

The impact of health on wages: Evidence from Europe before and during the Great Recession

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Effects of health on wages – what we know

- Theoretical economic models predict, based on productivity arguments, that an individual's health affects his or her wage rate (Becker, 1962; Mushkin, 1962).
- However, while there is a wide support in the empirical literature of the positive impact of experience and education on wages (Card, 1999), the relationship between wages and health is less clear-cut.
- Health and its possible endogeneity in wage equations has received a great deal of attention in the literature (Currie and Madrian, 1999). Common reasons for this endogeneity are nonrandom sample selection, unobserved heterogeneity, and measurement error.

Evidence on the effects of health on wages – what we know

Previous studies have considered these issues to different extents, with mixed findings:

- Haveman et al. (1994): PSID (men). Poor health does affect both wages and work-time negatively.
- Contoyannis and Rice (2001): BHPS. No (limited) evidence of an effect of excellent SRH on wages for men (women).
- Brown et al. (2010): BHPS (men). No effect of health on (reservation) wages.
- Jäckle and Himmler (2010). GSOEP. Positive effect of health on wages for men but not for women.

Our contribution

1. Expand the findings of Jäckle and Himmler (2010) for Germany to men and women in Europe, and by age groups.
2. Use data from before and during the Great Recession (GR), which started in Europe in 2008, to gain insights into whether the current crisis has altered the relationship between health and wages.

Outline of the rest of the talk

- Data
- Empirical model
- Estimation results
- Sensitivity analyses
- Discussion and conclusions

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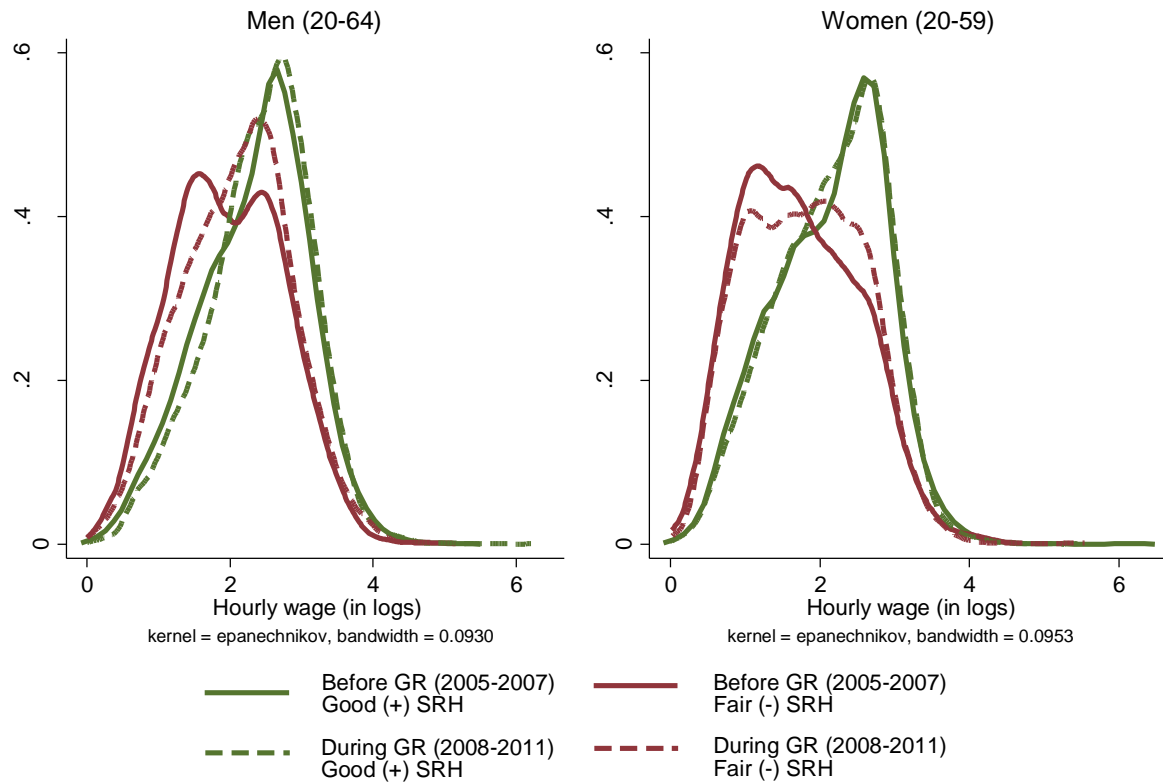
Data and sample selection

- European Union Statistics on Income and Living Conditions (EU-SILC)
 - Cross-country panel representative of 16+ population across Europe
 - Information on income, work, health, housing and other social indicators about living conditions
 - Four-year rotational panel: before (2005–2007) and during (2008–2011) GR
- Working-age men and women from 15 European countries which cover Northern (DK, FI, NO), Central (AT, BE, LU, NL), Southern (CY, ES), Eastern Europe (CZ, EE, HU, LT, PL, SI).
- Balanced panel (20, 357 and 15,132 individuals in 2005–2007 and 2008–2011 period, respectively).

Some descriptive statistics

	Employed		Nonemployed					
	2005–2007	2008–2011	2005–2007	2008–2011	Standard deviation	Standard deviation		
Men (20–64)	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Hourly gross wage rate	12.66	10.55	13.52	11.73				
Self-reported health (1-5)	4.05	0.76	4.07	0.73	3.54	0.99	3.67	0.9
Prob. work (entire sample)	0.92	0.27	0.93	0.26				
Observations (N)	27,462		26,386		2,280		2,126	
Women (20–59)								
Hourly gross wage rate	10.31	10.03	10.34	8.6				
Self-reported health (1-5)	4.01	0.77	4.01	0.74	3.8	0.89	3.8	0.83
Prob. work (entire sample)	0.73	0.44	0.79	0.41				
Observations (N)	22,954		25,153		8,375		6,863	

Kernel density estimates for log hourly wages before and during the Great Recession by levels of SRH for men and women



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Empirical model (I)

$$w_{it} = \beta_0 + x_{it} \beta_1 + c_{i1} + u_{it1} \quad (1)$$

$1 \times K$

$$S_{it}^* = \delta_0 + z_{it} \delta_1 + c_{i2} + u_{it2}; S_{it} = 1[S_{it}^* > 0] \quad (2)$$

$1 \times G$

- x_{it} : SRH (1=very bad, 5=very good), Exp, Exp², Time dummies,
Gender- and country-specific employment and unemployment rates
- z_{it1} : Chronic illnesses, GALI, Exp, Exp², Time dummies,
Gender- and country-specific employment and unemployment rates
- z_{it} : z_{it1} , Non-labor income, Marital Status, Household size

The model combines problems of :

1. (time-constant) unobserved heterogeneity,
2. sample selectivity
3. endogeneity in SRH due to measurement error

Empirical model (II)

- Solution: Semykina and Wooldridge's (2010) estimator.
- To summarize the method for estimating β_1 :
 1. For each year t use probit to estimate the selection equation, and use estimates to obtain $\hat{\lambda}_{it}$
 2. For $S_{it}=1$, use pooled 2SLS to estimate $w_{it} = \beta_0 + x_{it}\beta_1 + \bar{z}_i\xi_1 + \gamma_t\hat{\lambda}_{it} + e_{it1}$;
using z_{it1} , \bar{z}_i , and $\hat{\lambda}_{it}$ as instruments, where $z_{it1} \subset z_{it}$, but z_{it1} is at least $1 \times K$.

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Log wage equations (Men, 20–64)

	OLS	FE	Wool95	2SLS	FE-2SLS	SemWool10
Before GR (2005–2007)	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.070*** (0.005)	0.012*** (0.004)	0.015*** (0.005)	0.106*** (0.013)	0.055*** (0.017)	0.085*** (0.020)
Observations	27462	27462	27462	27462	27462	27462
F-test				1920.97 (2)	435.64 (2)	
Overid. test				11.46 (0.00)	0.21 (0.65)	
Unobserved effects			194.10 (0.00)			119.80 (0.00)
During GR (2008–2011)	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.081*** (0.006)	0.008** (0.004)	-0.001 (0.005)	0.092*** (0.013)	0.033** (0.015)	0.002 (0.021)
Observations	26040	26040	26040	26040	26040	26040
F-test				1561.36 (2)	377.05 (2)	
Overid. test				15.3 (0.00)	1.71 (0.19)	
Unobserved effects			283.33 (0.00)			209.2 (0.00)

Log wage equations (Women, 20–59)

	OLS	FE	Wool195	2SLS	FE-2SLS	SemWool10
Before GR (2005–2007)	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.072*** (0.006)	0.009 (0.005)	0.013** (0.007)	0.059*** (0.012)	-0.006 (0.020)	0.001 (0.023)
Observations	22954	22954	22954	22954	22954	22954
F-test				1673.08 (2)	387.73 (2)	
Overid. test				8.43 (0.00)	0.82 (0.36)	
Unobserved effects				194.06 (0.00)		119.88 (0.00)
During GR (2008–2011)	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.068*** (0.006)	0.007 (0.005)	0.006 (0.005)	0.061*** (0.013)	0.018 (0.017)	-0.002 (0.020)
Observations	23859	23859	23859	23859	23859	23859
F-test				1488.42 (2)	447.7 (2)	
Overid. test				6.92 (0.01)	2.98 (0.08)	
Unobserved effects				140.34 (0.00)		76.35 (0.00)

Log wage equations. Before GR (2005–2007)

Men

	OLS	FE	Wool95	2SLS	FE-2SLS	SemWool10
Age 20–34	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.051*** (0.010)	0.004 (0.009)	0.006 (0.010)	0.097*** (0.033)	0.036 (0.041)	0.070 (0.049)
Observations	7545	7545	7545	7545	7545	7545
F-test				296.18 (2)	82.36 (2)	
Overid. test				3.52 (0.06)	0.07 (0.80)	
Unobs. Effects			61.01 (0.00)			49.12 (0.00)
Age 35–49	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.067*** (0.009)	0.013* (0.007)	0.010 (0.007)	0.108*** (0.020)	0.045* (0.026)	0.037 (0.027)
Observations	10821	10821	10821	10821	10821	10821
F-test				802.99 (2)	206.22 (2)	
Overid. test				3.91 (0.05)	0.06 (0.80)	
Unobs. effects			68.6 (0.00)			41.24 (0.00)
Age 50–64	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.079*** (0.011)	0.021*** (0.008)	0.036*** (0.009)	0.110*** (0.021)	0.101*** (0.033)	0.164*** (0.039)
Observations	5896	5896	5896	5896	5896	5896
F-test				606.68 (2)	105.09 (2)	
Overid. test				2.97 (0.08)	0.32 (0.57)	
Unobs. Effects			45.27(0.00)			17.84 (0.00)

Log wage equations. During GR (2008–2011)

Men

	OLS	FE	Wool95	2SLS	FE-2SLS	SemWool10
20–34	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.066*** (0.012)	0.006 (0.009)	0.003 (0.010)	0.048 (0.030)	0.000 (0.037)	-0.005 (0.048)
Observations	5580	5580	5580	5580	5580	5580
F-test				152.39 (2)	69.94 (2)	
Overid. test				1.76 (0.18)	0.54 (0.46)	
Unobs. effects			75.5(0.00)			63.14 (0.00)
35–49	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.092*** (0.009)	0.007 (0.006)	-0.002 (0.007)	0.100*** (0.021)	0.042 (0.027)	-0.019 (0.035)
Observations	9881	9881	9881	9881	9881	9881
F-test				573.76 (2)	114.44 (2)	
Overid. test				6.56 (0.01)	0.59 (0.44)	
Unobs. effects			118.5 (0.00)			77.32 (0.00)
50–64	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.084*** (0.013)	0.005 (0.008)	-0.004 (0.011)	0.102*** (0.026)	0.051* (0.029)	0.036 (0.037)
Observations	5696	5696	5696	5696	5696	5696
F-test				523.23 (2)	131.97 (2)	
Overid. test				6.28 (0.01)	0.00 (0.97)	
Unobs. effects			58.85 (0.00)			40.86 (0.00)

Log wage equations. Before GR (2005–2007)

Women

	OLS	FE	Wool95	2SLS	FE-2SLS	SemWool10
Age 20–34	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.054*** (0.012)	-0.004 (0.013)	-0.011 (0.014)	-0.005 (0.030)	-0.018 (0.040)	-0.079* (0.046)
Observations	5809	5809	5809	5809	5809	5809
F-test				249.11(2)	75.33 (2)	
Overid. test.				1.16 (0.28)	0.02 (0.88)	
Unobs effects			40.15 (0.00)			27.98 (0.00)
Age 35–49	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.065*** (0.008)	0.016** (0.007)	0.024*** (0.009)	0.055*** (0.017)	-0.000 (0.028)	0.015 (0.032)
Observations	10166	10166	10166	10166	10166	10166
F-test				743.71 (2)	196.31 (2)	
Overid. test				0.75 (0.39)	0.22 (0.64)	
Unobs effects			93.98 (0.00)			51.13 (0.00)
Age 50–59	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.097*** (0.014)	0.021** (0.011)	0.018 (0.012)	0.120*** (0.024)	0.014 (0.035)	0.039 (0.037)
Observations	4078	4078	4078	4078	4078	4078
F-test				485.56 (2)	79.65 (2)	
Overid. test				8.64 (0.00)	6.60 (0.01)	
Unobs effects			45.91 (0.00)			19.54 (0.00)

Log wage equations. During GR (2008–2011)

Women

	OLS	FE	Wool95	2SLS	FE-2SLS	SemWool10
20–34	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.054*** (0.013)	0.012 (0.013)	-0.001 (0.015)	0.090** (0.042)	0.055 (0.059)	0.030 (0.062)
Observations	4840	4840	4840	4840	4840	4840
F-test				137.05 (2)	63.66 (2)	
Overid. test				0.49 (0.49)	0.44 (0.51)	
Unobs. effects			28.32 (0.00)			20.37 (0.00)
35–49	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.077*** (0.009)	0.017*** (0.006)	0.023*** (0.007)	0.064*** (0.020)	0.049** (0.022)	0.025 (0.026)
Observations	9996	9996	9996	9996	9996	9996
F-test				632.84 (2)	209.17 (2)	
Overid. test				8.18 (0.00)	2.7 (0.10)	
Unobs. effects			70.78 (0.00)			41.14 (0.00)
50–64	(1)	(2)	(3)	(4)	(5)	(6)
Health (+1)	0.064*** (0.015)	-0.021* (0.011)	-0.020* (0.012)	0.045* (0.025)	-0.069** (0.034)	-0.101** (0.042)
Observations	4484	4484	4484	4484	4484	4484
F-test				456.45 (2)	81.66 (2)	
Overid. test				2.42 (0.12)	1.54 (0.21)	
Unobs. effects			32.37 (0.00)			16.01 (0.00)

Sensitivity analyses

- We investigate our (implicit) model assumption of no reverse impacts of wages on health limitations (i.e., the assumption of strict exogeneity of the health limitation variables conditional on the individual fixed effect)
 - by re-estimating the two-stage models with health limitations restricted to only chronic conditions.
 - These limitations are those unlikely to be directly affected by current wages (and employment) (Westerlund et al. 2010).
- This does not change our main results for men and women, neither before nor during the GR

Discussion and conclusions (I)

- Before the GR and in accordance with Jäckle and Himmler (2010), we find that once considered the potential problems of unobserved heterogeneity, sample selection and measurement error in SRH, health has a significant impact on wages for men but not for women in Europe.
- In addition to their study, our results show that the positive impact of health on wages for men is driven by older workers, which is in line with the expectation of health having an increasing impact on labor market outcomes with age (Currie and Madrian, 1999).

Discussion and conclusions (II)

For men:

- The positive impact of health on wages in the period prior to the GR largely disappears during the GR.
- One possible explanation for this finding is that *presenteeism* (i.e. attending work even though being sick) has become more common among workers.
- Most likely short-run effects, and raises concern on the potentially negative long-run effects for these workers and on the negative impacts on public health, e.g., by affecting their co-workers' health.

Discussion and conclusions (III)

For women:

- We do not find evidence of an impact of health on wages both before and during the GR.
- However, for middle-aged (35–49) and older female workers (50–59) we find a (significant) positive and negative impact of health on (hourly) wages during the GR, respectively.
- These results might be related to the “added-worker effect”.
- The negative effect of health on hourly wages that we find for older female workers is due to a dominating effect on working hours, and might be related to the fact that for these women the increase in employment probability during the GR (i.e. the “added-worker effect”) is largest.

Thanks for your attention!

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