A LONGITUDINAL ANALYSIS OF THE EFFECT OF UNEMPLOYMENT ON HEALTH

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Abstract:

This paper examines the relationship between health and unemployment on individual panel data for the Czech Republic between 2008 and 2011. Foreign research comes up with two possible directions: that unemployment worsens health and that for people with poor health it is more difficult to find jobs, the healthy worker effect. In many models based on representative data from the European Union Statistics on Income and Living Conditions, it has been verified that unemployment actually worsens health. Conversely, healthy worker effect could not be verified. Finally, it was found that the relationship from unemployment to poorer health is greater among men than women.

Keywords:

Unemployment, health, Czech Republic, healthy worker effect, gender, self-reported health, labor market.

JEL Classification: J64, J70, I10

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1   Introduction

The relationship between unemployment and health is well documented. It has been shown that employed people are healthier (Ross & Mirowsky, 1995) and a positive relationship has been discovered between employment and good health – both mental health (Cai & Kalb, 2006) and physical health (Ahs & Westerling, 2006). Conversely, unemployed people are of worse health (Dooley, Fielding, & Levi, 1996). An extensive summary is put forth by Marmont a Wilkinson (2006).

Longitudinal research makes for a significant progress in uncovering the relationship between unemployment and health. Groundbreakers include for example Berkman (1984), who demonstrates the relationship between unemployment and premature death, Aneshensel (1985) for depressions, or generally between unemployment and health shown on longitudinal data by Bolton and Oatley (1987) or Frese and Mohr (1987). Montgomery et al. (1999), for example, showed that newly-unemployed people face more than two times higher a risk of depression as opposed to employed people. The same results were obtained even after discarding people who suffered from depression before an employment status change. Recent studies by Diette et al. (2012) or Binder and Coad (2014) show the negative relationship between transition into unemployment on well-being even though the later study shows that the effect on a comprehensive well-being variable is smaller than on typical life satisfaction variables. This paper continues in this line of work and puts forth a longitudinal analysis of the relationship between unemployment and health for the Czech Republic. The present analysis is based on subjectively measured self-reported health.

Longitudinal research is crucial for determining the relationship between unemployment and health. With short-run research, it is very difficult to tell if unemployment worsens health or if it is the other way round – if good health leads to a higher probability of employment and vice versa, that is if what Repetti, Matthews, and Waldron (1989) call the *healthy worker effect* prevails. Current longitudinal research works with objective health measurements (Kuhn, Lalive, & Zweimüller, 2009), uses more kinds of health measurements (Salm, 2009) or looks for exogeneous variables that would filter out the healthy worker effect (Schmitz, 2011). This effect has been shown to be significant when for example Ipsen (2006) found that handicapped people increased their probability of employment after a purposeful improvement of their health condition.

Nowadays, research of the relationship between unemployment and mental health is gaining popularity. It is being shown that unemployed people are more dispirited, suffer from depressions, anxieties and so on (Paul, Geithner, & Moser, 2009) while education (Dean & Wilson, 2009), health care access (Pharr, Moonie, & Bungum, 2012) and other factors play a significant role in the intensity of the depressions.

Explanations go beyond the scope of economics and they are mostly put forward by doctors and psychologists. For example, in medical science Lee et al. (1991) or Fagan et al. (2007) found that unemployment leads people to smoke more cigarettes. The same relationship was discovered by psychologists Dooley, Catalano, and Hough (1992) for unemployment and alcohol consumption and Henkel (2011) demonstrates on a large body of literature that it exists also for unemployment and drug use. Brenner and Mooney (1983) on aggregate data claim that a 10% growth in unemployment rate leads to an almost 2% increase in suicides and a more than 4% increase in mental hospitalizations. There is also plenty of sociological research that analyzes the broader social context of this phenomenon (Jahoda, 1982).

Some longitudinal research shows the opposite relationship, i.e. that health affects unemployment. Butterworth et al. (2012) demonstrate this on the relationship between mental health and unemployment where bad mental health increases the risk of unemployment and prolongs its duration. The best recent analysis comes from Schmitz (2011) who concludes that unemployment is strongly correlated with health condition but the causal effect is not significant. The explanation is thus the selection of people with worse health into the unemployed population.

It is true, in the end, that the opposite relationship exists where employment negatively affects health. It is conceivable for particular physically demanding work or work load in general to be effects that worsen health. Classic research in this regard is represented for example by Jenkins (1982) who shows a negative effect of employment on heart condition rates or Verbrugge (1986) and his relationship between bad mental health in women as a result of employment, especially housework.

2   Data

Data for this research comes from Eurostat, concretely, from a questionnaire research called European Union Statistics on Income and Living Conditions. The data contains 21 510 observations in total. An economically active citizen of the Czech Republic was chosen to be the observed variable. We hold those respondents to be economically active who answered that they are employed (including self-employed) or unemployed. We discarded from the data those respondents who stated they were retired (24.8%) or otherwise economically inactive (28%). There is a high correlation with age (corr. = −0.66) with the latter group, they are mostly children and students.

The data was worked out into a model where we observe each respondent for a four-year period (2008–2011). In these respondents, we observe mainly their health condition (*Health*) and unemployment (*Unemployed*). Unemployment in the dataset reaches 8.7% for women, 6.7% for men – that is 7.6% on average in the observed population. Health condition was reported in a number of dimensions, for our purposes we observed a five-degree scale Very good/Good/Fair/Bad/Very bad. On average, the health condition in the

sample is 2.1, i.e. good. 72.4% report their health condition to be very good, 5.2% report it to be bad or very bad.

Other variables include *Age* divided into age groups (average age of the analyzed sample is 42.2 years), *Widowed* (2.4% of the sample) and *Divorced* (12.2%) for controlling the marital status, *Education* divided into standard education levels, *First job age* (18.4 years on average), and *Children* – at least one child have 57% respondents – and other as shown below.

Table 1 – Dataset

Dataset – mean values (economically active)			
Variable	**Population**	**Women**	**Men**
Unemployed	0,07592	0,0873	0,0665
Age	42,1756	42,4679	41,9344
Single	0,0680	0,0673	0,0685
Education upper secondary	0,7517	0,7259	0,7731
Education post secondary	0,0136	0,0187	0,0094
Education tertiary	0,1642	0,1690	0,1604
Married	0,6034	0,6013	0,6050
Divorced	0,1223	0,1632	0,0886
Children (1 or more)	0,574	0,628	0,535
Years of paid work	21,526	20,723	22,189
First job age	19,095	19,016	19,161
Dense urbanisation	0,3007	0,3064	0,2959
Never married	0,2505	0,1924	0,2985
Widowed	0,0238	0,0432	0,0079
Homeowner	0,8147	0,8129	0,8163
Health (1=good, 5=bad)	2,0800	2,1072	2,0515

Source: Own calculations from EU-SILC (2008-2011) data.

3   Models and results

3.1   Effects of unemployment on health

To verify the relationship between unemployment and health in the causal relationship from unemployment to health, we use several models whose common feature is the possibility to track the development of variables in time. We can, therefore, include various lags into the models and track the development of the relationship between particular years of the questioning.

The goal of the models in this chapter is to estimate the reduction of health for unemployment, i.e. the difference of the probabilities of a particular health condition between the employed and the unemployed.

To this end, we use ordered logit. We use the following probabilistic function

$$P\left(y_j = i\right) = P(cut_{i-1} < \beta_s s_j + \beta_1 x_{1j} + \beta_2 x_{2j} + \cdots + \beta_n s_{nj} + u_j \leq cut_i)$$

where $\beta_s, \beta_1, \beta_2, \dots \beta_n$ are regression coefficients, cut are the cutpoints of the ordered logit's probability distribution, where $cut_{i-1} = -\infty$ and $cut_i = \infty$, i denominate the health condition from very good (1) to very bad (5) and we assume u_j to be logistically distributed

Because the following holds

$$P(s = i; s = u, a) = cut_{i-1} < \beta_s + u_j < cut_i$$

we can transcribe the probability of health condition as

$$P(s = i; s = u, a) = \frac{1}{1 + e^{(\beta_s - cut_i)}} - \frac{1}{1 + e^{(\beta_s - cut_{i-1})}}$$

where s represents employment status of u (unemployed) and a (employed), we can then easily calculate the reduction for unemployment for each health condition i as

$$reduction_i = P(u = i) - P(a = i)$$

For easy estimates, we observe predictable results. That is, for example, an unemployed person will be in a very good health condition with a probability of 49% whereas it is 62% for an employed person. Therefore, unemployment reduces the probability of very good health in two years by 13 percentage points.

However, this analysis struggles with the problem of unclear causality. To make the estimates better and more precise, we use differences, in spite of the fact that we lost many observations in the process. Now we want to track how the probability of a particular health condition changes after a change in employment status from employment to unemployment and vice versa.

It shows that the status change is significant for last-year-this-year change and in time periods *t-1* and *t-2*. Unfortunately, it is not possible to derive from the data how long a respondent is unemployed. If they answered that their status changed to unemployment, we do not know whether they became unemployed a day after the last round of questioning or the day before the current one. It is a fundamental difference, knowledge of which would make the results a great deal more precise. We must, therefore, take the first estimate with a grain of salt, although we statistically assume that the unemployment duration is half a year. Half a year of unemployment on average, therefore, reduces very good health by 13 percentage points as opposed to employment. One and a half year of unemployment by 21 percentage points. Two and a half years shows to be not significant, too small a number of observations being probably the reason.

For an easy interpretation we established the sums of reductions in good health and very good health. With the sums of reductions in very good and good health or increase in bad and very bad, respectively, we get numbers showing that unemployment reduces the

chance of generally good health in the order of ones of percent. Unemployment mostly shifts the health condition from very good to good and in the order of ones of percent shifts from these two to average and in the order of tenths of percent to bad or very bad. These figures are shown in the following table.

Table 2 – Reductions of health for uneployment

Recalculations of reductions in health probability for unemployment

Variable	Health Very good/good	Health Very bad/bad
$Reduction_t$	-0,0504	0,0036
$Reduction_{t-1}$	-0,0481	0,0033
$Reduction_{t-2}$	-0,0181	0,0013
$Reduction_{t-3}$	-0,0520	0,0033
$d\_Reduction_t$	-0,0238	0,0016
$d\_Reduction_{t-1}$	-0,0374	0,0025
$d\_Reduction_{t-2}$	0,0116	-0,0007

n = 9097, 6768, 4473, 2201, 6768, 4473, 2201 from the first row down.

Source: Own calculations from EU-SILC (2008-2011) data.

To test the results, we use the relationship between changes in the dependent variable and in the independent variable, too. Estimating the probit model of the probability of health worsening on the basis of status change to unemployment, we find that the effect of the unlagged change is insignificant and so is the effect of the change lagged one year. However, the effect of the twice-lagged change is significant (0.7200***). Marginal effect is 0.1661 which shows that status change to unemployment in an average duration of 2.5 years increases the probability of health worsening by 17 percent. That is a large effect and, moreover, an effect shorter than two years could not be established.

If we were to interpret the results, then we believe to have proven the effect of unemployment on health in the Czech Republic. Majority of estimates were significant and show a causal relationship from unemployment to a worse health condition.

3.2   Effect of health on unemployment

A question remains whether we can, on the available data, prove the *healthy worker effect*, that is the causal relationship from better health to a higher probability of employment. Although we consider the causal effect from unemployment to worse health proven, this fact does not deny the existence of an additional effect from the other side.

With the available data, this hypothesis can be verified with the help of probit models explaining an individual unemployment status on lagged variables that track the health condition. So we estimated models similar to the models from the previous chapter. In the first set of models, we used lagged variables and a set of sixteen control variables: among others age, a dummy for education, a dummy for marital status, a regional dummy, and a lagged dummy for home ownership. Home ownership is included into the model based on Oswald (1997) hypothesis about the relationship between home ownership and unemployment, which has been verified also on Czech data.

All estimates of health were significant; however, it shows that with some of the lags it is appropriate to use only the dummy for good health. The models were able to explain a smaller part of the variability – only around 10 percent. Thus, the models have a lower explanatory power than the models in the previous chapter; however, 10 percent is a common figure among similar models in other research. In aggregated health conditions, bad health increases unemployment in a given year by 3.22%. Conversely, good health reduces the probability of unemployment by 2.71%. It demonstrates that the *healthy worker effect* is in play in the Czech Republic. This means that the probability of unemployment is lower for healthy people whereas this probability is higher for people of bad health.

To verify these conclusions, we again use the change of health as independent variable. We therefore estimate the same model as in the previous case, only we use differences and lagged difference instead of lagged variables. Because models for the change from bad or average health (3–5) to good (1–2) turned out not significant, we only use significant estimates for models with the change of good or average health (1–3) to bad (4–5). The following table shows the conclusions.

Table 3 – Effect of health on unemployment

Independent variable	Model 12 Fixed Effects Probit	Model 13 Fixed Effects Probit	Model 14 Fixed Effects Probit
Dependent variable Unemployed			
Health $(4,5)_t$ - Health $(4,5)_{t-1}$	0, 4768*** (0,1477)		
Health $(4,5)_{t-1}$ - Health $(4,5)_{t-2}$		0,2507** (0,1731)	
Health $(4,5)_{t-2}$ - Health $(4,5)_{t-3}$			0,0610 (0,2863)
Control variables	16	16	16
Pseudo R^2	0,0991	0, 0875	0,1076

n = 4113, 4172, 2083

Control variables include age, education, home ownership, marital status and a regional dummy

Source: Own calculations from EU-SILC (2008-2011) data.

The models again explain about 10 percent of the variability and the estimates remain significant only in the first two models, the third one is insignificant.

The first models show that the change in health reported in the last round of the questionnaire has a significant effect on the change of employment status. Concretely, the marginal effect is 0.0359, i.e. health worsening to bad health increases the probability of unemployment by almost four percent. It is again necessary to point out that it is not possible to deduce from the questionnaires whether this change happened right before the questioning or right after the last round of questioning.

The second model turns out significant again and the marginal effect is 0.0184. Health worsening leads after one and a half year on average to a higher probability of unemployment by almost two percent. The third model turns out insignificant with a marginal effect under one half percent.

As with the opposite relationship, here, too, we can test the relationship between the changes. Therefore, we estimated the effect of health worsening on the shift to unemployment. Here, too, the first two estimates in differences and lagged differences are insignificant. The twice lagged difference is also insignificant but rather positive (0.1408, st.err 0.1944, p-value 0.469) with a marginal effect of 0.7 percent. The model explains more than 12 percent of the variability. In the opposite relationship, that is between health improvement and a shift to employment we found no significant relationship. The model closest to significance was the one between once lagged health improvement and a shift of employment status to unemployment. Here, the relationship is rather negative (−0.1382, st.err 0.1944, p-value 0.329) with a marginal effect of −0.6 percent. The model explains more than 10 percent of the variability. The insignificance shows that health worsening has rather no effect on employment.

We have shown that, in the Czech Republic, there is a close relationship between health and unemployment. From the various models, we have concluded that there exists a strong relationship from unemployment to bad health but not the other way round, i.e. the *healthy worker effect* is not present in the Czech Republic. The relationship exists between

3.3   Difference between men and women

Verbrugge (1986) was the first to point out that there is a substantial difference between men and women in the relationship between unemployment and health. Because of the implications of their roles, it is women whose health worsens as an effect of employment.

To find out whether the difference between men and women exists also in the Czech Republic, we estimate the reductions for men and women separately. Unemployment is connected with worse health and employment on the other hand with better health but results in men and women differ in the degree. For easier orientation, differences between men and women were calculated. Results are shown in the following table.

Table 4 – Difference between men and women

Differences of reductions in probability of health for employment between the sexes

Variable	Male-Female Health Very good/good	Male-Female Health Very bad/ bad
Reduction$_t$	-0,0015	0,0014
Reduction$_{t-1}$	-0,02	0,0027
Reduction$_{t-2}$	-0,0056	0,0013
Reduction$_{t-3}$	-0,111	0,0127

n = 9097, 6768, 4473, 2201

Source: Own calculations from EU-SILC (2008-2011) data.

A clear relationship shows – men have higher reductions for unemployment. Men's unemployment reduces their chance of good health by approximately 0.2–2 percentage points as opposed to women, in the period of more than three years a whopping 11 percentage points. On the other side, men's unemployment increases their chance of bad health by 0.1–1.3 percentage points as opposed to women. Therefore, men have an undoubtedly stronger relationship between health and unemployment than women.

4   Conclusion

The first and important objection against everything stated above might be character of the dependent variable. That is constructed by the Eurostat as self-perceived health (SPH) and is in its nature subjective. The respondent themself answers the question "What is your health in general?" with one of the five options (from very good to very bad). We cannot, therefore, rule out a bias on the basis of the self-reported health condition (Adams, Soumerai, Lomas, & Ross-Degnan, 1999). We can refer to plenty of research that uses this data which is almost all research referenced in the introduction of this paper and to the classic analysis in which Waldron, Herold and Dunn (1982) show that SPH can be considered meaningful. Kaplan and Camacho (1983) back this up showing a strong dependence of death rate on SPH. Moreover, same problems are present even for macroeconomic well-being measures (Otoitu & Titan, 2014).

It could also be assumed that we need to take into account that unemployed people might bias their answers in the other way as to look better in front of the interviewer for example. Unfortunately, no better data is available and we cannot assume any better-quality data to be available in the foreseeable future.

On the other contrary, we think this research is based on the best possible data with the greatest number of observations and that it stands out with its data in the context of other research.

Some limitations are of course brought about by the used dataset and variables that were not available. Contrary to expectations, no data was available about the number of children which can be at least thought to be a possible variable that enters into the relationship between unemployment and health. On the basis of large body of literature, although dated, it can be argued that with the exception of a few categories (e.g. ethnic), the number of children does not show to be an important factor (Repetti, Matthews, & Waldron, 1989, p. 1397). Furthermore, better results could be obtained by controlling for the kinds of employment. It may be that extremely physically demanding jobs can bring different results. Finally, the R^2 is rather small (around 10% of the variablitiy is explained). This is however comparable to

The *healthy worker effect* for the Czech Republic is not present in this paper. We have found that in a given year the relationship is present but we have not found a causal effect.

We introduced a number of models. First, using the ordered logit, we estimated the relationship between employment and health where we found, after controlling with significant control variables, a positive correlation between the two variables. Unemployment is thus related to worse health.

After we found out concrete values, we constructed models for the calculation of the reduction of health for unemployment and estimated them. It has been shown that unemployment reduces the probability of very good health and increases the probability of good health and worse. That is according to expectations.

We discussed the problem of causality between the variables first with the help of models with lagged variables. It showed that unemployment reduces the probability of good or very good health by in the order of tenths of percent. To rule out illusory causation, we estimated the model using differences. The change of employment status to unemployment in the average duration of 2.5 years has shown to increase the probability of health worsening by almost 17 percent. No effect of less than two years turned out significant.

In the opposite direction, we analyzed the relationship from health to employment status, the *healthy worker effect*. In models with lagged variables, the relationship has shown to be significant. People of good health have, in the present and in the future, a higher probability to be employed than people of bad health. However, after testing the causality using differences, the *healthy worker effect* could not be verified.

In the end, we took a look at differences between men and women. It has shown that the differences are significant. Men's unemployment reduces their chance of good or very

good health by 0.2 to 2 percentage points as opposed to women, in the period of more than three years by more than 11 percent. On the other side, men's unemployment increases the chance of bad health by 0.1–1.3 percentage points, again as opposed to women. It has shown, therefore, that men have a stronger relationship between health and unemployment than women.

The opportunity for further research is broad. We have proven that the *healthy worker effect* cannot be analyzed easily by cross-sectional data or lagged variables. In the model with differences, it was not to be found as opposed to the two aforementioned models. A disadvantage of this model is, however, a small number of people with an employment status change, even despite the extensive dataset. Longer time periods could help this problem and improve our results. Furthermore, because there is a relationship from the minimum wage to unemployment (Kaderabkova & Jasova, 2016) we can study the effect of minimum wage laws to health and make the arguments against this policy stronger. One can easily find similar examples of other indirect links of policies to health, most notably inflation through the Phillips curve (Dumlao, 2014).

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