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5

6 [Abstract](#)

7 The Great Recession of 2008 has led to elevated unemployment in Europe and thereby
8 revitalised the question of causal health effects of unemployment. This article applies fixed
9 effects regression models to longitudinal panel data drawn from the European Union Statistics
10 on Income and Living Conditions for 28 European countries from 2008 to 2011, in order to
11 investigate changes in self-rated health around the event of becoming unemployed. The
12 results show that the correlation between unemployment and health is partly due to a decrease
13 in self-rated health as people enter unemployment. Such health changes vary by country of
14 domicile, and by individual age; older workers have a steeper decline than younger workers.
15 Health changes after the unemployment spell reveal no indication of adverse health effects of
16 unemployment duration. Overall, this study indicates some adverse health effects of
17 unemployment in Europe – predominantly among older workers.

18

19 **Keywords:** Self-reported health, unemployment, fixed effects analysis, health inequalities

20 Highlights

- 21 • Unemployed individuals report poorer self-rated health than employed individuals.
- 22 • Self-rated health levels fall when people move from employment to unemployment.
- 23 • This health fall is small compared to the health gap between employed and unemployed.
- 24 • Self-rated health levels fall more among older workers.
- 25 • The fall in levels of self-rated health differs between European countries.

26 Introduction

27 Following the Great Recession, unemployment rates in the European Union (EU-28) rose
28 from 6.8 per cent in January 2008 to 10.0 per cent in January 2012 (OECD, 2014). Because it
29 is well documented that unemployed people have poorer health than those who are employed
30 (Bartley, Ferrie & Montgomery, 2005; Schmitz, 2011), this rise in unemployment has led to
31 concern for the well-being and health of those affected (Catalano et al., 2011). Poorer health
32 among the unemployed may be driven by various processes, including (1) causation –
33 individuals becoming and remaining unemployed develop poorer health than those who
34 continue working, and (2) health selection – individuals in poor health have elevated risks of
35 becoming and staying unemployed. How far does self-rated health change when people move
36 between employment and unemployment? This article investigates this issue using the panel
37 of the European Union Statistics on Income and Living Conditions (EU-SILC) from 2008 to
38 2011.

39 Health selection

40 Health selection means that people in poor health are more likely to become and to stay
41 unemployed than people in good health. The reasons can be that poor health leads to
42 unemployment or that various other factors affect both health and employment prospects,
43 sometimes labelled direct and indirect health selection (Steele, French & Bartley, 2013).
44 Using various indicators of health, several studies have found that people in poor health are
45 more likely to become unemployed than those who are healthier (Korpi, 2001; Virtanen,
46 Janlert & Hammarström, 2013). Indicators include self-rated health (Elstad & Krokstad, 2003;
47 Van de Mheen, Stronks, Schrijvers & Mackenbach, 1999; Virtanen et al., 2005),
48 psychological distress (Mastekaasa, 1996), number of self-reported health symptoms (Korpi,
49 2001), and longstanding illness (Arrow, 1996). Both Virtanen et al. (2013) and Korpi (2001)

50 found that poor self-rated health increases the risk of becoming and remaining unemployed in
51 Sweden, and Schuring, Burdorf, Kunst and Mackenbach (2007) drew similar findings from a
52 more comprehensive panel from 12 European countries. A study from Great Britain (1973 –
53 2009) shows that over the last decades, people with limiting longstanding illness have had
54 increasingly lower probability of employment compared to their counterparts in better health
55 (Minton, Pickett & Dorling, 2012). In Europe Reeves, Karanikolos, Mackenbach, McKee and
56 Stuckler (2014) find that health selection processes are reinforced in the recent years.

57 Some of this selection might be due to indirect health selection into unemployment, i.e.
58 through the effect of underlying causes on health and employment status. In Germany, Arrow
59 (1996) found that immigrants, women, young adults, and previously unemployed people are
60 at particularly high risk of health selection into unemployment. In their 12-country study,
61 Schuring et al. (2007) found an elevated risk of health selection among unmarried women,
62 parents of young children, elderly people, and low-income groups. Low education and poor
63 health may also increase the risk of remaining unemployed (Bartley & Owen, 1996; Korpi,
64 2001; van der Wel, Dahl & Thielen, 2011). Nevertheless, disentangling such indirect health
65 selection from direct health selection requires sophisticated methods because health and social
66 position cannot (and should not) be randomised. Using dynamic panel models, which address
67 the effect of previous health on current health, Steele et al. (2013) found limited evidence for
68 direct selection but strong support for indirect selection; unmeasured individual factors were
69 associated with higher risk of both unemployment and ill health.

70 [Causal effects](#)

71 Longitudinal data allow for investigations into changes in health as individuals become
72 unemployed as well as temporal changes in health before and after becoming unemployed.
73 Such methods come closer to causal effects than cross-sectional comparison because they can

74 filter out all time-variant individual characteristic leading to both unemployment and poor
75 health (Gunasekara, Richardson, Carter & Blakely, 2014).

76 However, there could be individual characteristics that change over time that might affect
77 both health and the probability of unemployment. For example, alcoholism or marital
78 dissolution could lead to both unemployment and poor health. These would be examples of
79 time-varying confounding and health selection effects. Longitudinal data typically allow for
80 investigating some – but not all – such effects.

81 Flint, Bartley, Shelton and Sacker (2013) found that unemployment transitions were
82 associated with a decrease in self-reported mental distress, suggesting that unemployment
83 generates psychological stress. In a review of longitudinal research on health and
84 unemployment, Catalano et al. (2011) found that job losers are twice as likely as those who
85 remain employed to have increased symptoms of depression and anxiety. On average, job
86 losers tend to increase their report of symptoms by 15 - 30 per cent, suggesting a possible
87 causal link between unemployment and health. Nevertheless, studies investigating how health
88 changes around the time that unemployment occurs could be contaminated by direct health
89 selection (when a sudden health decline precedes unemployment) and indirect selection (when
90 a third factor affects both outcomes).

91 For such reasons, some analysts believe that plant closures or major layoffs are better
92 indicators of true causal effects than instances of individual unemployment (Jin, Shah &
93 Svoboda, 1995; Morris & Cook, 1991). Schmitz (2011) found a greater decline in health as
94 measured by hospitalisation, mental health scores and satisfaction with health among people
95 unemployed for individual reasons than among people becoming unemployed as a result of
96 closures or mass layoffs. For those unemployed because of a closure, a similar finding was
97 discovered for hospital visits, but not for satisfaction with health or mental health. Schmitz
98 (2011) argues that the divergent results for the two groups are due to health selection.

99 However, cases of downsizing and individual job terminations could be perceived as the
100 result of selection based on the individuals' characteristics, unlike closures that affect the
101 entire staff (Mastekaasa, 1996). Individuals who are laid off individually may relate their job
102 loss to their inadequate job performance or other unattractive individual characteristics, and
103 this interpretation may be more stressful than collective unemployment due to closure. As
104 such, investigations of health effects of unemployment could benefit from a more direct
105 investigation of health changes prior to unemployment.

106 [Hypotheses](#)

107 We hypothesise (1) that changes in health when people become unemployed can explain some
108 of the health difference between employed and unemployed individuals. We also hypothesise
109 that these effects of unemployment will vary by individual characteristics. Because
110 unemployment is more common among younger people and they are more likely than older
111 workers to be reemployed (Skärlund, Åhs & Westerling, 2012; Wanberg, Hough & Song,
112 2002), we hypothesise (2) that older workers will suffer more adverse health consequences
113 than younger workers on becoming unemployed. Because it is probably easier for women
114 than men to adopt social roles other than that of "breadwinner" (Kuhn, Lalive & Zweimüller,
115 2009), we expect (3) that the health consequences of unemployment to be more adverse for
116 men than for women. We also expect (4) the health consequences of unemployment will be
117 less severe for highly educated than for less educated individuals. One reason is that
118 employers might prefer more highly educated workers, making those with more education
119 more likely to gain reemployment than those with less (Carling, Edin, Harkman & Holmlund,
120 1996). More educated individuals may also have resources that make it easier for them to
121 engage in alternative activities during periods of unemployment – for example, pursuing
122 further education or training opportunities.

123 Finally we hypothesise (5) that the relationship between unemployment and health may vary
124 between European countries. The current analysis makes no assumptions about the countries
125 or country in which various characteristics predict better or worse health effects following
126 individual unemployment.

127 Data and methods

128 This analysis uses data from the 2008–2011 panel of the European Union Statistics on Income
129 and Living Conditions (EU-SILC). It uses 404,843 yearly observations from 189,177
130 individuals who were in the labour force (working or unemployed) and living in 28 European
131 countries (i.e. the EU-28, excluding Germany and Ireland and including Norway and Iceland).
132 The data have been harmonised according to European Parliament and Council regulation
133 1177/2003, and they comprise an extraordinarily rich source of employment information. All
134 variables – dependent and explanatory – can vary between the up-till four yearly observations
135 of each individual (2008–2011).

136 Dependent variable

137 The dependent variable is self-rated health, measured on a single item (“How is your health in
138 general?”) and ranked on a 5-point scale (5 = “very good”, 4 = “good”, 3 = “fair”, 2 = “bad”,
139 and 1 = “very bad”). This item has been shown empirically to be a powerful predictor of
140 future morbidity and mortality (Burström & Fredlund, 2001; Eriksson, Undén & Elofsson,
141 2001; Idler, Russell & Davis, 2000). In EU-SILC, this question has an overall response rate of
142 83 per cent.

143 [Independent variables](#)

144 Data on unemployment versus employment, the main independent variable of interest, were
145 collected retrospectively from the EU-SILC, which provides information on the main activity
146 over the previous 12 months. Full-time, part-time and self-employment were given the value
147 1, unemployment was given the value 0, and all other activities (e.g. education/training,
148 unpaid work experience, retirement, permanent disability/inability to work, compulsory
149 military or community service, domestic responsibilities, etc.) were recorded as “missing”. If
150 more than one type of activity occurred in the same month, priority was given to economic
151 over non-economic activity or inactivity.

152 *Unemployment* (unemployed at t) is coded 1 if the respondent is unemployed at the time of
153 the interview, 0 if employed. *Unemployment transition* (employed at t-1, t-2 or t-3) is coded 1
154 if the respondent is observed to be employed at previous interviews, but had a transition into
155 unemployment between baseline and interview. *Reemployment* (employed at t, unemployment
156 transition at t-1 or t-2) is coded 1 if the respondent re-entered employment after an
157 *unemployment transition*.

158 Health changes before and after the unemployment spell were investigated by utilising the
159 time distance from the unemployment spell to the interview. To locate the exact month of
160 unemployment transition, we created a job history file from the retrospective information on
161 the main activity of each respondent for each month from 2007 through 2010. Transitions
162 from employment to unemployment were recorded when at least three months of employment
163 was followed by at least three months of unemployment. We then calculated the time from the
164 month when a period of unemployment began to the time of the interview for all yearly
165 observations. This variable was separated at zero to provide two variables, where *health trend*
166 *before unemployment spell* denotes the temporal distance between interview and
167 unemployment spell in the time before becoming unemployed while *health trend after*

168 *unemployment spell* denotes the equivalent temporal distance in the time after becoming
169 unemployed. On this variables, we recorded 7,251 observations among 6,156 individuals
170 (mean =1.18) before unemployment transition and 33,344 observations among 17,162
171 individuals (mean = 1.92) after unemployment transition. The unequal number of before and
172 after unemployment observations is mainly attributable to the survey design. Respondents
173 reported their monthly job history for the previous year at the time of the interview.
174 Consequently, there will be more information on health after unemployment spells than
175 before, providing stronger statistical power for health change after than the health trend
176 before.

177 Time-varying covariates are current age (linear and squared), partnership (married or
178 cohabiting) status and the number of dependent children (i.e. household members below 16
179 years) in the household. Disposable household income might mediate the effect of
180 unemployment on health. This variable is recoded into logarithm because the impact of
181 absolute changes may depend on the income level (Kawachi, Adler & Dow, 2010).

182 Gender and education level are time-invariant variables. Following Heggebø (2015) education
183 is represented by two dummy-variables computed from the highest ISCED level attained. Pre-
184 primary, primary and lower secondary is collapsed to *primary education*; (upper) secondary
185 and post-secondary non-tertiary is collapsed to *secondary education* (reference category); and
186 all higher educational qualifications are coded as *higher education*.

187 [Statistical analysis](#)

188 The data were analysed using linear regression models. Distributions in self-rated health were
189 investigated using ordinary least squares (OLS) regression models, whereas changes in self-
190 rated health were investigated using panel data models with individual fixed effects.

191 The OLS model estimates the mean self-rated health score among unemployed compared to
192 the employed. Such estimates include both selection and causal effects. The fixed effects
193 model estimates the within individual health change and thereby controls for all (measured
194 and unmeasured) time-invariant confounding effects (Gunasekara et al., 2014). Health
195 selection due to fixed factors is thereby eliminated.

196 Fixed effects estimates might be contaminated by health selection if there is a short time span
197 between declining health and the onset of unemployment (Gunasekara et al., 2014). This
198 possibility is tested by estimating health changes prior to entering unemployment; the data
199 reveal no such tendencies. A lagged dependent variable is endogenous and cannot therefore
200 be included in a regular fixed effects model. Thus, to control for path dependency – i.e. that
201 previous health predicts current health changes – we employ Arellano-Bond dynamic fixed
202 effects estimation (Arellano & Bond, 1991), which is a Generalised Method of Moments
203 (GMM) estimator particularly appropriate for short panels with large number of observations
204 (Arellano & Bond, 1991; Bond, 2002; Cameron & Trivedi, 2010). The Arellano-Bond
205 estimator eliminates potential omitted variables bias by first-differencing, before estimating a
206 system of year specific equations where first lag regressors constitute an instrument for the
207 lagged dependent variable (Cameron & Trivedi, 2010, pp. 293-303).

208 Transitions from work to unemployment are associated with lower income. How far income
209 mediates the relationship between unemployment and health is tested in a separate model.

210 Three models investigate how far the health effects of becoming unemployed are modified by
211 three individual characteristics using interaction terms between unemployment and gender
212 (female dummy), age (linearized) and education level (two dummy variables). Whether the
213 results vary between the 28 European countries is investigated using interactions between
214 unemployment and country dummies controlling for covariates and age interactions. The

215 coefficients are estimated at age 40 and country-variation is tested by an associated (27 df) F-
216 test.

217 Because national sample sizes do not correspond to the size of the national workforces, all
218 OLS and regular fixed effects models apply population weights that provide estimates
219 representative of the European population. Population weights were calculated as the function
220 of $\frac{p}{n}$, where p is the number of employees (aged 20–64) in the labour force, and n is the
221 number of respondents in the analysis. Information on the number of employees (aged 20–64)
222 in the labour force was extracted from Eurostat (2014). Test statistics are robust for
223 heteroscedasticity and correct for the fact that repeated observations (2008, 2009, 2010 and
224 2011) for each individual are not statistically independent using the cluster option in Stata
225 (2007). All tables present two-sided tests.

226 Results

227 Descriptive statistics

228 Table 1 reports descriptive statistics of the data. At one interview or more, 37,413 (10.9 per
229 cent) respondents were unemployed, and 9,472 (4.0 per cent) moved from employment (three
230 months or more) to unemployment (three months or more) during the time covered by the job
231 history data.

232 Self-rated health (1–5) has a mean value of 4.056 (SD = 0.761). Employed Europeans
233 reported better health (4.081) than unemployed individuals (3.851). Respondents were aged
234 on average 42 years (SD = 11.6) and had one dependent child (SD=1.4) at the interviews. 71
235 per cent were married or cohabiting, 49 per cent had primary or lower secondary education as
236 highest ISCED level attained, while 29 per cent had higher education; the remaining 22 per
237 cent had upper secondary or some post-secondary education.

238

239

Table 1 about here

240 [Transition and health change](#)

241 Table 2 presents regression models of the correlation between unemployment and health. The

242 OLS model (1) estimates cross-sectional differences between employed and unemployed,

243 whereas the fixed effects model (2) estimates how health changes within individuals as they

244 move between employment and unemployment.

245

Table 2 about here

246 Model 1 reveals a cross-sectional gap of 0.287 (SE = 0.006) in self-rated health between

247 employed and unemployed individuals. The longitudinal estimate from the fixed effects

248 model (2) shows that unemployment transitions are associated with significant change in

249 subjective health (-0.038, SE = 0.008). In Model 3, the unemployment estimate is restricted to

250 transitions from employment to unemployment because health change associated with

251 reemployment is indicated by a separate coefficient. Transition into unemployment is still

252 significantly associated with a decrease in self-rated health (-0.035, SE=0.012).

253 Reemployment is associated with an increase in self-rated health (0.043, SE=0.027), however,

254 the reemployment estimate is not statistically significant. The estimated health changes before

255 and after entering unemployment indicate improved self-rated health (0.033, SE=0.019 and

256 0.020, SE=0.007), however, only the health change after becoming unemployed is statistically

257 significant.

258 Adjusting for relative household income changes does not alter the main result; Model 4

259 shows that the unemployment estimate, as well as the health change after the unemployment

260 spell, still reveals a significant increase in self-rated health , while reemployment remains

261 insignificant. Even when we control for previous health, which is a highly predicative factor

262 (-0.192, SE=0.016), the significant negative correlation between unemployment transition and
263 self-rated health sustains (Model 5). The number of observations in this last model is
264 substantially lower than in the former models as estimation depends on information at t-1
265 (Cameron & Trivedi, 2010).

266 Table 3 investigates whether and how far the longitudinal unemployment effect from Model 2
267 varies by gender, age, and educational level. Models 6 and 8 suggest no gender or educational
268 differences, while model 7 suggests age differences.

269 The age variable is centred on 40 years (age – 40) and then divided by 10 (indicating a 10-
270 year change). The estimates in Model 7 (– 0.031, SE = 0.009) indicate virtually no health
271 change following transitions between employment and unemployment among individuals
272 aged under 25 years but a strong decrease in self-rated health when older workers move into
273 unemployment, for example a drop of 0.078 (0.016 + 0.031* 2) for workers who become
274 unemployed at age 60 ($[60 - 40]/10 = 2$).

275

276 Table 3 about here

277 [Between-country variation](#)

278 The interactions between unemployment and country dummies are reported in Figure 1, and
279 the variation is statistically significant ($p < 0.001$ using a 27 df F-test). These country specific
280 results were estimated using Model 7 (interaction term between unemployment and age) plus
281 an additional interaction term between unemployment and country of living (N=28). Model 7
282 is used because the age distribution of those becoming unemployed varies between the 28
283 countries, which affect the country level comparison. The graph shows that the largest health
284 effects from transition into unemployment were in Sweden, Romania, Croatia and Hungary.

285 In contrast, transitions into unemployment were associated with an increase in self-rated
286 health in some of the investigated countries such as Spain, Iceland and Estonia.

287 Figure 1 about here

288 Discussion

289 The 2008 economic crisis has manifested itself in increased, and for several countries
290 historically high, unemployment rates. Because the recession has been long-lasting and
291 unemployment rates have remained high, there is good reason to be concerned about the
292 welfare of those entering unemployment. Even a small individual health effect of
293 unemployment could have substantial impact on health if accumulated at population level.
294 This analysis investigates the association between a transition into unemployment and change
295 in subjective health. In line with Flint et al. (2013), we find a decrease in self-rated health as
296 people enter unemployment, providing some support for a potential causal effect.

297 The results further indicate that individuals who experience unemployment transitions are in
298 poorer health than the stable employed because the cross-sectional difference in health
299 between employed and unemployed individuals is much larger than the health change
300 associated with transitions between employment and unemployment. The deviation between
301 cross-sectional and longitudinal estimates could indicate direct or indirect health selection
302 mechanisms. However, this study cannot distinguish between these mechanisms nor
303 determine the exact overall size of these selection effects.

304 Previous research shows that workers in poor health are more likely than healthy workers to
305 become unemployed (Korpi, 2001; Virtanen et al., 2013). According to Reeves et al. (2014),
306 such health selection effects have been strengthened over recent years in Europe, particularly
307 in countries hardest hit by the Great Recession (Reeves et al., 2014), which indicate that the

308 current recession has made health an even more important employment factor than it was in
309 periods with better employment opportunities.

310 We find no tendency that subjective health deteriorates before people become unemployed.
311 The reason could be that more severe changes in health would most likely result in transitions
312 into a disabled status rather than remaining economically active and continuing to search for a
313 job.

314 The results indicate that subjective health tends to improve over the first few years after
315 becoming unemployed, also when controlling for reemployment and relative income changes
316 at household level (Table 2, Models 3 and 4). This finding could be attributable to various
317 adaption processes. There is the possibility that entering unemployment is a stressful
318 experience and that some individuals eventually learn to cope with the new situation. Further,
319 unemployment might have both positive and negative effects, and positive effects such as
320 fewer physically or mentally demanding job requirements could balance the negative effects
321 such as lower income and social position. Those who learn to live with this situation may
322 adjust their expectations. Brickman and Campbell (1971) describe this psychological
323 mechanism of adjusting our emotional system to new circumstances as the hedonic treadmill
324 (see also Diener, Lucas & Scollon, 2006; Kahneman, Krueger, Schkade, Schwarz & Stone,
325 2004) . The implication is that any life event leading to a better or worse situation tends to
326 have relatively short-lived effects on individuals' subjective judgements of well-being,
327 including subjective health.

328 This analysis cannot distinguish between the two explanations to say whether individuals
329 learn how to live with being unemployed or if they merely adapt their subjective judgements
330 in relation to being unemployed. More objective indicators of health could perhaps help to
331 distinguish between the two explanations. However, in contrast to subjective health, which
332 may change abruptly, most objective indicators of poor health develop or change so slowly

333 that they are difficult to investigate longitudinally. Levels of cortisol, a stress hormone
334 obtained from hair analysis, indicate no reduction in stress over the first one or two years of
335 unemployment (Dettenborn, Tietze, Bruckner & Kirschbaum, 2010). In light of current
336 research, the implication of such stability in stress levels after unemployment could be that
337 unemployed individuals merely adjust their subjective judgements around being unemployed,
338 although they still experience stress. Those who do not adapt to unemployment may, on the
339 other hand, become “discouraged workers”, and say that they are “permanently sick” or
340 “economically inactive”. As a result, the unemployed group might look healthier each year
341 relative to those employed. More remains to be known about how individuals adapt to
342 unemployment, including the consequences for their health.

343 All major results are similar for men and women. This finding is in line with the majority of
344 previous longitudinal studies (Catalano et al., 2011). Although women might have a wider
345 range of alternative social roles when becoming unemployed (Kuhn et al., 2009),
346 unemployment seems to affect the subjective health of men and women similarly.

347 We also hypothesised that more educated individuals could face better employment prospects
348 than less educated individuals and also have resources that make unemployment easier for
349 them. Our analyses reveal no such gradient.

350 This study also finds that age moderates the health consequences of unemployment;
351 unemployment affects the health of older workers, while younger workers seem to be
352 unaffected. Although unemployment has risen more among younger than older workers, the
353 health cost for the transitions have been more pronounced among older workers. Possible
354 interventions to prevent and reduce the negative health effects of unemployment could
355 therefore be most relevant for persons over 40 years. One explanation of the disproportionate
356 large effect among older workers could be that unemployment in older age implies lower
357 chances of reemployment (Skärlund et al., 2012; Wanberg et al., 2002). Another explanation

358 could be that unemployment is a less socially stigmatizing among young people, since a
359 majority of the unemployed are young, and young people tend more often than older people to
360 move in and out of employment.

361 Country-specific context could be another moderating factor; the longitudinal results vary
362 between the 28 European countries (Figure 1). Entering unemployment is associated with
363 poorer subjective health in most, but not all, European countries. This finding also holds when
364 controlling for the moderating factor of age; the results are not driven by cross-country
365 variation in age composition of individuals entering unemployment.

366 [Strengths](#)

367 This study is unique in examining possible health consequences for those exposed to
368 unemployment in Europe during the economic crisis. It follows 189,177 Europeans of
369 working age, analysing their individual health changes over four years. Both the data and
370 statistical methods used are powerful, and the specific job history file developed as part of this
371 research makes it possible to explore issues of direct health selection and changes in health
372 over a few years after the onset of unemployment.

373 A noticeable advantage with this study is its two different ways of investigating health status
374 before the unemployment spell: controlling for health *change* by applying health slopes and
375 controlling for path dependency by controlling for previous health *levels*. Both methods are
376 applied in order to reduce the possibility of bias due to various forms of health selection and
377 support the main results: unemployment spells tend to have an immediate impact on self-rated
378 health.

379 [Limitations](#)

380 EU-SILC provides a short observation window (from 2008 to 2011) and typically low number
381 observations for each individual (mean=2.14). Previous unemployment transition and other

382 unfavourable life events prior to 2008 are not included in the analysis. By estimating the
383 health slope prior to unemployment and applying a dynamic fixed effects model, we limit the
384 bias due to effects of the most recent life events but cannot control for health selection in
385 earlier work history. A larger time window could also allow for estimating more robust
386 dynamic fixed effects models.

387 Attrition is a problem in longitudinal survey data and could affect our results. This study does
388 not address the impact of such attrition biases.

389 We have limited information about factors that may mediate the relationship between
390 unemployment and health such as social exclusion, health behaviour, psychological scarring,
391 or psychological justification (Bambra, 2011; Bartley, 1994; Clark, Georgellis & Sanfey,
392 2001; McDonough & Amick III, 2001). The SILC data allow for investigating the role of
393 income and poverty including more subjective judgments such as economic stress. Income
394 does not change any unemployment estimates in this research. However, we have not
395 controlled for any subjective judgments of the financial situation because the dependent
396 variable (subjective health) is also a subjective judgment. Psychological justification may
397 mediate whether individuals who are unemployed project health as a reason for their loss or
398 lack of work (McDonough & Amick III, 2001). Such justifications are not necessarily
399 intentional; they might as well be results of unconscious protection mechanisms, including a
400 psychological defence against self-blame. If such a protection mechanism is prevalent, it
401 would imply that the effects of unemployment on health are overestimated in all of the
402 regression models presented here. On the other hand; some of the included time-variant
403 confounders, such as partnership, could also be potential mediating factors (MacKinnon,
404 Fairchild & Fritz, 2007).

405 Although we find limited health consequences of unemployment, unemployment may affect
406 health through more implicit mechanisms than direct exposure, and may affect the health of

407 others in the lives of the unemployed. In a study of unemployment in Germany, Marcus
408 (2013) showed that unemployment may affect mental health among family members, as
409 mental health impairment among spouses was about two-thirds that of the directly affected
410 unemployed workers. Furthermore, anticipation of job loss, a consequence of rising
411 unemployment rates, may also affect the health of employed individuals. For example, Ferrie,
412 Shipley, Marmot, Stansfeld and Smith (1998) found that rumours about the privatisation of
413 public services led to deteriorated self-rated health among British civil servants in the two to
414 three years before privatisation actually took place.

415 Conclusion

416 This study has investigated the individual health changes associated with unemployment
417 transitions in Europe. Workers – especially older workers and – who became unemployed
418 during the Great Recession experienced a drop in self-rated health at the time of the transition.
419 However, the potentially causal effect of unemployment on self-rated health appears to
420 diminish after entering unemployment. The results indicate that workers in poor health face
421 elevated risk of becoming unemployed. Taken together with the age-related differences in the
422 probability of reemployment, this study supports the more general notion that poor health and
423 disadvantageous social factors tend to accumulate.

424

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Figures and tables:

Table 1: Descriptive statistics

| | Definition | Frequency |
|--|---|----------------|
| Number of observations | Number of observations in the panel data | 404 843 |
| Number of respondents | Number of respondents in the panel data | 189 177 |
| Number of unemployment observations | Number of unemployment observations in the panel data. Unemployment = 1; self-employment or employed = 0; all other values = missing. | 54 287 |
| Number of unemployed | Number of respondents with unemployment observations in the panel data. | 37 413 |
| Number of unemployment transitions | Number of transitions from employment (0) to unemployment (1) | 9 197 |
| Number of reemployments | Number of transitions from employment (0) to unemployment (1) and back to employment (0) | 1 409 |
| | | Mean (SD) |
| Variable | Definition | Weighted |
| Self-rated general health | 1 (very bad) – 5 (very good) | 4.056 (0.761) |
| Unemployed | Unemployment = 1; self-employment or employed = 0; all other values = missing. % | 0.107 (0.309) |
| Secondary education | Highest ISCED level attained: Secondary and post-secondary non-tertiary. | 0.488 (0.500) |
| Higher education | Highest ISCED level attained: 1st & 2nd stage of tertiary education | 0.293 (0.455) |
| Trend before | Years from the current interview to the unemployment spell | -0.007 (0.076) |
| Trend after | Years from unemployment spell to next interview | 0.083 (0.367) |
| Gender | 1 = woman, 0 = man | 0.466 (0.499) |
| Age | Age of respondents, centred at 40, divided by 10. | 0.201 (1.119) |
| Age squared | Age of respondents, centred at 40, divided by 10. | 1.293 (1.322) |
| Partnership | Married or living in a consensual union | 0.710 (0.454) |
| Children | Number of persons under 18 years living in the household | 1.147 (1.392) |
| Household income | Household disposable income (log) | 10.092 (1.103) |

Table 2: Self-rated health as result of unemployment and covariates.

| | Model 1 β (SE) OLS | Model 2 β (SE) Fixed effects | Model 3 β (SE) Fixed effects | Model 4 β (SE) Fixed effects | Model 5 β (SE) Dynamic fixed effects |
|---|--------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---|
| Unemployment (unemployed at t) | -0.287*** (0.006) | | | | |
| Unemployment transition(s) (employed at t-1, t-2 or t-3) | | -0.038*** (0.008) | -0.035** (0.012) | -0.035** (0.012) | -0.039** (0.015) |
| Reemployment (employed, unemployed at t-1 or t-2) | | | 0.043 (0.027) | 0.043 (0.027) | 0.014 (0.021) |
| Health trend before unemployment spell | | | 0.033 (0.019) | 0.033 (0.019) | |
| Health trend after becoming unemployed | | | 0.020** (0.007) | 0.021** (0.007) | |
| Log household income | | | | 0.004 (0.003) | |
| Self-rated health (t-1) | | | | | -0.192*** (0.016) |
| Covariates: | | | | | |
| Woman | YES | NO | NO | NO | NO |
| Age, Age ² , Marital/cohabitation status, Number of children | YES | YES | YES | YES | YES |
| Number of observations | 404,843 | 404,843 | 404,843 | 404,821 | 72,984 |
| Number of individuals | 189,177 | 189,177 | 189,177 | 189,175 | 70,804 |
| R ² | 0.073 | | | | |
| R ² (FE within) | | 0.004 | 0.004 | 0.004 | Not applicable |

OLS and fixed effects models are population weighted. Population weights are not applicable on dynamic fixed effects models.

Robust standard errors in parentheses. * = p < 0.05, ** = p < 0.01 & *** = p < 0.001 in two-sided tests.

Table 3: Self-rated general health. Interactions with unemployment transition.

| | Model 6 β (SE) Fixed effects | Model 7 β (SE) Fixed effects | Model 8 β (SE) Fixed effects |
|--|------------------------------------|------------------------------------|------------------------------------|
| Unemployment transition (employed at t-1, t-2 or t-3) | -0.020 (0.014) | -0.015 (0.011) | -0.037* (0.015) |
| Interactions with unemployment transition: | | | |
| Women | 0.006 (0.021) | | |
| Age | | -0.031*** (0.009) | |
| Primary education (secondary education reference category) | | | 0.024 (0.023) |
| Higher education (secondary education reference category) | | | 0.036 (0.030) |
| Covariates | | | |
| Reemployment, Age, Age ² , Marital/cohabitation status, Number of children | YES | YES | YES |
| Number of observations | 404,843 | 404,843 | 401,154 |
| Number of individuals | 189,177 | 189,177 | 187,438 |
| R ² (within) | 0.003 | 0.003 | 0.003 |

Population weighted. Robust standard errors in parentheses. * = p < 0.05, ** = p < 0.01 & *** = p < 0.001 in two-sided tests

Figure 1: Unemployment transition at age 40. Country specific estimates (Model 2, $p < 0.001$ using a 27 df F-test)



