were limited in some way at work or in everyday activities?	☐	☐	☐	☐	☐
10. feel that due to mental health or emotional problems you achieved less than you wanted to at work or in everyday activities?	☐	☐	☐	☐	☐
11. feel that due to mental health or emotional problems you carried out your work or everyday tasks less thoroughly than usual?	☐	☐	☐	☐	☐
12. feel that due to physical or mental health problems you were limited socially, that is, in contact with friends, acquaintances, or relatives?	☐	☐	☐	☐	☐

Note. Questions taken from the SOEP individual questionnaire (see TNS Infratest Sozialforschung, 2013).

Table A2: List and definition of control variables

Control Variable	Definition
Sex (female)	Binary variable equal to 1 if an individual identifies as female and 0 as male
Age	Indicates how old an individual is
Age^2	Squared value of age; controls for non-linear (quadratic) age effects
Years of education	Indicates how many years of education an individual has
Years of education^2	Squared value of years of education; controls for non-linear (quadratic) effects of years of education
Migration status (migrant)	Binary variable equal to 1 if an individual has a migrant background and 0 if not
Marital status (married)	Binary variable indicating whether an individual is married (=1) or not (=0)
Living with partner	Binary variable indicating whether an individual lives together with their partner (=1) or not (=0)
Losing (loss of) a close person	Binary variable equal to 1 if an individual reports the death of a partner, spouse, parent, child or any other person living in the same household in the past 24 months and 0 if not
Becoming (became) a parent	Binary variable equal to 1 if an individual reports (repeatedly) becoming a parent in the past 24 months and 0 if not
Recently married	Binary variable equal to 1 if an individual married in the past 24 months and 0 if not
Recently divorced	Binary variable equal to 1 if an individual divorced or separated themselves from their partner in the past 24 months and 0 if not
Federal state indicators	Set of variables indicating in which federal state an individual resides in
Household size	Reports how many people live in a household
No. of children $\leq$ 16 years in household	Indicates how many children up to 16 years of age live in a household
Net household income	Reports the after-tax income of a household in thousands of euros per year
Job dissatisfaction	Measures the current dissatisfaction level of an individual with their job, ranging from 0 (complete satisfaction) to 10 (total dissatisfaction)
Tenure	Indicates the number of years an individual has been working with their current employee
Occupation	Set of dummy variables indicating an individual's current occupational position
Blue-collar unskilled	=1 if an individual is an unskilled blue-collar worker
Blue-collar skilled	=1 if an individual is a skilled blue-collar worker
White-collar low skilled	=1 if an individual is a low skilled white-collar employee
White-collar high skilled	=1 if an individual is a high skilled white-collar employee
Company size [a]	Set of dummy variables capturing the size of the company an individual works for
Small company	=1 if less than 5 people are employed by the company
Medium company	=1 if between 5 and 199 people are employed by the company
Large company	=1 if 200 or more people are employed by the company
Temporary work contract	Binary variable equal to 1 if an individual is in temporary employment and 0 if they have a permanent work contract
Working full-time	Binary variable equal to 1 if an individual works full-time and 0 if they work part-time
Side job	Binary variable equal to 1 if an individual has a side job alongside their main occupation and 0 if not
Weekly hours worked	Reports the number of hours an individual works per week, including overtime

Note. [a] The choice of splitting up the company size into these categories is based on the analysis by Reichert and Tauchmann (2017): Companies with less than five employees are exempted from strict dismissal protection regulations throughout the period covered in this analysis. Furthermore, employee representation in large companies ($\geq$ 200 employees) is expected to be better organized due to the mandatory presence of at least one full-time work-council member in such companies.

Table A3: Summary statistics for the reference groups and all control variables

	Mean	St. Dev.[a]	Median	Minimum	Maximum
Reference group of EI variables					
No economic anxiety	0.252	0.434	0	0	1
No macroeconomic anxiety	0.079	0.270	0	0	1
No job insecurity	0.392	0.488	0	0	1
Control variables					
Female	0.354	0.478	0	0	1
Age (years)	43.094	9.030	43	19	65
Age^2 (years^2)	1938.628	775.817	1849	361	4225
Years of education (years)	12.563	2.526	11.5	7	18
Years of education^2 (years^2)	164.214	70.163	132.25	49	324
Migrant	0.144	0.351	0	0	1
Married	0.702	0.458	1	0	1
Living with partner	0.801	0.400	1	0	1
Loss of a close person	0.023	0.150	0	0	1
Became a parent	0.024	0.153	0	0	1
Recently married	0.019	0.135	0	0	1
Recently divorced	0.022	0.148	0	0	1
Household size	2.898	1.215	3	1	14
No. of children under 16 in household	0.643	0.920	0	0	8
Net household income (1000€/year)	38.624	29.633	34.8	3.12	2400
Job dissatisfaction	2.995	1.878	3	0	10
Tenure (years)	12.564	9.243	11	0	52
Occupation					
Blue-collar unskilled	0.015	0.121	0	0	1
Blue-collar skilled	0.340	0.474	0	0	1
White-collar low skill	0.107	0.309	0	0	1
White-collar high skill	0.538	0.499	1	0	1
Company size					
Small company (< 5 employees)	0.066	0.249	0	0	1
Medium company (5-199 employees)	0.458	0.498	0	0	1
Large company (≥ 200 employees)	0.476	0.499	0	0	1
Temporary work contract	0.028	0.165	0	0	1
Working full-time	0.857	0.350	1	0	1
Side job	0.054	0.226	0	0	1
Weekly hours worked	44.108	12.027	42.7	2	103.1
Year 2002	0.205	0.403	0	0	1
Year 2004	0.229	0.420	0	0	1
Year 2008	0.218	0.413	0	0	1
Year 2010	0.193	0.394	0	0	1
Year 2012	0.156	0.363	0	0	1

Note. Calculations based on SOEP v35 data (SOEP, 2019). EI – economic insecurity. This table presents the summary statistics of the reference groups of some economic insecurity indicators and all control variables except for *federal state indicators*. The sample consists of 12,567 observations for 3,984 continuously employed private sector employees. Individuals with less than two responses are excluded. Summary statistics for the dependent variable and key independent variables are presented in Table 1.

[a] St. Dev. – standard deviation.

Appendix B

Table B1: Full regression output for OLS and fixed effects

Dependent variable: MCS	**OLS**		**Fixed effects (FE)**	
	Est. coefficient	Standard error	Est. coefficient	Standard error
Workforce reduction	0.316*	(0.184)	0.041	(0.181)
Income drop	-0.785**	(0.395)	-0.270	(0.380)
Much economic anxiety	-3.069***	(0.349)	-1.714***	(0.340)
Some economic anxiety	-1.571***	(0.214)	-0.956***	(0.218)
Much macroeconomic anxiety	-0.476	(0.352)	-0.239	(0.355)
Some macroeconomic anxiety	-0.790**	(0.307)	-0.348	(0.300)
Much job insecurity	-1.320***	(0.316)	-0.931***	(0.317)
Some job insecurity	-0.675***	(0.190)	-0.398**	(0.197)
Financial dissatisfaction	-0.331***	(0.062)	-0.257***	(0.064)
Female	-1.866***	(0.252)	–	
Age (years)	0.011	(0.086)	–	
Age^2 (years^2)	0.001	(0.001)	0.002	(0.001)
Years of education (years)	-1.365***	(0.493)	–	
Years of education^2 (years^2)	0.042**	(0.018)	–	
Migrant	0.790**	(0.310)	–	
Married	-0.253	(0.308)	0.149	(0.440)
Living with partner	0.168	(0.340)	1.258***	(0.445)
Loss of a close person	-2.041***	(0.557)	-1.774***	(0.513)
Became a parent	-0.128	(0.549)	-0.661	(0.521)
Recently married	0.893*	(0.528)	0.098	(0.560)
Recently divorced	-3.116***	(0.642)	-1.971***	(0.655)
Household size	0.106	(0.119)	0.044	(0.162)
No. of children $\leq$ 16 years in household	-0.332**	(0.157)	-0.288	(0.177)
Net household income (1000€/year)	0.002	(0.003)	0.001	(0.002)
Job dissatisfaction	-1.401***	(0.058)	-0.874***	(0.059)
Tenure (years)	-0.014	(0.013)	-0.003	(0.023)
Blue-collar skilled	2.482***	(0.784)	-0.335	(0.850)
White-collar low skill	2.035**	(0.825)	-0.479	(0.926)
White-collar high skill	1.834**	(0.810)	0.141	(0.936)
Medium company	0.066	(0.414)	-0.498	(0.496)
Large company	-0.497	(0.431)	-0.636	(0.577)
Temporary work contract	0.313	(0.545)	0.473	(0.544)
Working full-time	0.246	(0.363)	-0.132	(0.543)
Side job	-0.437	(0.395)	0.306	(0.435)
Weekly hours worked	-0.045***	(0.010)	-0.071***	(0.012)
Constant	66.470***	(3.919)	–	
Year controls	Yes		Yes	
Region controls	Yes		–	
Observations	12,567		12,567	
Adjusted R^2 (Within R^2 for FE)	0.192		0.075	

Note. Calculations based on SOEP v35 data (SOEP, 2019). Standard errors are clustered at the household level reported next to each regression. *MCS* – mental health indicator; Est. coefficient – estimated coefficient.

Asterisks denote significance levels such that: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table B2: Robustness checks OLS

Dependent variable: MCS	(1) Ages 20 to 60	(2) Permanent contracts only	(3) 12,000€ $\leq y_{ht}$ $\leq$ 108,000€	(4) 16,000€ $\leq y_{ht}$ $\leq$ 78,000€	(5) Unemployment exp. dummy	(6) Marginal empl. dummies	(7) Ind. income dynamics	**(8) Baseline results**
Workforce reduction	0.351*	0.276	0.352*	0.315	0.308*	0.324*	0.196	**0.316***
Income drop	-0.766*	-0.942**	-0.687*	-0.883**	-0.804**	-0.772*	-0.261	**-0.785****
Much economic anxiety	-3.113***	-3.079***	-3.103***	-3.211***	-3.068***	-3.055***	-2.962***	**-3.069*****
Some economic anxiety	-1.592***	-1.571***	-1.585***	-1.690***	-1.567***	-1.564***	-1.581***	**-1.571*****
Much macroeconomic anxiety	-0.484	-0.518	-0.452	-0.406	-0.482	-0.474	-0.286	**-0.476**
Some macroeconomic anxiety	-0.769**	-0.835***	-0.745**	-0.686**	-0.797***	-0.789**	-0.825**	**-0.790****
Much job insecurity	-1.275***	-1.389***	-1.284***	-1.178***	-1.322***	-1.329***	-1.685***	**-1.320*****
Some job insecurity	-0.646***	-0.680***	-0.680***	-0.636***	-0.675***	-0.675***	-0.868***	**-0.675*****
Financial dissatisfaction	-0.328***	-0.327***	-0.324***	-0.342***	-0.327***	-0.329***	-0.223***	**-0.331*****
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**
Observations	12,357	12,217	12,362	11,371	12,567	12,567	9,598	**12,567**
Adjusted R^2	0.191	0.193	0.192	0.193	0.192	0.192	0.199	**0.192**

Note. Calculations based on SOEP v35 data (SOEP, 2019). Standard errors are clustered at the household level yet unreported. MCS – mental health indicator; y_{ht} – net household income; exp. – experience; empl. – employment; ind. – individual. All columns include a set of year dummies, federal state indicators, individual controls (*sex*, *age*, *age*^{2}, *years of education*, *years of education*^{2}, *migration status*, *marital status*, *living with a partner*, *losing a close person*, *becoming a parent*, *recently married*, and *recently divorced*), household controls (*number of children 16 and younger*, *household size*, and *yearly net household income*), and work-related controls (*job dissatisfaction*, *tenure*, *company size*, *occupation status*, *temporary work contract*, *working full-time*, *side job*, and *weekly hours worked*). In column 1, only individuals aged 20 to 60 enter the regression estimation. Column 2 only considers individuals with a permanent work contract. Column 3 analyses individuals with a yearly net household income between 12,000€ and 108,000€. In column 4, only individuals with a yearly net household income between 16,000€ and 78,000€ are considered. Column 5 includes a binary variable indicating whether an individual has been unemployed before. Next, column 6 adds two binary variables controlling for marginal employment such as a mini job or a midi job (job paying between 450€ and 1,300€ a month). Column 7 focuses on income dynamics of individuals instead of households. This information is not available for 2002 and consequently, the year 2002 is dropped from the analysis. Therefore, *income drop* refers to a significant loss of an individual's income and *financial dissatisfaction* measures an individual's dissatisfaction with their yearly net income. Lastly, column 8 presents the baseline results. Results for covariates and constants are not shown. Asterisks denote significance levels such that: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table B3: Robustness checks fixed effects

Dependent variable: MCS	(1) Ages 20 to 60	(2) Permanent contracts only	(3) 12,000€ $\leq y_{ht}$ $\leq$ 108,000€	(4) 16,000€ $\leq y_{ht}$ $\leq$ 78,000€	(5) Unemployment exp. dummy	(6) Marginal empl. dummies	(7) Ind. income dynamics	**(8) Baseline results**
Workforce reduction	0.058	0.015	0.028	0.071	0.035	0.040	-0.294	**0.041**
Income drop	-0.235	-0.337	-0.179	-0.348	-0.261	-0.267	-0.136	**-0.270**
Much economic anxiety	-1.750***	-1.689***	-1.626***	-1.558***	-1.718***	-1.713***	-1.334***	**-1.714*****
Some economic anxiety	-0.976***	-0.917***	-0.963***	-1.006***	-0.957***	-0.956***	-0.791***	**-0.956*****
Much macroeconomic anxiety	-0.261	-0.309	-0.350	-0.525	-0.239	-0.242	-0.340	**-0.239**
Some macroeconomic anxiety	-0.344	-0.409	-0.423	-0.523*	-0.347	-0.347	-0.502	**-0.348**
Much job insecurity	-0.908***	-0.966***	-0.915***	-0.820**	-0.942***	-0.929***	-1.187***	**-0.931*****
Some job insecurity	-0.395**	-0.408**	-0.363*	-0.340	-0.400**	-0.398**	-0.608**	**-0.398****
Financial dissatisfaction	-0.246***	-0.272***	-0.263***	-0.239***	-0.256***	-0.259***	-0.201***	**-0.257*****
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	**Yes**
Observations	12,357	12,217	12,362	11,371	12,567	12,567	9,598	**12,567**
Within R^2	0.076	0.074	0.076	0.074	0.076	0.076	0.081	**0.075**

Note. Calculations based on SOEP v35 data (SOEP, 2019). Standard errors are clustered at the household level yet unreported. MCS – mental health indicator; y_{ht} – net household income; exp. – experience; empl. – employment; ind. – individual. All columns include a set of year dummies, time-variant individual controls (*age*^{2}, *marital status*, *living with a partner*, *losing a close person*, *becoming a parent*, *recently married*, and *recently divorced*), household controls (*number of children 16 and younger*, *household size*, and *yearly net household income*) and work-related controls (*job dissatisfaction*, *tenure*, *company size*, *occupation status*, *temporary work contract*, *working full-time*, *side job*, and *weekly hours worked*). In column 1, only individuals aged 20 to 60 enter the regression estimation. Column 2 only considers individuals with a permanent work contract. Column 3 analyses individuals with a yearly net household income between 12,000€ and 108,000€. In column 4, only individuals with a yearly net household income between 16,000€ and 78,000€ are considered. Next, column 5 includes a binary variable indicating whether an individual has been unemployed before. Column 6 adds two binary variables controlling for marginal employment such as a mini job or a midi job (jobs paying between 450€ and 1,300€ a month). Column 7 focuses on income dynamics of individuals instead of households. This information is not available for 2002 and consequently, the year 2002 is dropped from the analysis. Therefore, *income drop* refers to a significant loss of an individual's income and *financial dissatisfaction* measures an individual's dissatisfaction with their yearly net income. Lastly, column 8 presents the baseline results. Results for covariates are omitted.
Asterisks denote significance levels such that: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.