# Abstract

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

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

Highlights

•    Unemployed individuals report poorer self-rated health than employed individuals.

•    Self-rated health levels fall when people move from employment to unemployment.

•   This health fall is small compared to the health gap between employed and unemployed.

•   Self-rated health levels fall more among older workers.

•   The fall in levels of self-rated health differs between European countries.

# Introduction

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

## Health selection

Health selection means that people in poor health are more likely to become and to stay unemployed than people in good health. The reasons can be that poor health leads to unemployment or that various other factors affect both health and employment prospects, sometimes labelled direct and indirect health selection (Steele, French & Bartley, 2013). Using various indicators of health, several studies have found that people in poor health are more likely to become unemployed than those who are healthier (Korpi, 2001; Virtanen, Janlert & Hammarström, 2013). Indicators include self-rated health (Elstad & Krokstad, 2003; Van de Mheen, Stronks, Schrijvers & Mackenbach, 1999; Virtanen et al., 2005), psychological distress (Mastekaasa, 1996), number of self-reported health symptoms (Korpi, 2001), and longstanding illness (Arrow, 1996). Both Virtanen et al. (2013) and Korpi (2001) found that poor self-rated health increases the risk of becoming and remaining unemployed in Sweden, and Schuring, Burdorf, Kunst and Mackenbach (2007) drew similar findings from a more comprehensive panel from 12 European countries. A study from Great Britain (1973 – 2009) shows that over the last decades, people with limiting longstanding illness have had increasingly lower probability of employment compared to their counterparts in better health (Minton, Pickett & Dorling, 2012). In Europe Reeves, Karanikolos, Mackenbach, McKee and Stuckler (2014) find that health selection processes are reinforced in the recent years.

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

## Causal effects

Longitudinal data allow for investigations into changes in health as individuals become unemployed as well as temporal changes in health before and after becoming unemployed. Such methods come closer to causal effects than cross-sectional comparison because they can filter out all time-variant individual characteristic leading to both unemployment and poor health (Gunasekara, Richardson, Carter & Blakely, 2014).

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

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

For such reasons, some analysts believe that plant closures or major layoffs are better indicators of true causal effects than instances of individual unemployment (Jin, Shah & Svoboda, 1995; Morris & Cook, 1991). Schmitz (2011) found a greater decline in health as measured by hospitalisation, mental health scores and satisfaction with health among people unemployed for individual reasons than among people becoming unemployed as a result of closures or mass layoffs. For those unemployed because of a closure, a similar finding was discovered for hospital visits, but not for satisfaction with health or mental health. Schmitz (2011) argues that the divergent results for the two groups are due to health selection. However, cases of downsizing and individual job terminations could be perceived as the result of selection based on the individuals’ characteristics, unlike closures that affect the entire staff (Mastekaasa, 1996). Individuals who are laid off individually may relate their job loss to their inadequate job performance or other unattractive individual characteristics, and this interpretation may be more stressful than collective unemployment due to closure. As such, investigations of health effects of unemployment could benefit from a more direct investigation of health changes prior to unemployment.

## Hypotheses

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

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

# Data and methods

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

## Dependent variable

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

## Independent variables

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

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

Health changes before and after the unemployment spell were investigated by utilising the time distance from the unemployment spell to the interview. To locate the exact month of unemployment transition, we created a job history file from the retrospective information on the main activity of each respondent for each month from 2007 through 2010. Transitions from employment to unemployment were recorded when at least three months of employment was followed by at least three months of unemployment. We then calculated the time from the month when a period of unemployment began to the time of the interview for all yearly observations. This variable was separated at zero to provide two variables, where *health trend before unemployment spell* denotes the temporal distance between interview and unemployment spell in the time before becoming unemployed while *health trend after unemployment spell* denotes the equivalent temporal distance in the time after becoming unemployed. On this variables, we recorded 7,251 observations among 6,156 individuals (mean =1.18) before unemployment transition and 33,344 observations among 17,162 individuals (mean = 1.92) after unemployment transition. The unequal number of before and after unemployment observations is mainly attributable to the survey design. Respondents reported their monthly job history for the previous year at the time of the interview. Consequently, there will be more information on health after unemployment spells than before, providing stronger statistical power for health change after than the health trend before.

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

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

## Statistical analysis

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

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

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

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

Three models investigate how far the health effects of becoming unemployed are modified by three individual characteristics using interaction terms between unemployment and gender (female dummy), age (linearized) and education level (two dummy variables). Whether the results vary between the 28 European countries is investigated using interactions between unemployment and country dummies controlling for covariates and age interactions. The coefficients are estimated at age 40 and country-variation is tested by an associated (27 df) F-test.

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

# Results

## Descriptive statistics

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

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

Table 1 about here

## Transition and health change

Table 2 presents regression models of the correlation between unemployment and health. The OLS model (1) estimates cross-sectional differences between employed and unemployed, whereas the fixed effects model (2) estimates how health changes within individuals as they move between employment and unemployment.

Table 2 about here

Model 1 reveals a cross-sectional gap of 0.287 (SE = 0.006) in self-rated health between employed and unemployed individuals. The longitudinal estimate from the fixed effects model (2) shows that unemployment transitions are associated with significant change in subjective health (-0.038, SE = 0.008). In Model 3, the unemployment estimate is restricted to transitions from employment to unemployment because health change associated with reemployment is indicated by a separate coefficient. Transition into unemployment is still significantly associated with a decrease in self-rated health (-0.035, SE=0.012). Reemployment is associated with an increase in self-rated health (0.043, SE=0.027), however, the reemployment estimate is not statistically significant. The estimated health changes before and after entering unemployment indicate improved self-rated health (0.033, SE=0.019 and 0.020, SE=0.007), however, only the health change after becoming unemployed is statistically significant.

Adjusting for relative household income changes does not alter the main result; Model 4 shows that the unemployment estimate, as well as the health change after the unemployment spell, still reveals a significant increase in self-rated health , while reemployment remains insignificant. Even when we control for previous health, which is a highly predicative factor (-0.192, SE=0.016), the significant negative correlation between unemployment transition and self-rated health sustains (Model 5). The number of observations in this last model is substantially lower than in the former models as estimation depends on information at t-1 (Cameron & Trivedi, 2010).

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

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

Table 3 about here

## Between-country variation

The interactions between unemployment and country dummies are reported in Figure 1, and the variation is statistically significant (*p* < 0.001 using a 27 df F-test). These country specific results were estimated using Model 7 (interaction term between unemployment and age) plus an additional interaction term between unemployment and country of living (N=28). Model 7 is used because the age distribution of those becoming unemployed varies between the 28 countries, which affect the country level comparison. The graph shows that the largest health effects from transition into unemployment were in Sweden, Romania, Croatia and Hungary. In contrast, transitions into unemployment were associated with an increase in self-rated health in some of the investigated countries such as Spain, Iceland and Estonia.

Figure 1 about here

# Discussion

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

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

Previous research shows that workers in poor health are more likely than healthy workers to become unemployed (Korpi, 2001; Virtanen et al., 2013). According to Reeves et al. (2014), such health selection effects have been strengthened over recent years in Europe, particularly in countries hardest hit by the Great Recession (Reeves et al., 2014), which indicate that the current recession has made health an even more important employment factor than it was in periods with better employment opportunities.

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

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

This analysis cannot distinguish between the two explanations to say whether individuals learn how to live with being unemployed or if they merely adapt their subjective judgements in relation to being unemployed. More objective indicators of health could perhaps help to distinguish between the two explanations. However, in contrast to subjective health, which may change abruptly, most objective indicators of poor health develop or change so slowly that they are difficult to investigate longitudinally. Levels of cortisol, a stress hormone obtained from hair analysis, indicate no reduction in stress over the first one or two years of unemployment (Dettenborn, Tietze, Bruckner & Kirschbaum, 2010). In light of current research, the implication of such stability in stress levels after unemployment could be that unemployed individuals merely adjust their subjective judgements around being unemployed, although they still experience stress. Those who do not adapt to unemployment may, on the other hand, become “discouraged workers”, and say that they are “permanently sick” or “economically inactive”. As a result, the unemployed group might look healthier each year relative to those employed. More remains to be known about how individuals adapt to unemployment, including the consequences for their health.

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

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

This study also finds that age moderates the health consequences of unemployment; unemployment affects the health of older workers, while younger workers seem to be unaffected. Although unemployment has risen more among younger than older workers, the health cost for the transitions have been more pronounced among older workers. Possible interventions to prevent and reduce the negative health effects of unemployment could therefore be most relevant for persons over 40 years. One explanation of the disproportionate large effect among older workers could be that unemployment in older age implies lower chances of reemployment (Skärlund et al., 2012; Wanberg et al., 2002). Another explanation could be that unemployment is a less socially stigmatizing among young people, since a majority of the unemployed are young, and young people tend more often than older people to move in and out of employment.

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

## Strengths

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

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

## Limitations

EU-SILC provides a short observation window (from 2008 to 2011) and typically low number observations for each individual (mean=2.14). Previous unemployment transition and other unfavourable life events prior to 2008 are not included in the analysis. By estimating the health slope prior to unemployment and applying a dynamic fixed effects model, we limit the bias due to effects of the most recent life events but cannot control for health selection in earlier work history. A larger time window could also allow for estimating more robust dynamic fixed effects models.

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

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

Although we find limited health consequences of unemployment, unemployment may affect health through more implicit mechanisms than direct exposure, and may affect the health of others in the lives of the unemployed. In a study of unemployment in Germany, Marcus (2013) showed that unemployment may affect mental health among family members, as mental health impairment among spouses was about two-thirds that of the directly affected unemployed workers. Furthermore, anticipation of job loss, a consequence of rising unemployment rates, may also affect the health of employed individuals. For example, Ferrie, Shipley, Marmot, Stansfeld and Smith (1998) found that rumours about the privatisation of public services led to deteriorated self-rated health among British civil servants in the two to three years before privatisation actually took place.

# Conclusion

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

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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 | Model 2 | Model 3 | Model 4 | Model 5 |
|  | β (SE) | β (SE) | β (SE) | β (SE) | β (SE) |
|  | OLS | Fixed effects | Fixed effects | Fixed effects | 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\*\*\* | -0.035\*\* | -0.035\*\* | -0.039\*\* |
|  |  | (0.008) | (0.012) | (0.012) | (0.015) |
| Reemployment (employed, unemployed at t-1 or t-2) |  |  | 0.043 | 0.043 | 0.014 |
|  |  |  | (0.027) | (0.027) | (0.021) |
| Health trend before unemployment spell |  |  | 0.033 | 0.033 |  |
|  |  |  | (0.019) | (0.019) |  |
| Health trend after becoming unemployed |  |  | 0.020\*\* | 0.021\*\* |  |
|  |  |  | (0.007) | (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, Age2, 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 |
| R2 | 0.073 |  |  |  |  |
| R2 (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 | Model 7 | Model 8 |
|  | β (SE) | β (SE) | β (SE) |
|  | Fixed effects | Fixed effects | Fixed effects |
|  |  |  |  |
| Unemployment transition(employed at t-1, t-2 or t-3) | -0.020 | -0.015 | -0.037\* |
|  | (0.014) | (0.011) | (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, Age2, 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 |
| R2 (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)