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a European Perspective

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Health at Work and Low-pay: a European Perspective[#]

Elena Cottini* and Claudio Lucifora**

Abstract

This study investigates the relationship between health, working conditions and pay in Europe. In particular, we measure health at work using self-assessed indicators for overall, as well as physical and mental health, using the 2005 wave of the EWCS (European Working Conditions Survey) for 15 EU countries. We find that, controlling for personal characteristics, (adverse) working conditions are associated with poor health status – both physical and mental. Low pay plays a role, mainly for men and when interacted with working conditions, suggesting that stigma and deprivation effects may be correlated with health at work. We also account for the potential endogeneity arising from workers sorting by firms and job types with different working conditions, and provide evidence of a causal effect of (adverse) working conditions and (low) pay on health at the workplace.

Keywords: working conditions, physical and mental health, low-pay employment
JEL: I100, J41, J81

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1. Introduction

Low pay employment has received increased attention in recent years as a result of higher inequality and increasing polarization of the wage distribution (Autor, et al., 2006; Goos and Manning, 2007). The share of low-skill and low paid jobs has been rising over recent years, such that one in seven employees in the EU are expected to be low paid (Leontaridi and Sloane, 2001). While the incidence and persistence of low-paid employment has been extensively documented (Lucifora and Salverda, 2008), much less attention has been devoted to the relationship between low paid jobs, (adverse) working conditions and individual health status. Empirical research has mainly focused attention on the effects of income inequality and relative deprivation on overall health (Deaton, 2001; Leigh, 2008), and on the effects of job attributes and contractual provisions (i.e. atypical employment, see Bardasi and Francesconi, 2004 and Rodrigues 2003) on individual psychological well-being¹. Available evidence suggests that more stressful and more insecure jobs are associated with poor mental health and lower satisfaction (Booth and Francesconi, 2002; Oecd, 2008). However, not all studies confirm the above findings, while evidence from studies on physical health is also mixed (Apouey and Clark, 2009). In general, there is uncertainty about the socio-economic correlates of health status at the workplace, and the extent to which the latter reflects causal relations. Indeed, while bad working conditions and low pay may harm workers' health, also poor health can make it more difficult to search for jobs and more physically or mentally costly to work. Equally, illnesses may also increase absenteeism and reduce job performance, which can affect earnings, increase the probability of dismissal, and reduce the chances of promotion. Employers may also discriminate against workers who have a physical or mental disability even when their performance is satisfactory.

Henceforth, particular care should be used in interpreting empirical evidence on health, working conditions and (low) pay. Some recent studies have used longitudinal data to address workers' unobserved heterogeneity and endogeneity issues to recover the causal effects of socio-economic status and job attributes on health (Cantarero and Pascual, 2005; Lorgelly and Lindley, 2008). One limit of these studies is that they usually focus on a single country and can rely on a limited number of health indicators and socio-economic correlates. Alternatively, studies using cross sectional data from specific surveys – such as EWCS –

¹ Explanations range from disparities in income resulting in disinvestment in human capital (Kaplan, Pamuk, Lynch, Cohen and Balfour, 1996), eroding social capital (Kawachi and Kennedy, 1997; 1999); and harming social comparisons (Schor, 1998).

usually provide a more accurate measurement of health status (mental and physical), a wider set of controls (personal, job and workplace) as well as a larger set of countries. Hence, there is a clear trade-off between the ability to deal with unobserved heterogeneity and endogeneity issues and the possibility to adequately measure health and job attributes while comparing the patterns across countries. In this context, a number of studies have documented, only for selected countries, the impact of employment contract or working conditions on psychological distress, finding modest effect of flexible employment on the health status of men and women (Bardasi and Francesconi, 2004). To the best of our knowledge there are no contributions that have jointly addressed the relationship between physical and mental health, low pay and working conditions. This paper tries to fill this gap, providing cross-country evidence for 15 European countries, on the links between working conditions, workplace attributes, low pay and health (both physical and mental) using the 2005 wave of the European Working Conditions Survey (EWCS). We document recent patterns in health at the workplace and relate these to working conditions at the lower end of the wage distribution. Our results show that, controlling for personal characteristics, (adverse) working conditions are associated with poor health status – both physical and mental. Low pay plays a role, mainly for men and when interacted with working conditions, suggesting that stigma and deprivation effects may be correlated with health at work. There is evidence that the association of health with poor working conditions is attenuated by the low pay status. We also address the issue of potential endogeneity arising from workers sorting by firms and job types with different working conditions, our results support the hypothesis of a causal effect of (adverse) working conditions on the probability of experiencing health problems. Overall we find that working conditions are an important determinant of health status at the workplace, and that health policies directed to workers should pay special attention at improving working attributes and pay.

The paper is organized as follows: section 2 presents a review of the literature, details of the data used and the indicators of health and workplace attributes are discussed in section 3. Section 4 presents our empirical strategy and results. Section 5 concludes.

2. Review of the literature

The empirical evidence on the relationship between health outcomes and socio-economic attributes is widely documented across different countries and time periods and it has been

reported using cross-sectional and longitudinal data, for a variety of indicators of morbidity showing that those with higher levels of economic resources have better health. Also medical scientists have reported evidence supporting the existence of a relationship between socio-economic status and health disparities (Marmot, 2001, Netterstrøm et al. 2008). What is still object of an ongoing debate in most fields is the mechanisms through which low economic status leads to poor health, and the extent to which it reflects a causal relation (Smith, 1999).

In examining the health-income relationship the accuracy in the measurement of both income and health is of paramount importance. Poor data on health and income constitute a major problem in empirical studies (Judge et al., 1998). Most of the literature has relied on self-reported measures of general health status and, to a lesser extent, on self-reported chronic health conditions. These measures are justified on the basis that self-reported health is a significant predictor of future functioning and mortality within countries (see, for example, Idler and Angel, 1990; van Doorslaer and Gerdtham, 2003; Frijters et al., 2005).

Recent studies using panel data and (self-reported) measures of general health status have found only a weak (causal) effect of income on health. Among these, Currie and Madrian (1999), find a strong negative association between labour income and a wide range of sources of morbidity such as arthritis, asthma, hypertension, physical disabilities, psychiatric disorders, and self-reported health. Mellor and Milyo (2002) using US data construct different inequality measures (both at state and metropolitan level) illustrate how their impact on self-assessed health status tends to disappear when individual income and regional fixed effects are controlled for. Finally, Theodossiou and Zangelis (2006), use a set of indicators of household wealth to instrument individual's own income and find a positive but modest impact of income on health.

Among the few studies that combine the analysis of working conditions and health are: Robone, Jones and Rice (2008) who examine the impact of working and contractual conditions on self-assessed health and psychological well-being in the British labour market, and Cottini and Lucifora (2009) who focus on the link between employment arrangements, working conditions and mental health in an European context. Both studies find that adverse workplace attributes lead to a higher probability of reporting health problems at work. Moreover bad environment at the workplace can cause poor health both in terms of its mental and physical dimension, these dimensions are particularly important at the lower end of wage distribution. Serrano and Cabral (2005) examine the relationship between low pay and job

satisfaction with working conditions, they report a lower level of job satisfaction for low-pay workers and suggest the presence of a dual labour market in terms both of job quality and working conditions, showing that this is particularly pronounced in Southern European countries².

3. Data and descriptive evidence

In this study, we use the 2005 wave of the European Working Condition Survey (EWCS), which is particularly rich in terms of information on individual demographics, mental and physical work-related health, as well as working and contractual conditions. The survey is based on a standardised questionnaire administered face-to-face to a representative sample of the employed population in the European Union. We concentrate our analysis on EU15 countries (Greece, Sweden, Italy, Finland, Luxemburg, France, Portugal, Belgium, Spain, Denmark, United Kingdom, Germany, Netherlands, Austria and Ireland). While more waves of the survey are available, the need to identify low paid workers forced us to restrict the analysis to the last available wave as it provides a better measure of individual earnings. Also, we concentrate on full time workers due to the lack of information on the number of hours worked. The list of the variables and their definition is discussed in the following section (also reported in the Appendix, Table A1).

3.1. Definition and measurement

We define physical and mental health indicators on the basis of the following questions: "*Does your work affect your health, or not? If yes, 'how does it affect your health?': (1) skin problems; (2) respiratory difficulties; (3) stomach-ache; (4) hearth disease; (5) stress; (6) sleeping problems; (7) anxiety and (8) irritability*". Out of the above responses we construct a set of dummies that take value 1 if the worker mentions the problem and 0 if the problem has not been mentioned. For example individuals were classified as reporting "skin problems" if they answered that their job affected in some way their health and choose "skin problems" as one of the reasons among a checklist of several options. Using all the specific health variables, we built a composite index of general health (*healthgen*), obtained summing all the

² There is a wide literature that looks at the effect of labour flexibility on one individual's health, such as for example, Theodossiou (1998), Clark et al. (2001), Bardasi and Francesconi (2004), Rodriguez (2003) and Shields and Price (2005).

dummies defined above (i.e. in parentheses the name of the variable). Then, as a measure of the intensity of the physical health problems, we sum up dummies from (1) to (4) – as described above - and construct a composite index (*physicalh*). We replicate the same procedure to measure mental health problems (*mentalh*), summing up dummies from (5) to (8). This goes in the direction of medical studies suggesting that health problems are more serious if they involve more than one symptom (Netterstrøm et al., 2008). We argue that the more (or less) an individual reports problems in her or his physical or mental health, the greater (smaller) is likely to be the originating from the distress of adverse working conditions.

With concern to working conditions, we group the indicators with reference to some broad categories already used in the previous literature (Karasek et al., 1990; Robone et al. 2008). In practice, we consider several possible work related stressors, such as hazardous physical working conditions, demands at work, control over one's job, and support from co-workers and supervisors. These working conditions have been associated with adverse health outcomes such as physical and mental health problems (Karasek and Theorell, 1990). The following seven indicators have been selected³. “*High work intensity*” takes value 1 if the job includes working at very high speed and tight deadlines from half of the time to almost all the time (0 otherwise). “*Long working hours*” takes value 1 if the employee works more than 40 hours per week (0 otherwise). “*Repetitive work*” takes value 1 if the job involves short repetitive tasks of at least 10 minutes (0 otherwise). Similarly “*low job autonomy*”, work that involves “*complex tasks*”, working in “*shifts*”, and “*having no assistance from colleagues*”, all take value 1 if the conditions are regarded as a significant disutility at work by the individual (0 otherwise). In the empirical strategy we use a summary measure of the overall working conditions reported by the worker, based on a synthetic index of job attributes (*WC*) which has been constructed summing up all the variables that affect workers disutility at the workplace. In addition, to describe relational aspects of the job, we use a discrimination index (*discrim*) that is 1 whether the worker has experienced any type of discrimination (gender, sexual orientation, religious, ethnic and disability discrimination) at the workplace, and a dummy that takes value 1 if the boss is a woman (*bossw*). Concerning contractual conditions we construct a dummy variable derived from the question: “*What kind of employment contract do you have?*” that is 1 if the answer is permanent contract (0 otherwise).

³ These categories are constructed out of a seven-point scale in which the lowest category corresponds to workers perception that a given work attribute is "very much" an adverse factor at the workplace.

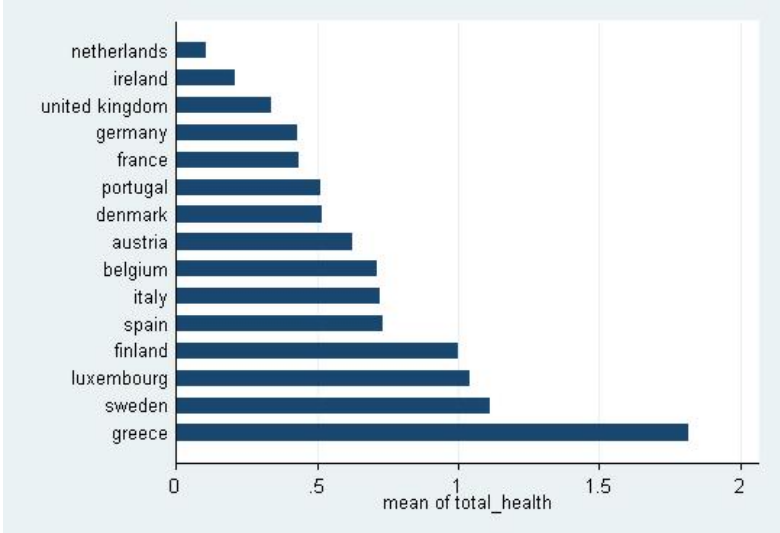
The measure of pay considered in this study is derived on from the following question: “*what is on average your monthly net income from your main paid job?*”. In order to facilitate comparison with previous empirical studies, we define low-pay employment as those individuals whose earnings fall below two third of the median of the earnings distribution.

Further to the above, we include a set of controls for individual and work characteristics, such as gender (*female*), age group dummies (*agec11-agec14*), marital status for married or living in couple (*spouse-part*), and the presence of children in the household (*children*). Education is created from the ISCED classification (*educ1-educ4*). Finally we control for a set of workplace and firm attributes that include dummies for firm’s size (*fsize1-fsize4*), industry (*sector1-sector13*) and occupational dummies (*occup1-occup8*), and for country fixed effects (*countid1-countid15*). The full set of explanatory variables and their sample means are summarised in Table A1 in the Appendix.

3.2. Stylized Facts

Figure 1 reports the incidence of our indicator of general work-related health problems for low-paid workers, across the countries included in our sample. The ranking of countries shows Greece and Sweden at the top of the chart, while the lower incidence of total health problems is found in the Netherlands and Ireland.

Fig 1: General health problems for low-paid workers by country EU15, 2005



In Table 1, we report some descriptive statistics on the distribution of mental and physical health problems, as well as working conditions and low-pay, both for the whole sample and separately for men and women. Overall, differences by gender appear quite modest: compared to men, on average, women report better health (31.99% versus 34.84%) and better overall working conditions, while are over-represented in the low pay group (16.3 % versus 8.1%)⁴.

Table 1: Health problems, working conditions and low pay
(in percentage)

	ALL SAMPLE	FEMALE	MALE
General Health *	33.45	31.99	34.84
Mental Health*			
<i>Stress</i>	30.30	31.56	28.99
<i>Anxiety</i>	5.48	5.63	5.35
<i>Sleeping problems</i>	13.25	13.64	12.95
<i>Irritability</i>	13.10	13.84	12.3
Physical Health*			
<i>Heart disease</i>	1.77	1.14	2.38
<i>Respiratory difficulties</i>	6.10	4.29	7.75
<i>Skin problems</i>	14.81	14.49	15.13
<i>Stomach-ache</i>	15.25	15.41	15.15
Working Conditions **	2.88	2.78	2.97
Low Pay	12.2	16.3	8.1

Note: (*) for aggregate indicators of health (total-health, mental health and physical health) the percentage of workers reporting at least one health problem associated to their job is reported.

(**)= for Working Conditions we report the average of our general indicator of adverse working conditions.

To get an overview of the association between working conditions and health problems, in Figure 2 we report the cross-country patterns of our indicators of mental and physical health with overall working conditions.

The overall correlation between average country working conditions and mental and physical health morbidity exhibits a positive gradient; in other words, worse working conditions appear positively associated to worse physical and mental health status. Figure 3 replicates the analysis by country with respect to the share of low paid workers. A positive relationship is detected suggesting that countries with a higher share of low pay also have, on average, a higher incidence of health problems⁵. It should be noted, however, that these correlations are based on unconditional means are likely to conceal substantial heterogeneity.

⁴ In particular, physical health problems appear to be more prevalent among men compared to women (i.e. 40.5% versus 35.3%) while mental health problems among women (64% versus 59.5%).

⁵ Note that, with respect to the cross-country pattern reported in Figure 3 and 4, Sweden appears to be an outlier, with a low share of low-paid workers but a higher incidence of mental health problems.

Figure 2: Working conditions and incidence of mental and physical health

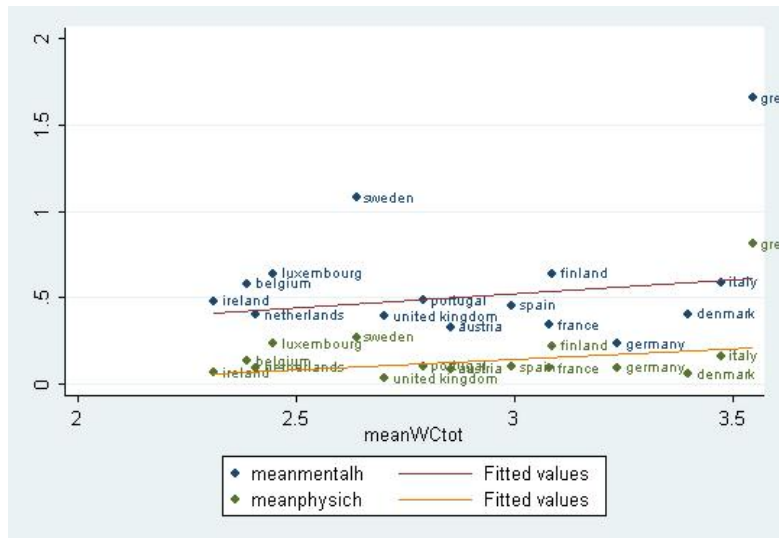
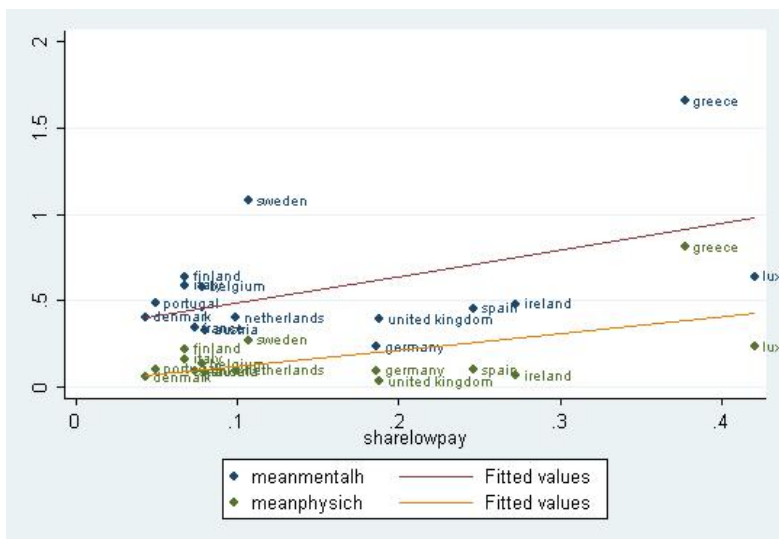


Figure 3: Low pay and mental health, EU15 2005



4. Empirical methods

In our empirical strategy, we regress different indicators of work-related health status on a vector of individual and firm characteristics, on a composite indicator of working conditions and on a low-pay dummy. Since the indicators of work-related health status, our dependent variables, are categorical, we fit an ordered probit model. The specification used is reported below:

$$\Pr(\text{Health}_{ij} = j) = \Phi(\alpha + \delta WC_{ij} + \eta LP_{ij} + X' \beta_{ij} + c_j + \varepsilon_{ij}) \quad [1]$$

where the dependent variable Health_{ij} represents our health indicator, that could be either general, mental or physical for individual i , in country j . WC_{ij} describes working conditions in the current job based on workers' responses, LP_{ij} is a dummy that identifies the low-paid status, and X_{ij} is a vector of demographic characteristics (gender, age classes, education, civil status and a dummy for the presence of children in the household or not), job and firm characteristics (such as industry, occupation, firm size, type of contract, discrimination at the workplace and whether boss is a woman). All specifications include country fixed effects (c_j), while ε_{it} is the error term. To uncover the complex relations between working conditions and low-pay, we also augment equation [1] with an interaction term between working conditions and low pay ($LP*WC$); the latter is expected to capture the effect of working condition on health in the low-pay sector. We account for differences in health across gender performing separate analyses for men and women. Despite the little differences in physical and mental health morbidity across gender shown in the descriptive analysis, there are many reasons to expect a different impact of adverse working conditions and low-pay on health across gender. For example, differences in risk aversion, attitude towards competition may play a role in explaining gender disparities (Artazcoz et al. 2005 and Bardasi and Francesconi 2004).

4.1 Results

We first present results for our index of general health, which combines both mental and physical health problems. Columns (1) to (3) present results for the whole sample while the remaining columns report results separately for men and women. Demographic characteristics suggest that overall health problems are negatively correlated with being female, though the latter loses statistical significance when controlling for working conditions and job attributes. Age dummies show that health at the workplace, as might be expected, deteriorates over the life-cycle. Higher education and being married are positively correlated with better health conditions (though the former is only weakly statistically significant), while having children increases the probability of reporting work-related health problems. Other variables controlling for workplace attributes show that discrimination on the job is negatively

associated with individual health status, and that having a woman as a “boss” also affects work related health. One may anticipate that the latter should matter mainly for men and on psychological well being. Contrary to the existing literature having a permanent contract is never statistically significant. The theoretical justification behind the studies relies on the unemployment literature and postulates that workers in non-standard employment may suffer from health problems because they might be at a higher risk of unemployment (particularly those with fixed-term contracts), or have less stable careers⁶.

The indicator of overall working conditions shows a positive and statistically significant association with general health problems at the workplace, suggesting that worse working conditions are associated to a higher probability of reporting work-related health problems; this is also true when we split the sample by gender. These results are in line with empirical evidence from previous studies showing that adverse working conditions have negative effects on health (Karasek 1990; Karasek and Theorell, 1990). Low-pay is also positively associated with higher general health problems, though it is statistically significant only when we add the interaction with working conditions. Moreover, looking at the results by gender the correlation between low pay and general health is only significant for males. The low pay dummy is likely to capture different effects, first a ‘stigma’ effect of being low-paid which is likely to impact more on mental health, second a deprivation effect which may affect both mental as well as physical health. The difference across gender may provide support to these hypotheses since the “stigma” effect is likely to be less important for women, as most of them are in low paid jobs anyway (Lucifora and Salverda, 2008), also the deprivation effect is unlikely to be of high relevance for women since a significant proportion of them live in high income household (Sloane and Theodossiou, 1996). Finally, the interaction term provides some indication as to whether the impact of working condition on health is different for the low paid as compared to high pay workers. The negative sign suggests that the association of working conditions with health is mitigated in low-pay occupations. Since many jobs have (explicit or implicit) provisions for pay differentials intended to compensate for some undesirable features of the job, the interaction may indicate that low pay workers – who are less likely to receive pay premia – are going to suffer less in terms of their health at work from adverse working conditions. Note, that since we are already controlling for overall

⁶ In terms of working hours patterns there is less clear cut evidence since some studies have found only modest effects (Bardasi and Francesconi, 2000) while another showed that working non-standard hours worsens mental health (Dockery, 2006).

(observed) working conditions the interaction terms is probably capturing some unobserved job attributes that matter for health conditions at the workplace. Since these are simple correlations - as the sorting of workers across firms and jobs may be driven by their health preferences and aversion for risky or hazardous jobs -, the above results should not be interpreted as causal – i.e. pay and working conditions causing health problems at work. We return the causal interpretation of our result to a later section.

Table 2: General health, working conditions and Low-pay, estimated coefficients

Dep var:	All Sample			Female	Male	Female	Male
<i>healthgen</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Female</i>	-0.059*** (-3.04)	0.011 (0.44)	0.012 (0.47)				
<i>Agecl2635</i>	0.357*** (9.47)	0.363*** (7.94)	0.364*** (7.96)	0.446*** (6.35)	0.313*** (5.03)	0.446*** (6.35)	0.322*** (5.16)
<i>Agecl3645</i>	0.445*** (11.51)	0.444*** (9.31)	0.443*** (9.30)	0.477*** (6.59)	0.428*** (6.54)	0.478*** (6.60)	0.435*** (6.63)
<i>Agecl4664</i>	0.383*** (10.23)	0.447*** (9.57)	0.445*** (9.54)	0.611*** (8.64)	0.325*** (5.01)	0.612*** (8.65)	0.326*** (5.04)
<i>Educ_mid</i>	0.004 (0.18)	0.027 (0.85)	0.025 (0.81)	0.028 (0.55)	0.027 (0.65)	0.029 (0.56)	0.026 (0.63)
<i>Educ_high</i>	-0.014 (-0.56)	-0.062* (-1.73)	-0.064* (-1.79)	-0.063 (-1.10)	-0.053 (-1.10)	-0.062 (-1.09)	-0.054 (-1.14)
<i>Spouse-part</i>	-0.084*** (-3.67)	-0.109*** (-3.86)	-0.109*** (-3.87)	-0.098** (-2.59)	-0.128*** (-2.88)	-0.098** (-2.59)	-0.131*** (-2.94)
<i>Child</i>	0.077*** (3.49)	0.121*** (4.44)	0.121*** (4.42)	0.129*** (3.34)	0.112*** (2.73)	0.130*** (3.35)	0.117*** (2.84)
<i>Discrim-tot</i>		0.601*** (14.80)	0.598*** (14.71)	0.640*** (11.63)	0.556*** (8.82)	0.641*** (11.64)	0.551*** (8.76)
<i>Bossw</i>		0.081*** (2.82)	0.082*** (2.84)	0.059 (1.62)	0.143*** (2.82)	0.059 (1.62)	0.150*** (2.95)
<i>Permanent</i>		-0.041 (-1.33)	-0.040 (-1.31)	-0.004 (-0.11)	-0.042 (-0.96)	-0.004 (-0.10)	-0.034 (-0.78)
<i>WC</i>		0.194*** (21.19)	0.204*** (21.01)	0.186*** (13.89)	0.202*** (15.76)	0.184*** (18.82)	0.221*** (16.34)
<i>LP</i>	0.018 (0.60)	0.044 (1.11)	0.291*** (3.32)	0.058 (1.09)	0.034 (0.55)	0.007 (0.07)	0.572*** (4.29)
<i>LP*WC</i>			-0.084*** (-3.14)			0.017 (0.47)	-0.181*** (-4.51)
Firm size	No	Yes	Yes	Yes	Yes	Yes	Yes
Sector effect	No	Yes	Yes	Yes	Yes	Yes	Yes
Occupation effect	No	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. obs.	18099	12897	12897	6030	6867	6030	6867
LR	1274.43	1922.10	1931.94	1058.39	1079.55	1058.61	1099.81

Note: significance levels, *** 1%, ** 5%, * 10%; z-test in parentheses. In the estimation we also control for firm size, sector, occupation and country effects.

In table 3, we report the results we obtain disentangling the associations of pay and job attributes with both mental and physical work-related health problems. Estimates are reported

for the whole sample (columns 1 and 3), and separately for females (columns 2 and 5) and for males (columns 3 and 6). Results for demographic and workplace attributes confirm previous estimates on general health, with some interesting differences across gender. For example, being in couple has a positive effect on work-related health, though in terms of mental health for men and physical health for women. Also, as previously discussed, having a woman as a “boss” only matters for the mental health of men.

Table 3: Mental health, physical health, working conditions and low pay, estimated coefficients

	Dep var: <i>mental health</i>			Dep var: <i>physical health</i>		
	All sample	Female	Male	All sample	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Female</i>	0.032 (1.16)			-0.001 (-0.04)		
<i>Agecl2635</i>	0.357*** (7.52)	0.433*** (5.99)	0.318*** (4.86)	0.264*** (4.6)	0.300*** (3.32)	0.247*** (3.2)
<i>Agecl3645</i>	0.419*** (8.48)	0.463*** (6.22)	0.393*** (5.68)	0.325*** (5.45)	0.325*** (3.5)	0.330*** (4.1)
<i>Agecl4664</i>	0.417*** (8.57)	0.578*** (7.93)	0.286*** (4.18)	0.347*** (5.94)	0.487*** (5.4)	0.268*** (3.37)
<i>Educ_mid</i>	0.018 (0.16)	0.021 (0.4)	0.012 (0.28)	0.084** (2.15)	0.076 (1.14)	0.105** (2.09)
<i>Educ_high</i>	0.005 (0.16)	-0.022 (-0.38)	0.04 (0.82)	-0.163*** (-3.54)	-0.117 (-1.55)	-0.183*** (-3.01)
<i>Spouse-part</i>	-0.082*** (-2.84)	-0.057 (-1.48)	-0.133*** (-2.87)	-0.083** (-2.30)	-0.155*** (-3.18)	0.001 (0.03)
<i>Child</i>	0.126*** (4.48)	0.112*** (2.83)	0.148*** (3.48)	0.098*** (2.8)	0.153*** (2.99)	0.042 (0.84)
<i>Discrim-tot</i>	0.604*** (14.5)	0.617*** (10.99)	0.591*** (9.1)	0.471*** (9.7)	0.560*** (8.34)	0.427*** (5.79)
<i>Bossw</i>	0.101*** (3.45)	0.056 (1.5)	0.206*** (3.98)	-0.025 (-0.68)	-0.023 (-0.49)	0.001 (0.0001)
<i>Permanent</i>	0.001 (0.01)	0.024 (0.53)	0.031 (0.67)	-0.147*** (-3.88)	-0.112** (-1.97)	-0.180*** (-3.41)
<i>WC</i>	0.208*** (20.92)	0.190*** (12.93)	0.226*** (16.13)	0.154*** (12.62)	0.154*** (8.3)	0.155*** (9.31)
<i>LP</i>	0.224** (2.4)	-0.019 (-0.16)	0.379** (2.5)	0.193* (1.73)	0.09 (0.57)	0.332** (1.99)
<i>LP*WC</i>	-0.057** (-2.02)	0.02 (0.55)	-0.115** (-2.59)	-0.085** (-2.50)	-0.01 (-0.21)	-0.161*** (-3.21)
N.obs.	12897	6030	6867	12897	6030	6867
LR	1802.93	974.61	1082.46	1152.05	621.85	623.79

Note: significance levels, *** 1%, ** 5%, * 10%; z-test in parentheses. In the estimation we also control for firm size, sector, occupation and country effects.

Consistent with previous studies which have investigated the relationship between contract provision and health (Silla et al., 2005; Gash et al., 2006), our findings provide support for a

negative association between (good) health and holding a temporary job. While previous studies made no distinction between physical and mental health, we find a statistically significant effect on physical health - which is robust also when we split the sample by gender - but no effect on mental health.

With concern to working conditions and low-pay, results confirm their relevance for work-related health problems: in particular (adverse) working conditions are associated with poor mental and physical health for both male and females, while low-pay – as previously discussed - matters for males only.

Coefficient estimates reported in the previous tables, however can only have a qualitative interpretation. In order to compare results and have an idea of the magnitude of the correlations, in Table 4 we present the marginal effects of our key variables of interest: working conditions and low pay. While we computed marginal effects for all the levels of the dependent variables (i.e. general health 0-8; mental and physical 0-4), to save space in table 4 we only report the marginal effects for the median level of our dependent variables, namely: level 4 for general health and level 2 for both mental and physical health⁷. In practice, marginal effects show the change in the probability of reporting the median value of the distribution of health problems due to a marginal change for continuous variables (*WC*) and to a discrete change for binary variables (*LP*). We compute the effects for a hypothetical representative agent with “average characteristics”⁸. In columns 1 to 3 we present marginal effects related to the probability of reporting the median level for general health problems (*healthgen=4*), for the whole sample and for females and males respectively. The marginal effect for workers with average (adverse) working conditions suggests that the probability of health problems increases by 1.5 percent for the whole sample, but it is stronger for males (2.3 percent) as compared to females (1 percent). Being low pay also increases the probability of reporting the median level of general health problems by 2 percent for the whole sample, and by 4.6 percent for males (i.e. it is not statistically significant for women). As already discussed, our results highlights a different pattern by gender (Clark and Apouey, 2009),

⁷ Results for all the other levels are available upon request from the authors.

⁸ We attribute the mean value to the covariates that are continuous and the modal value to covariates that are categorical, while the marginal effects of the interaction term (*LP*WC*) is computed for the representative agent working in the low pay sector. When dealing with non linear models attention should be given to interaction terms, as highlighted by Ai and Norton (2003). The standard errors of the interaction term are calculated by applying the delta method (Norton et al. 2004)

where females seem to derive their health problems at work mostly from (adverse) working conditions, while for men being low paid is more strongly associated with health problems.

Table 4: Marginal effects

	General health (level=4)			Mental health (level=2)			Physical health (level=2)		
	All	Female	Male	All	Female	Male	All	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>WC</i>	0.015*** (9.52)	0.0098*** (5.60)	0.023*** (8.07)	0.020*** (15.98)	0.015*** (8.54)	0.026*** (13.2)	0.009*** (5.22)	0.007 (0.01)	0.011*** (4.10)
<i>LP</i>	0.019*** (2.94)	0.0004 (0.07)	0.046*** (3.43)	0.021** (2.34)	-0.001 (-0.16)	0.041** (2.41)	0.0103 (1.54)	0.004 (0.00)	0.018* (1.65)
<i>LP*WC</i>	-0.006** (-2.59)	0.0009 (0.50)	-0.019*** (-3.34)	-0.005** (-1.96)	0.001 (0.57)	-0.013** (-2.53)	-0.005* (-1.86)	-0.0004 (0.01)	-0.011** (-2.06)

Note: We compute the marginal effects for an hypothetical representative agent with “average characteristics”. We attribute the modal values to the covariates that are categorical. To compute the marginal effect of *LP*WC_tot* we make reference to the representative individual who is low pay. significance levels, *** 1%, ** 5%, * 10%; z-test in parentheses.

The partial effects for the interaction term (*LP*WC*) are still negative and statistically significant for whole sample and for males, to indicate that partial correlation between working conditions and health are attenuated for low pay workers. Notice that if evaluated at median value of working conditions the effect for low is still positive, suggesting that on average (adverse) working conditions are bad also for low paid workers⁹. Columns 4 to 6 report the marginal effects for mental health, while columns 7 to 9 deal with physical health. Here the probability of reporting median mental health problems (*mental health=2*) when conditions at work are unfavourable is higher for males (2.6 percent) as compared to females (1.5 percent). While for males the marginal effects on physical health are smaller, for women results for physical health are never statistically significant. Low pay for men has a much stronger effect on the probability of reporting mental health problems (4.1 percent), while it is only marginally statistically significant with respect to physical health problems and never statistically significant for women. These findings provide support to the view that adverse working conditions and low pay are bad for workers’ health at the workplace. There seems to be a gender dimension to this relationship, in that men are generally found to be more affected by adverse working condition and low pay as compared to women, both in terms of mental and physical health.

⁹ Note that, while it is true that if evaluated at the highest level of the *WC* variable the partial correlation may turn negative, there are very few low paid workers with highly unfavorable working attributes.

4.2. Endogeneity and robustness checks

There are many reasons to believe that health problems and the allocation of workers to jobs with differing working conditions - as already mentioned - may not be random, such that workers who prefer healthier working conditions or are more risk-averse may be prepared to trade pay with a better work environment, and look for jobs that minimise psychological strain and hazard at work. Alternatively, it could also be that mental and physical health problems at the workplace influence firms choices *vis-à-vis* job attributes, pay and working conditions. Henceforth, if working condition and low pay are not exogenous to the presence of (mental and physical) health problems, some additional care is needed in the estimation process as endogeneity bias may affect the results. In this section, we use a two stages least squares estimation to account for the potential endogeneity between: working conditions and low pay status, on the one side, and health conditions on the other. The first stage consists in estimating, separately, a working condition (WC) and a low pay (LP) equations and using them as instruments, in the second stage, when we fit the health equations. In order to simplify the estimation process, in this section we re-define our dependent variable as dummy ($Health_{ij}$) that takes value 1 if (at least) one health problem at work has been reported, and 0 otherwise. All the other indicators maintain their previous definition. As in the previous section, we estimate a model for general health and for mental and physical health; next for each specification, we fit the model separately for men and women. A key consideration in the above approach is the choice of instruments to identify the health equation. First, we use a regulation index of occupational health and safety that measures the level of government intervention in promoting health and safety at the workplace (i.e. constructed using ILO Directives Archive <http://www.ilo.org/ilolex/>¹⁰). More specifically, it reports the number of ratifications of ILO conventions implemented between 1995 and 2005 in the countries included in our sample. We expect that government's intervention, directed to enforce higher standard of health and safety at the workplace, will affect working conditions having no (direct) effect on workers' health status. Second, we use the statutory level of minimum wage, constructed combining the existence of a national minimum wage and the degree of government intervention and discretion in setting the minimum wage in each country¹¹. In this case, the identification assumption relies on the hypothesis that the minimum wage

¹⁰ A description of this index is given in the data appendix.

¹¹ This indicator was derived by the authors from the Institutional Characteristics of Trade Unions Database (ICTWSS). A detailed description on how we constructed this index is given in the Appendix.

affects the proportion of workers that, in each country, are low paid but is not correlated to health outcomes. Results are reported in Table 5: in column (1) estimates refer to the whole sample, while column (2) and (3) refer to female and male respectively.

Table 5: Mental health, physical health, working conditions and low pay, 2SLS

	ALL		MALE		FEMALE	
	(1)		(2)		(3)	
<i>depvar: Healthgen</i>						
WC	0.483	***	.299	***	0.423	***
LP	1.246	***	1.147	***	-0.417	*
LP*WC	-0.307	***	-.259	***	0.054	
<i>depvar: Mentalh</i>						
WC	0.295	***	0.167	*	0.359	***
LP	-0.052		-0.146		-0.312	
LP*WC	0.579		0.029		0.0714	
<i>depvar: Physich</i>						
WC	0.048		0.045		0.118	*
LP	0.828	***	.091	***	-0.001	
LP*WC	-0.149	***	-0.078		0.071	
Nobs	15256		8290		6966	

Note: significance levels, *** 1%, ** 5%, * 10%; z-test in parentheses. The estimates control also for demographics (gender, age, education) and firm and job characteristics. Standard errors are calculated via bootstrap using 500 repetitions.

In general results confirm previous findings suggesting that, even accounting for endogeneity, adverse working conditions at work and low pay increase the probability of reporting general health problems. When the model is estimated separately for women and men, we still find that low pay is particularly harmful for men, while working conditions affect both males and females. When we investigate mental and physical health separately, we find that working conditions are more relevant for mental health problems, while low pay matters for the physical health of males, while it is not statistically significant for females. As before, the interaction term bears a negative sign but it loses statistical significance when the model is disaggregated by gender or health problems.

5. Conclusions

This paper has investigated the relationship between health, working conditions and low-pay at the workplace in European countries, using the 2005 wave of EWCS data. We have first

documented health patterns at the workplace, then we have investigated the relationship between working conditions and low pay with (mental and physical) health at work. Our results show that, controlling for a wide range of personal and job attributes, (adverse) working conditions are associated with lower health status – both physical and mental. Low pay plays a role when interacted with working conditions, suggesting that at the lower end of the wage distribution, workers may experience a trade-off between pay and working conditions. Overall our results suggest that working condition and pay levels are important determinants of health status at the workplace, and that health policies directed to workers should pay special attention at improving working attributes and pay.

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Appendix

Table A1 - Average Sample characteristics

	All sample	Low Pay
Tot_health	2.42	2.58
mentalh	2.00	2.10
physich	1.39	1.40
female	0.59	0.43
agecl_less26	0.30	0.12
agecl2635	0.27	0.23
agecl3645	0.20	0.29
agecl4664	0.23	0.35
Educ_low	0.48	0.29
Educ_mid	0.34	0.33
Educ_high	0.18	0.38
spouse_part	0.48	0.63
child	0.41	0.47
discrim_tot	0.12	0.06
bossw	0.29	0.22
permanent	0.52	0.79
WC_tot	2.83	2.89
Fsize 1_4	0.40	0.25
Fsize 5_9	0.20	0.15
Fsize 10_50	0.24	0.32
Fsize 51_250	0.12	0.22
Fsize 251_over	0.04	0.06
Agriculture	0.08	0.03
Manufacturing	0.12	0.16
Electricity, gas and water	0.01	0.01
Construction	0.07	0.08
Wholesale and retail trade	0.23	0.15
Hotel and restaurants	0.07	0.04
Transport and communication	0.06	0.07
Financial intermediation	0.02	0.04
Real estate	0.06	0.08
Public administer.	0.03	0.07
Other services	0.27	0.27
Legislator	0.04	0.08
Professionals	0.04	0.11
Technicians	0.11	0.18
Clerks	0.09	0.13
Service workers	0.20	0.13
Skilled agriculture	0.06	0.02
Craft and related trade	0.14	0.14
Plant and machine operators	0.04	0.07
Elementary occupation	0.28	0.13
Armed force	0.003	0.01
Belgium	0.02	0.04
Denmark	0.08	0.08
Germany	0.11	0.10
Greece	0.13	0.06
Spain	0.15	0.10
France	0.05	0.09
Ireland	0.08	0.05
Italy	0.05	0.06
Luxemburg	0.10	0.05
Netherlands	0.04	0.06
Austria	0.03	0.07
Portugal	0.04	0.09
Finland	0.03	0.05
Sweden	0.04	0.04
United Kingdom	0.05	0.06
Lowpay		0.12
Nobs	18192	2183

Dataset description

In this paper we use three distinct datasets. First is the European Working Conditions Survey (EWCS), which provides very detailed information on working conditions; second is the ILOLEX dataset which informs about government intervention in health and safety, third is the ICTWSS which gives information on institutional settings across European countries. Follows a detailed description of the datasets.

The European Working Conditions Survey (EWCS-2005): in the 2005 wave, 31 countries were included in the survey: EU27 plus Croatia, Turkey, Switzerland and Norway. In our paper we focus on EU15 countries (i.e. Greece, Sweden, Italy, Finland, Luxemburg, France, Portugal, Belgium, Spain, Denmark, United Kingdom, Germany, Netherlands, Austria and Ireland). EWCS data provide detailed information on both work-related psychological problems, as well as job attributes. While, the number of questions and issues covered in the EWCS has expanded over time, still a core of questions have remained unchanged across the different waves, allowing a comparative study of the changes in working conditions and their effects. The EWCS2005 was carried out following standard procedures by INRA (Europe), the European Coordination Office, that assessed the quality of data collection and the database preparation, in close cooperation with the Occupational National Institutes and Eurostat. Details of sampling methods are provided elsewhere (Paoli et al.1997and 2001 and Agnes et al 2006).

The ILO LEX: safety and health in the labour market are regulated also through international legislation in particular the most important guidelines about occupational health and safety services are provided by the International Labour Organisation. ILO Member States have to ratify these regulations before implementing them into the national legislation however countries can freely decide if and when to ratify ILO Conventions and Recommendations. In this paper we construct an index of ILO ratifications implemented in each country in the period 1995-2005, these information are derived from www.ilo.org/ilolex/english. The ratifications considered consist in two groups. The first provides general guidelines about occupational health and safety services (and includes C 155: Occupational safety and health Convention (1981); C 161: Occupational health services Convention (1985); C 174: Prevention of major industrial accident Convention (1993); C 187: Promotional framework

for occupational safety and health Convention (2006); C 155: Protocol of 2002 to the occupational safety and health Convention), while the second consists in those regulating the protection of workers against specific hazards experienced at the workplace (namely: C 13: White lead Convention (1921); C 115: Radiation protection Convention (1960); C 119: Guarding of machinery Convention (1983); C 120: Hygiene Convention (1964); C 127: Max weight Convention (1967); C 136: Benzene Convention (1971); C 139: Occupational cancer Convention (1974); C 148: Working environment (air pollution, noise and vibration) Convention (1977); C 162: Asbestos Convention (1986); C 170: Chemicals Convention (1990)).

The ICTWSS Database: it covers four key elements of modern political economies in advanced capitalist societies: trade unionism, wage setting, state intervention and social pacts. The database contains annual data for 34 countries: Australia; Austria; Belgium; Bulgaria; Canada; Cyprus; the Czech Republic; Denmark; Estonia; Germany; Greece; Finland; France; Hungary; Ireland; Italy; Japan; Latvia; Lithuania; Luxembourg; the Netherlands; New Zealand; Malta; Norway; Poland; Portugal; Romania; Spain; Slovenia; Slovakia; Sweden; Switzerland; the United Kingdom; the United States; and it runs from 1960 till 2007. More specifically, the data on minimum wage setting are from the OECD and from various national sources, among others collected from EIRO. The degree of government intervention is defined as:

- 0 = No national (cross-sectoral or inter-occupational) minimum wage;
- 1 = Minimum wages are set by collective agreement or tripartite wage boards in (some) sectors;
- 2 = Minimum wages are set by national (cross-sectoral or inter-occupational) agreement (“autonomous agreement”) between unions and employers;
- 3 = National minimum wage is set by agreement (as in 2) but extended and made binding by law or Ministerial decree;
- 4 = National minimum wage is set through tripartite negotiations;
- 5 = National minimum wage is set on fixed rule (index-based minimum wage) after negotiations or consultations with by the social partners;
- 6 = National minimum wage is set by government, but after (non-binding) tripartite consultations;
- 7 = National minimum wage set by judges or expert committee, as in award-system;
- 8 = National minimum wage is set by government, without fixed rule.

It's worth noting that this coding combines two scales: the existence (codes 2-8) or not (codes 0-1) of a national minimum wage, and the degree of government intervention and discretion in setting the minimum wage, or – reversely – the degree to which the government is bound in its decisions by unions and employers, and/or fixed rules.

1. Solimene L., *Market Failures and State Intervention*
2. Solimene L., *The Efficiency under Private and Public Ownership: Some Empirical Evidence*
3. Baici E., Dell'Aringa C., *The EMS Effect on the Italian Labour Market*
4. Lucifora C., *Union Density and Relative Wages: Is there a Relationship?*
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6. Martini G., *Testing Different Bargaining Theories: A Pilot Experiment*
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31. Cappellari L., *Earnings dynamic and uncertainty in Italy: How do they differ between the private and public sectors?*
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