"Has the economic crisis worsened the work-related stress and mental health of temporary workers in Spain?"

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Abstract

This paper analyses the causal effects of temporary employment on work-related stress and mental health before (2006/07) and during the economic crisis (2011/12) and examines whether the economic recession worsened these two health outcomes. To control for selection bias, propensity scores (PS) are computed separately for men and women using microdata from two cross-sectional surveys, considering temporary (treatment group) versus permanent employment (control group). Next, we use difference-in-differences estimators stratifying by age, education level, and regional unemployment differences using PS as weights. Our results indicate that a male salaried worker with a temporary labour contract tends to have lower levels of work-related stress in the pre-crisis period, but not for women. The stratification analysis shows lower work-related stress levels among older male adults, workers with a high education level, and employees in regions with high unemployment rates. The economic crisis is responsible for increasing stress only among older temporary workers and male university graduates, without affecting women. We also see evidence of a positive link between temporary employment and poor mental health in both periods, although only for men. We neither find significant impacts for our sample of men or women, nor for most of our population subgroups with the exception male workers with a university degree.

JEL Classification: I10, J41, J28.

Keywords: Temporary employment; economic crisis; work-related stress; mental health; propensity score weighting.

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1. Introduction

One of the most frequent adverse health effects of temporary employment reported in the literature has been the risk of developing mental health problems (Quinlan et al. 2001; Virtanen et al. 2005). However, this finding is subject to wide heterogeneity depending on the type of study, the heterogeneity of the temporary employment taken into account, and the contextual labour market settings (Cuyper et al. 2008; Virtanen et al. 2005; Origo and Pagani 2009). Among other manifestations, job insecurity tends to be high for workers under temporary employment; however, in a context of high and rising unemployment rates, job insecurity may affect both permanent and temporary employees, augmenting feelings of personal vulnerability (Virtanen et al. 2011). Moreover, job insecurity and work-related stress are two potential sources of mediation in the association between temporary employment and mental health (Ferrie et al. 2005; Waenerlund et al. 2011).

Spain went into recession in 2008 when unemployment increased rapidly from less than 10% to reach 27% in 2013, but even after the burst of the economic crisis, temporary labour contracts remained relatively high, decreasing slowly from 33.2% in 2006 to 23.4% in 2012 (INE, 2016), a situation that can be seen as a "natural experiment."

Evidence on the health effects of the economic crisis by type of labour contract in Spain is scarce. As far as we know, only one study has examined this issue, reporting a declining gap in mental health between temporary and permanent employment during the economic crisis (Sánchez-Moreno et al., 2016). A limitation of this paper and others in the literature is that they mostly rely on observational studies without properly accounting for compositional effects and bias reduction (Frasquilho et al., 2015). In addition of considering a wide range of potential confounders, our estimations include a measure of physical health to minimise a potential reverse causality problem, i.e., the self-selection of workers with ill health status on temporary contracts (Urbanos-Garrido and Lopez-Valcarcel 2015).

The objective of the paper is twofold. First, we aim to estimate the causal effect of temporary employment on work-related stress and mental health. Second, we investigate whether the economic recession worsened work-related stress and mental

health outcomes for temporary and permanent workers. We also aim to assess the mediating role of work-related stress in the association between temporary employment and mental health. To estimate these effects, we apply a difference-in-differences (DiD) estimation framework with propensity score weights. To consider the possibility of heterogeneous effects, we also perform a DiD analysis by age group, education level, and business cycle conditions (low vs. high regional unemployment rates).

2. Background

2.1. Temporary employment and mental health

The literature has found a negative association between temporary jobs and mental health. Quinlan et al. (2001) present evidence for this association in 14 of the 24 studies they reviewed. However, there seems to be substantial heterogeneity across studies. These differences may be at least partially explained by the 'healthier work effect' (i.e., the healthiest members of the labour market are the most likely to get a job) and the 'healthy worker survivor effect' (i.e., the healthiest workers are the most likely to stay employed). Both effects point towards worse health effects among temporary vs. permanent employment (Virtanen et al., 2005).

The same variability of results is observed in studies analysing transitions between employment states (Ferrie et al., 2002). In particular, Gash et al. (2007) obtain similar results for Spain and Germany for men but not for women. Unlike Spain, Gash et al. (2007) observe positive long-term health effects of transitioning from unemployment to temporary employment for Germany. However, other evidence highlights opposite findings. A longitudinal study of British workers found no evidence of a significant impact of temporary contracts on workers' mental health, once controlling for background characteristics, with the exception of worsening job satisfaction among casual/seasonal workers (Bardasi and Francesconi, 2004). Similarly, a follow-up study in Sweden highlighted that job insecurity adversely affected mental health in both permanent and temporary employees (Virtanen et al., 2011). Altogether, the adverse health effects for temporary employment appears to be weaker with longitudinal data than in cross-sectional designs (Bamberger et al. 2012). Even in a observational study in Finland, high risk of poor mental health was found among both atypical contracts and

the unemployed, but not among temporary employees compared to permanent employees (Virtanen et al., 2003). Nonetheless, systematic reviews highlight a link between job insecurity and adverse health effects. A literature review from Bohle et al. (2001) finds a majority of studies linking job insecurity with worse health outcomes. Two meta-analyses indicate that many studies found a non-significant or moderate negative association between job insecurity and mental health, but few studies reported a strong association. The negative association was more likely to occur among manual workers who are exposed to a higher degree of uncertainty over future work and who are more dependent on paid work (Sverke et al., 2002), and was stronger among older workers who are less likely to find comparable jobs and tend to have more family obligations (Cheng and Chan, 2008).

2.2. Temporary employment and work-related stress

A systematic review reported job stress effects of the recent economic crisis due to staff reductions combined with increased workloads leading to mood disorders, anxiety, and psychosocial distress (Mucci et al., 2016). Two main explanatory models have been proposed. The Demands-Control-Support (DCS) model explains job strain as the mismatch between high job demands and low control over one's work (Karasek, 1979). The Effort-Reward-Imbalance (ERI) model states that job strain comes from an imbalance between employee effort and perceived low compensation for that effort (Siegrist, 1996). Strikingly, some empirical evidence shows that permanent employees reported higher levels of stress, overload, and job demands, while temporary workers had lower stress, less involvement in the organisation, but much distress coming from job insecurity (Benavides and Benach, 1999; Eiken and Saksvik, 2009; Inoue et al., 2010). The DCS and the ERI models suggest that both job insecurity and stress act as potential mediators in the association between temporary employment and mental health. For instance, after adding job control to a set of socioeconomic covariates, the explanatory power of the association between job insecurity and mental health outcomes of the Whitehall II study increased substantially (Ferrie et al., 2005). Similar results have been found for Sweden by Wanaerlunf et al. (2011) and for a wider sample of European countries (Cottini and Lucifora, 2010). Regarding differences in work-related stress by socioeconomic position, higher status should provide more autonomy, stability, and control over work, but the feeling of being unable to meet work demands

is more commonly reported (Hammarström et al., 2011; Damaske et al., 2016; Moen et al., 2013).

2.3. Empirical strategies

Several empirical strategies have been used in the literature to deal with the reverse causality problem (i.e., a selection into temporary employment by workers with previous psychosocial problems). Such approaches ultimately depended on the study design by focusing on dynamic changes in employment status, either adjusting for base health status or individual fixed-effects estimation in longitudinal studies (Bardasi and Francesconi, 2004; Rodriguez, 2002; Virtanen et al., 2005; Robone et al. 2011; Ehlert and Schaff, 2011), by using instrumental variables in observational studies (Caroli and Godard, 2016), or by sample restriction (Dooley et al., 1987; Ferrie, 2001; Virtanen, Kivima et al., 2005).

Another strategy is to match exposed and unexposed populations on a set of covariates regarding the probability of being treated, computing a propensity score (PS)—in our case, of having a temporary job (Rosenbaum & Rubin 1983). This framework has been applied in evaluations of the health effects of precariousness and temporary employment (Kim et al., 2008; Quesnel-vallée et al., 2010; Carrieri et al., 2014).

3. Data and Methods

3.1. Data

Our sample was drawn from two waves of the Spanish National Health Survey in 2006/07, before the economic crisis, and 2011/12, during the economic crisis. It is a cross-sectional and nationally representative survey of the Spanish population covering a considerable range of socioeconomic and health related indicators, including self-perceived health, mental health, chronic conditions, social support, use of health services, and lifestyles related to health. The sample is representative at regional level (NUTS2 - Nomenclature of Territorial Units for Statistics) and units are selected in a multiple-stage design: from census tracks stratified by municipality size, to households and individuals. To achieve a homogeneous salaried working population, we excluded those aged below 25 (as these ages correspond with the finalisation of the education

period), those above 64 years old (the retirement age), workers with atypical working days (e.g., at night, irregular shifts, and others), and immigrants. We also excluded Ceuta and Melilla for their low representativeness. Our final sample includes 6,283 observations (2,846 men and 3,437 women) for the 2006/07 survey and 4,505 observations (2,299 men and 2,206 women) for the 2011/12 survey.

3.2. Methods

Treatment effects

To obtain the causal or treatment effect of a temporary job on work-related stress and mental health status, the PS weighting technique is used. This technique minimises the selection bias, a problem arising in observational studies to infer causality of the treatment group (temporary employment) and the control group (permanent employment) on average characteristics that are relevant for the outcome (work-related stress and mental health).

Our interest is in estimating the causal or ATT effect (Average Treatment Effect on the Treated), that is, the average treatment effect of temporary employment on the health status of temporary workers. Let Y_{1i}, be the health outcome of subject *i* if she/he were to receive the treatment (temporary employment) and let Y_{0i} denote the health outcome of subject *i* if not. D_i is the binary treatment variable (1: temporary contract; 0: non-temporary employment). The ATT effect is defined as the expected difference:

$$ATT = E(Y_{1i} - Y_{0i} | D_i = 1) = E(Y_{1i} | D_i = 1) - E(Y_{0i} | D_i = 1) \qquad (1)$$

where the first-term of the right-hand side of equation (1) is the average health outcome of workers in temporary employment, while the second term is the counterfactual or unobserved potential average health outcome of temporary workers had they been in permanent employment. As the researcher cannot observe the term $Y_{0i} | D_i = 1$, a comparison/control group is generated to provide a consistent estimate. We estimate treatment effects by matching treated individuals (temporary employment) with untreated or control subjects (permanent employment) with a similar distribution of observable characteristics using the PS. Specifically, PS are calculated from a logistic regression estimated separately for 2006/2007 and 2011/2012 and distinguishing by

gender. This method assumes that all relevant differences between treated and non-treated groups are captured by the observable covariates. To satisfy this assumption, it is important to include in the propensity estimation all variables known to be related to both treatment assignment and health outcomes, including quadratic and interaction terms as additional covariates (Stuart, 2010). We have used the kernel matching method with an Epanechnikov distance, as it was the most effective in reducing the standardised bias across covariates. As (nearly) all possible observations are used with kernel matching, even those that may have bad matches, a common support condition to minimise this drawback is required. The common support requirement reduces the working sample to 6,254 observations (2,833 men and 3,421 women) in 2006/07 and 4,427 observations (2,259 men and 2,168 women) in 2011/12. Standard errors have been computed by bootstrapping 1,000 iterations.

To assess the performance of the PS, we compute a test of classification (c-test) of the percentage correctly classified among predicted versus treated. We also assess the validity of the covariate balance by analysing the standardised percentage in bias reduction for each variable and checking the Rubins' B and R statistics. As a robustness check, we perform the 4-nearest neighbour and radius matching methods within a caliper distance of 0.25 standard deviations. To assess if the results are sensitive to the reverse causality problem, we compute the same procedures excluding chronic diseases in the PS computation as covariates.

Using PS to weight observations is recommended for small samples, as it allows the retention of most cases and does not require normality in the outcome variable. Hirano et al. (2003) show that weighting by the inverse of the PS leads to an efficient estimate of the ATT coefficient. Thus, for estimating the ATT effect the weight is defined as,

$$w_i = D_i + (1 - D_i) \frac{\hat{e}_i(X_i)}{(1 - \hat{e}_i(X_i))} \qquad (2)$$

then a treated participant receives a weight of 1, whereas a control individual ($D_i = 0$) is weighted using the term $\frac{\hat{e}_i(X_i)}{(1 - \hat{e}_i(X_i))}$. In this way, both groups are weighted to represent the treatment group. This is equivalent to weight by the odds of the propensity. The PS weighting has been used in the DiD regression analysis described below.

Estimates of the incremental crisis effect: Difference-in-differences

An estimate of the change of the treatment effect during the economic recession is obtained by using a DiD approach (Angrist and Keueger, 1991; Card and Krueger, 1994). In particular, we have estimated a linear regression model with pooled data of both surveys for men and women. The linear probability model leads to similar results to those obtained by running logit or probit binary regression models (Angrist and Pischke, 2008). Controlling by a set of individuals' covariates (X), the model includes three main fixed effects: one for a time trend (δ), another for being in the treatment group (λ), and the key parameter of interest or DiD effect, measured by the interaction between them (γ):

$$Y_{it} = \alpha + \lambda D_{it} + \delta t + \gamma(D_{it}*t) + X'_{it}\, \beta_t + \varepsilon_{it} \quad i=1\ldots N,\ t=0,1 \ (3)$$

where t = 0 means 2006/07 (before the recession), t = 1 denotes 2011/12 (after the recession), and Y represents the health outcomes (i.e., work-related stress and mental health). The unbiased nature of the structural estimators depends on the parallel time-paths assumption. To make that assumption as plausible as possible, we include in X all observed covariates that may influence the outcome and relate to temporary employment before and during the crisis. Under the usual hypothesis on the stochastic term ε_{it} (zero mean and independence of the regressors), the parameter λ provides information on the effects of temporary employment on outcomes before and during ($\lambda + \gamma$) the economic crisis. Note that this regression is run on the reweighted sample, as previously mentioned.

Likewise, to explore the effects of temporary contracts by socioeconomic level and the contextual role of the economic cycle, we stratify the sample according to university and non-university studies and by high and low regional unemployment rates at year 2006/07 for both men and women. Finally, to assess the potential mediating role of stress in the association between temporary employment and mental health, we add work-related stress as an extra covariate in equation (3) when mental health is the dependent variable.

3.3. Variables definition

The treatment variable considered in our analysis is to have a temporary employment coded with 1 and a non-temporary/permanent job with 0.

We measure work-related stress through the responses given to the question "Overall and considering the conditions in which you do your work, indicate how you consider the level of stress of your work on a scale of 1 (not stressful) to 7 (very stressful)." Responses with values 1 to 5 are collapsed as low and medium stress, coded as 0, and response values of 6 or 7 are considered high stress, coded as 1. This measure has been used in other contexts as a screening tool of stress levels with significant correlations with domains of the DCS and ERI models. Studies have found an acceptable reliability of this measurement with a kappa between 0.804 and 0.868 (Arapovic-Johansson et al., 2017; Elo et al., 2003).

Mental health is measured using the 12-item General Health Questionnaire (GHQ-12), a screening instrument designed to detect emotional, mood-related problems and psychological distress, validated for the Spanish population (Sánchez-López and Dresch, 2008). GHQ-12 consists of 12 items in a Likert-type scale with four response categories. Individuals reporting 3 or more mental health problems are considered to be at risk of poor mental health and coded with 1 and 0 otherwise.

As additional controls, we consider several socioeconomic characteristics that have been shown to be important determinants of health outcomes. Specifically, age—accounting for an imperfect measurement of health status—is categorised in three 10-year intervals from 25 to 64 allowing for a non-linear association. Based on civil status, responses given to widowed, single, divorced, and legally separated categories are collapsed into the category of "non-married," leaving married as the base category. Respondents who contribute most to their household budget are referred to as the 'main breadwinner.' Being the main breadwinner may impose a psychological distress due to family obligations and dependence on the job (Bernard, 1981). Education level (based on the International Standard Classification of Education, ISCED), is classified in three categories: university, as the reference category; secondary education; and primary or less than primary education. Having children (≤7 years old) is another control that may

be correlated with the working family balance. However, this control is only used in the whole analysis for women, since they carry out most of the children's care under the traditional Mediterranean family model. Household income reported in the survey by means of several income intervals has been first equalised to account for household size and composition and then collapsed into four categories along with a fifth category of missing values (11.4% for 2006/07 and 23.4% for 2011/12). Moreover, to control for health status and need, we consider a dummy for self-reporting diagnosed chronicity within a wide range of chronic diseases. We also consider the activity sector (coded into nine dummies) and regional dummies for the 17 NUTS2 regions in Spain. Finally, for the purpose of contextual analysis, we use regional unemployment rates from the Labour Force Survey for both periods (INE 2016). Regions are classified into two clusters of low and high unemployment rates according to their relative level compared to the national mean in 2006.

4. Results

4.1. Descriptive statistics

The logistic regression used to compute the PS predicts correctly (between 72.9% and 80.4%) the conditional probability of being in temporary employment for both men and women in either period. The matching estimates successively reduce the mean standardised bias at around 90% and the Rubin's B statistic, which measures the absolute standardised difference of the mean of the PS in the treated and control groups, is well below 25% as recommended (available upon request).

Table 1 shows the time trend of selected variables in the two periods examined and split by gender. Interestingly, the rate of temporary employment has declined significantly for women (from 29.2% to 23.3%) and men (from 22.5% to 19.4%) between 2006/7 and 2011/2012. We also observe for both genders a statistically significant increase in high work-related stress (men: from 21.5% to 25.3%; women: from 23.3% to 29.9%), mostly driven by temporary employment among men (from 14.7% to 24.6%) and for both temporary and permanent employment among women (from 24.0% to 30.6% and from 21.7% to 27.9%). Regarding mental health, we document a decline in poor mental health in these two periods and for both genders (men: from 12.4% to 10.2%; women:

from 20.9% to 17.7%) driven by having a permanent contract (see Tables A1 and A2 in the Appendix for a complete information on covariates by type of employment and gender).

4.2. Matching estimates

Table 2 shows the ATT effect or causal impact of temporary employment on each outcome (work-related stress and mental health) before and during the economic crisis through PS matching. Our estimates show that having a temporary job causes a statistically significant decrease of 4.1% in work-related stress, but an increase of 4.1% in poor mental health solely among men when compared to those with permanent jobs in the pre-crisis period 2006/07. Moreover, we report a slightly higher positive causal impact on poor mental health (5.2%) in 2011/12. For women, no significant impacts of temporality on health outcomes are observed in either of the periods in our data. The robustness check performed with 4-nearest neighbour and radius matching gave similar results (available upon request).

4.3. Difference-in-difference estimates

Table 3 reports the estimates of equation (2) for each health outcome for men and women, respectively. Interestingly, our DiD results reveal that the economic crisis seems to additionally increase high labour stress by 7.1%, although just for the sample of men. We also see a significant common trend for both permanent and temporary employment. In contrast, we find no evidence of an incremental effect on poor mental health attributed to the economic recession. No statistically significant effects are revealed for women in Table 3, confirming our previous matching estimates.

To investigate if the results vary among subgroups, we stratify our sample by age, education level, and by low and high regional unemployment rates. Interestingly, Table 3 shows a significant negative impact of temporary contracts on high stress at the pre-crisis period among older men (-4.0%), those with a university degree (-8.8%), and those residing in regions with high unemployment (-5.3%). However, our results confirm that because of the Great Recession, high work-related stress levels increased among older salaried workers (7.3%) and remarkably among employees with a university degree (22.3%). Regarding mental health, we find that temporary employment increases poor mental health rates among men in the pre-crisis period,

especially in the groups of older working adults (5.9%), those with a non-university degree (5.5%), and those residing in regions with a high unemployment rate (5.5%). However, the economic crisis only seems to additionally deteriorate mental health among those with university degrees (13.7%). For women, the probability of suffering high stress at the base year due to temporary contracts was lower only among those with a university degree (-5.9%), with no incremental impacts due to the economic crisis. No significant DiD estimate is found for mental health.

We obtain similar results in the sensibility analysis after excluding chronic conditions in the PS computation for the whole sample (available upon request).

4.4. The mediating role of work-related stress
The estimates of the potential mediating role of work-related stress in the association between temporary employment and mental health are reported in Table 4. We show that the positive association between temporary employment with mental health at the base year remains significant and similar in size to the estimates reported in Table 3, which we interpret as a sign of no or a moderate mediating role. The results also show that experiencing high work-related stress levels increases the probability of poor mental health across most groups (between 7.2% and 15.2%) for men and women, except for women with a university degree.

5. Discussion and conclusion

This paper aims to estimate the causal effect of temporary employment on work-related stress and mental health and to investigate whether the economic recession worsened these two health outcomes. We also aim to assess the mediating role of work-related stress. We use a DiD estimation framework with propensity score weights.

First, our results seem to indicate that male salaried worker with temporary labour contracts in Spain tend to have lower levels of work-related stress in the pre-crisis period. This finding may be surprising, as it is expected that temporary workers may be willing to exert more effort and assume more demands, thus suffering from higher levels of labour stress, as part of a signalling strategy to step into a permanent position.

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However, this signalling mechanism might be weaker in countries characterised by highly segmented labour markets and for workers with low education levels, where the transition to permanent jobs is more constrained. It could also be the case that temporary workers may feel also less connected to the organisation's objectives and less involved, and the disengagement mechanism may overcome that of the greater effort. We hypothesise that this could be the case in Spain, a country characterised by high rates of short, temporary contracts. According to our estimates, disengagement with firms' goals at the base year would be stronger among older male workers who have a high education level and among employees in regions with high unemployment rates due to the low level of expectations about future possibilities compared to their permanent jobs counterparts.

Second, our findings show that because of the economic recession, with significant declines in employment rates and household incomes, working in a temporary job tends to incrementally increase work stress among the male population, with especially detrimental effects for older salaried workers and those with a university degree, who may be more sensitive to changes in the labour market due to the failure of expectations about work (Connelly and Gallagher, 2004). These findings are compatible with previous research showing an intensification of work activities and a notable increase in job strain exposure during the economic crisis in Spain (Utzet et al., 2015). Further research is needed to disentangle differential effects by socioeconomic group.

Third, mirroring previous research that positively links temporary employment with poor mental health (Quinlan et al., 2001; Virtanen et al., 2005), we show this same pattern and reveal that this is true in both periods (pre- and post-crisis), although only for men. As expected, we find a positive link between temporary employment and poor mental health in the pre-crisis period among older adults, as they are less likely to find comparable jobs and tend to have more family obligations (Cheng and Chan, 2008), among manual workers who experience higher employment turnover (Sverke et al., 2002), and among workers in regions with high unemployment who have fewer re-employment opportunities (Origo and Pagani, 2009). Surprisingly, while we expected to find a deepening of mental health problems for temporary employees as a result of the worsening of Spain's economy, we found no significant impacts for our sample of men and women or for most of our population subgroups, with the exception of male

workers with a university degree. For this latter group, we find that the economic recession incrementally increased the effect of temporality on poor mental health in around 14% of our sample. Work-related stress had a null or moderated mediating role for these groups. In addition, our results confirm previous findings that work-related stress contributes directly to poor mental health (Paterniti et al. 2002; Ferrie et al. 2005; Bonde 2008; Stansfeld and Candy, 2006).

Regarding the heterogeneity of results by gender, some scholars argue that the psychological response of women to unemployment tends to be more affective-based coping than that of men (Waters and Moore 2001). Women may find psychological compensation in their family role as a substitute for employment in the traditional family. However, the lack of significant changes in mental health remains controversial, especially when women become the breadwinners in previously dual-earner households as a result of the recession. As the household's economy depends increasingly on women's earnings, this can lead to higher levels of psychological distress among women in temporary employment.

The paper has some limitations. First, it was not possible to consider heterogeneity in temporary employment by type or by length of the temporary contract due to the small sample size, which we believe could qualify our findings. Second, to apply DiD estimators satisfactorily requires that the parallel trend assumption holds; that is, no other significant changes have occurred outside the intervention that could have impacted the treatment and controls. Fortunately, the labour reforms implemented in 2006 and 2010 did not significantly affect the duality in the Spanish labour market, and trends in temporary and indefinite contracts remained mostly unchanged (Ruesga Benito, 2010). As far as we know, this paper makes several improvements to previous analyses like the reduction in bias selection from the 'healthy worker effect' due to the use of PS and DiD combination, the inclusion of a wide range of potential confounding variables, the minimisation of reverse causality by including chronic conditions as additional covariates, or the exploration of worker heterogeneity.

The policy implications of our empirical analysis for Spain are clear: there is a need to strengthen reemployment policies to diminish perceived job insecurity; the government should also reinforce practices of stress prevention at the firm level to diminish adverse

consequences on mental health and to actively reorient health services in support of psychosocial work-related problems (Nexø et al., 2018). In that respect, stakeholders should be involved in the development of legislation and guidelines aimed at preventive interventions that identify the causes of psychosocial hazards by managerial procedures and that increase literacy about mental health problems.

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TABLES

Table 1. Descriptive statistics

	Mean (St.dev)			Mean (St.dev.)		
	Men			Women		
	2006/07	2011/12		2006/07	2011/12	
	N=2708	N=2252	p-value	N=3442	N=2177	p-value
High work stress	21.5 (0.411)	25.3 (0.435)	0.011	23.3 (0.423)	29.9 (0.458)	0.000
Permanent	23.5 0.424)	25.5 (0.436)	0.241	24.0 (0.427)	30.6 (0.461)	0.000
Temporary	14.7 (0,354)	24.6 (0.431)	0.001	21.7 (0.412)	27.9 (0.449)	0.037
Poor mental health	12.4 (0,330)	10.2 (0.303)	0.042	20.9 (0.407)	17.7 (0.382)	0.015
Permanent	11.4 (0.318)	9.1 (0.288)	0.041	20.5 (0.404)	17.0 (0.376)	0.016
Temporary	15.8 (0.365)	14.8 (0.355)	0.723	21.7 (0.413)	20.1 (0.402)	0.567
Temporary employment	22.5 (0.418)	19.4 (0.395)	0.032	29.2 (0.455)	23.3 (0.423)	0.000

Table 2. Matching estimates: Effects of temporary employment

	Year 2006/07					Year 2011/12				
	% Temporary	% Counter-factual Non-temporary	Impact	SE	t-value	% Temporary	% Counter-factual Non-temporary	Impact	SE	t-value
	$E(Y_1|D=1)$	$E(Y_0|D=1)$	ATT			$E(Y_1|D=1)$	$E(Y_0|D=1)$	ATT		
Men										
High work stress	0.1642	0.2052	-0.0410*	0.0208	-1.97	0.2306	0.2021	0.0285	0.0259	1.10
Poor mental health	0.1511	0.1102	0.0409*	0.0186	2.19	0.1626	0.1108	0.0518*	0.0223	2.32
Women										
High work stress	0.2111	0.2159	-0.0047	0.0180	-0.26	0.2756	0.2858	-0.0101	0.0270	-0.37
Poor mental health	0.2279	0.2154	0.0125	0.0181	0.69	0.2179	0.2084	0.0096	0.0245	0.40

*p-value<0.05;**p-value<0.01;***p-value<0.001. Standard errors computed by bootstrapping methods (1000 iterations). Common support option was used. Controls: age, civil status, main breadwinner, young children, education, income, chronic diseases, sector of activity, and region of residence.

Table 3. Difference-in-difference estimates of temporary employment

			High work stress			Poor mental health		
			(λ) Effect at base year	(δ) Time effect	(γ) Change effect	(λ) Effect at base year	(δ) Time effect	(γ) Change effect
Men								
Full sample		N=4960	-0.0394* (0.0174)	0.1136* (0.0473)	0.0710* (0.0277)	0.0411** (0.0108)	0.0410 (0.0628)	0.0099 (0.0287)
Age	Young adults <34y	N=1213	-0.0444 (0.0388)	0.1206 (0.1098)	0.0666 (0.0632)	0.0165 (0.0260)	0.1307 (0.0862)	0.0469 (0.0290)
	Old adults	N=3747	-0.0398* (0.0160)	0.1693* (0.0685)	0.0732** (0.0228)	0.0590** (0.0191)	-0.0476 (0.0805)	-0.0218 (0.0281)
Education level	University	N=1281	-0.0885* (0.0396)	0.1365 (0.1611)	0.2232** (0.0756)	-0.0229 (0.0407)	0.0607 (0.1439)	0.1375* (0.0530)
	Non-university	N=3679	-0.0260 (0.0189)	0.0332 (0.0975)	0.0328 (0.0272)	0.0554*** (0.0128)	-0.0574 (0.1040)	-0.0198 (0.0331)
Regional unemployment	Low	N=2676	-0.0202 (0.0348)	0.0182 (0.0732)	0.0617 (0.0299)	0.0256 (0.0214)	0.2475 (0.1334)	0.0359 (0.0463)
	High	N=2284	-0.0532* (0.0220)	0.0297 (0.0942)	0.0737 (0.0516)	0.0550*** (0.0095)	0.0078 (0.0656)	-0.0065 (0.0366)
Women								
Full sample		N=5619	-0.0013 (0.0256)	0.0122 (0.1026)	-0.0063 (0.0356)	0.0172 (0.0163)	0.1009 (0.1030)	-0.0060 (0.0251)
Age	Young adults <34y	N=1506	-0.0273 (0.0364)	-0.0514 (0.2265)	-0.0233 (0.0526)	0.0558 (0.0311)	0.1466 (0.1302)	-0.0715 (0.0467)
	Old adults	N=4113	0.0079 (0.0260)	0.0657 (0.0865)	0.0167 (0.0431)	-0.0071 (0.0162)	0.0644 (0.1097)	0.0299 (0.0296)
Education level	University	N=1930	-0.0586* (0.0272)	-0.0405 (0.1679)	0.0550 (0.0456)	0.0567 (0.0396)	0.0634 (0.1109)	-0.0708 (0.0508)
	Non-university	N=3689	0.0169 (0.0299)	0.1781 (0.0898)	-0.0281 (0.0477)	0.0031 (0.0166)	0.2171 (0.1604)	0.0091 (0.0279)
Regional unemployment	Low	N=3240	-0.0192 (0.0361)	-0.0171 (0.1299)	0.0216 (0.0541)	-0.0027 (0.0258)	0.1043 (0.0973)	0.0429 (0.0390)
	High	N=2379	0.0211 (0.0333)	0.2086 (0.1780)	-0.0382 (0.0431)	0.0353 (0.0180)	-0.0837 (0.1679)	-0.0405 (0.0337)

*p-value<0.05;**p-value<0.01; ***p-value<0.001. Robust standard errors in parenthesis. Controls: age, civil status, main breadwinner, young children, education, income, chronic diseases, sector of activity, and region of residence.

Table 4. The mediating role of work-related stress

		Poor mental health			
		(λ) Effect at base year	(δ) Time effect	(γ) Change effect	High work stress
Men					
Full sample		0.0457*** (0.0109)	0.0276 (0.0638)	0.0016 (0.0300)	0.1174*** (0.0203)
Age	Young adults <34y	0.0232 (0.0271)	0.1123 (0.0852)	0.0367 (0.0317)	0.1525*** (0.0330)
	Old adults	0.0627** (0.0182)	-0.0636 (0.0805)	-0.0287 (0.0283)	0.0949** (0.0245)
Education level	University	-0.0140 (0.0386)	0.0470 (0.1445)	0.1151* (0.0503)	0.1004** (0.0330)
	Non-university	0.0585*** (0.0140)	-0.0614 (0.1040)	-0.0237 (0.0344)	0.1188*** (0.0220)
Regional unemployment	Low	0.0273 (0.0215)	0.2460 (0.1357)	0.0307 (0.0462)	0.0836* (0.0358)
	High	0.0614*** (0.0107)	0.0042 (0.0678)	-0.0154 (0.0397)	0.1214** (0.0291)
Women					
Full sample		0.0173 (0.0165)	0.0996 (0.0973)	-0.0054 (0.0248)	0.1020*** (0.0238)
Age	Young adults <34y	0.0578 (0.0305)	0.1503 (0.1255)	-0.0698 (0.0476)	0.0724* (0.0320)
	Old adults	-0.0080 (0.0155)	0.0571 (0.1078)	0.0280 (0.0272)	0.1101*** (0.0253)
Education level	University	0.0589 (0.0401)	0.0649 (0.1104)	-0.0728 (0.0505)	0.0371 (0.0281)
	Non-university	0.0010 (0.0179)	0.1949 (0.1572)	0.0126 (0.0281)	0.1248*** (0.0293)
Regional unemployment	Low	-0.0009 (0.0274)	0.1060 (0.0895)	0.0408 (0.0403)	0.0976** (0.0232)
	High	0.0331 (0.0159)	-0.1049 (0.1583)	-0.0366 (0.0330)	0.1018 (0.0478)

*p-value<0.05;**p-value<0.01; ***p-value <0.001. Robust standard errors in parenthesis. Controls: age, civil status, main breadwinner, young children, education, income, chronic diseases, sector of activity, region of residence, and work-related stress.

APPENDIX

Table A1. Sample mean and standard deviation (sd) by type of employment (Men)

Men	Permanent			Temporary		
	Mean (sd)			Mean (sd)		
	Men 2006/07	Men 2011/12	p- value	Men 2006/07	Men 2011/12	p-value
	N=2172	N=1840		N=536	N=412	
Main breadwinner	19,9 (40)	21,8 (41,3)	0.246	41,2 (49,3)	35 (47,8)	0.133
Not married	31,4 (46,4)	30,5 (46)	0.622	53 (50)	50,8 (50,1)	0.577
Age 25-34	27,8 (44,8)	22,2 (41,6)	0.005	53,9 (49,9)	43,1 (49,6)	0.034
Age 35-44	33,6 (47,2)	33,8 (47,3)		23,6 (42,5)	29,2 (45,5)	
Age 45-54	24,8 (43,2)	28,3 (45)		15,9 (36,6)	20,9 (40,7)	
Age 55-64	13,8 (34,5)	15,7 (36,4)		6,6 (24,8)	6,79 (25,2)	
#kids<=7	26,3 (44,2)	26,6 (44,2)	0.789	23 (42,1)	22,4 (41,8)	0.873
Chronic conditions	51,8 (50)	41,9 (49,3)	0.000	52,3 (50)	38,9 (48,8)	0.000
University educ.	29 (45,4)	26,6 (44,2)	0.045	17,9 (38,4)	19,2 (39,4)	0.199
Secondary educ.	32,4 (46,8)	37 (48,3)		25,7 (43,8)	31,6 (46,6)	
Primary and less educ.	38,5 (48,7)	36,4 (48,1)		56,4 (49,6)	49,2 (50,1)	
Managerial & tech	26,7 (44,3)	27,3 (44,6)	0.903	18,4 (38,8)	18,2 (38,6)	0.982
Intermediary	23,6 (42,5)	22,9 (42)		13,8 (34,5)	14,4 (35,1)	
Manual	49,7 (50)	49,8 (50)		67,8 (46,8)	67,4 (46,9)	
Very low income*	30,1 (45,9)	26,3 (44)	0.000	35,6 (47,9)	22,7 (41,9)	0.000
Low	23,6 (42,4)	25,4 (43,5)		14,6 (35,3)	18,7 (39)	
High	21,4 (41)	14,1 (34,8)		19,2 (39,5)	10,2 (30,3)	
Very high	17,9 (38,3)	13 (33,6)		23,6 (42,5)	24,4 (43)	
Missing income	7,02 (25,6)	21,2 (40,9)		7,01 (25,5)	24 (42,8)	
Agriculture	5,69 (23,2)	4,39 (20,5)	0.000	10,5 (30,7)	6,88 (25,3)	0.011
Extractives	12,7 (33,3)	8,72 (28,2)		8,35 (27,7)	8,37 (27,7)	
Light industry	4,8 (21,4)	8,93 (28,5)		5,53 (22,9)	6,46 (24,6)	
Machinery	15,5 (36,2)	12,4 (33)		33,8 (47,3)	22,2 (41,6)	
Construction	14,8 (35,6)	16,4 (37,1)		9,68 (29,6)	12,1 (32,7)	
Traditional services	10,5 (30,7)	11,6 (32,1)		7,21 (25,9)	11,1 (31,5)	
Advanced services	22,3 (41,7)	23,2 (42,2)		14,9 (35,6)	21 (40,8)	
Public services	9,55 (29,4)	8,54 (28)		8 (27,2)	5,62 (23,1)	
Others	4,02 (19,7)	5,66 (23,1)		2,05 (14,2)	6,19 (24,1)	

Note: Descriptive statistics based on the National Health Surveys for 2006-2007 and 2011-2012. Descriptive for the 17 regional dummies are omitted for space reasons, but are accounted for in the estimations. Monthly net income thresholds considered are: low (0-1000€); medium (1000-1575); high (1575-2725); very high (2725-4500).

Table A2. Sample mean and standard deviation (sd) by type of employment (Women)

Women	Permanent			Temporary		
	Mean (sd)			Mean (sd)		
	2006/07	2011/12		2006/07	2011/12	
	N=2547	N=1709	p- value	N=895	N=468	p-value
Main breadwinner	66,1 (47,3)	56,4 (49,6)	0.000	78 (41,4)	56,4 (49,6)	0.000
Not married	35,6 (47,9)	37,3 (48,4)	0.363	44,3 (49,7)	37,3 (48,4)	0.738
Age 25-34	31,9 (46,6)	24,2 (42,9)	0.000	45,8 (49,8)	24,2 (42,9)	0.049
Age 35-44	35,1 (47,7)	34,6 (47,6)		31,4 (46,4)	34,6 (47,6)	
Age 45-54	24,1 (42,8)	28,9 (45,3)		17,3 (37,8)	28,9 (45,3)	
Age 55-64	8,88 (28,4)	12,3 (32,9)		5,6 (23)	12,3 (32,9)	
#kids<=7	26,8 (44,3)	25,9 (43,8)	0.585	23,1 (42,2)	25,9 (43,8)	0.977
Chronic conditions	63,8 (48,1)	55,4 (49,7)	0.000	65,8 (47,5)	55,4 (49,7)	0.012
University Educ.	37,8 (48,5)	36,8 (48,2)	0.467	27,9 (44,9)	36,8 (48,2)	0.986
Secondary Educ.	34,1 (47,4)	36,3 (48,1)		30,5 (46,1)	36,3 (48,1)	
Primary and less educ.	28,1 (44,9)	26,9 (44,3)		41,5 (49,3)	26,9 (44,3)	
Managerial & tech	26,1 (43,9)	30,9 (46,2)	0.010	19,4 (39,6)	30,9 (46,2)	0.312
Intermediary	37,3 (48,4)	33,1 (47,1)		19,6 (39,7)	33,1 (47,1)	
Manual	36,6 (48,2)	36 (48)		61 (48,8)	36 (48)	
Low income	26,8 (44,3)	24,8 (43,2)	0.000	33,4 (47,2)	24,8 (43,2)	0.000
Medium	27,2 (44,5)	26,5 (44,2)		18 (38,5)	26,5 (44,2)	
High	18,3 (38,6)	12,3 (32,8)		11,4 (31,8)	12,3 (32,8)	
Very high	16,6 (37,2)	11,1 (31,4)		27,1 (44,4)	11,1 (31,4)	
Missing income	11,1 (31,4)	25,3 (43,5)		10,1 (30,1)	25,3 (43,5)	
Agriculture	5,6 (23)	2,18 (14,6)	0.000	8,94 (28,5)	2,18 (14,6)	0.000
Extractives	5,46 (22,7)	3,72 (18,9)		1,96 (13,9)	3,72 (18,9)	
Light industry	1,57 (12,4)	2,07 (14,2)		1,3 (11,4)	2,07 (14,2)	
Machinery	2,63 (16)	1,81 (13,4)		1,83 (13,4)	1,81 (13,4)	
Construction	19 (39,2)	19,2 (39,4)		20,8 (40,6)	19,2 (39,4)	
Traditional services	7,45 (26,3)	8,75 (28,3)		6,26 (24,2)	8,75 (28,3)	
Advanced services	29,7 (45,7)	21,4 (41)		22,2 (41,6)	21,4 (41)	
Public services	21,3 (41)	27,1 (44,5)		22,5 (41,8)	27,1 (44,5)	
Others	7,35 (26,1)	13,7 (34,4)		14,1 (34,9)	13,7 (34,4)	

Note: Descriptive statistics based on the National Health Surveys for 2006-2007 and 2011-2012. Descriptive for the 17 regional dummies are omitted for space reasons, but are accounted for in the estimations. Monthly net income thresholds considered are: low (0-1000€); medium (1000-1575); high (1575-2725); very high (2725-4500).