Workers' health and social relations in Italy

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November 2013

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Abstract

The paper investigates whether social relations are associated with the health of workers after controlling for demographic and worker characteristics, housing features, neighbourhood quality, size of municipality and regional dummies. We consider two aspects of social relationships: i) *individual social relations* that we proxy by the frequency of meetings *with* friends, and; ii) *contextual social relations*, the average frequency with which people meet friends at the community level. A Heckman selection model is estimated from the worker sample, employing both self-reported and objective health measures using new data from an income and living conditions survey carried out in 2006 by the Italian Statistics Office (IT-SILC). Results show that social relations at the individual level are positively correlated with self-perceived health, negatively associated with chronic condition but not related to limitations in daily activities. Contextual social relations are negatively linked with chronic condition and limitations in daily activities but not correlated with self-perceived health.

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1. Introduction

The positive association between health and socio-economic status is one of the most robust findings in the health economics literature as well as the correlation between working life, including adverse working conditions, and poor health and disparities in health (Datta Gupta and Kristensen 2008; Fletcher et al. 2011; Robone et al. 2011). The evidence also suggests that health outcomes are correlated with various aspects of individual relationships, from relationships with family and friends to membership of various kinds of associations, often grouped together under the common label of social capital (Folland 2007; D'Hombres et al. 2010).

While there is a large body of literature on the association between social capital and health for the whole population, the role of social relations in a few specific segments of the population, such as workers' health, has not yet been explored. Social relations in health of workers are likely to be important especially in the Italian National Health System in which, although services may be accessed by all citizens on a universal basis, suitable information on diseases, doctors, health facilities and therapies is not available to all citizens. Thus, understanding the effects of social relations on individual health of workers is important not only from a medical point of view but also from an economic perspective. For example, Fiorillo and Nappo (2011) show that social relations are a determinant of job satisfaction not only directly, but also indirectly increasing self-perceived health. Hence, *ceteris paribus*, it is reasonable to think that intense social relations lead to better health, thereby affecting worker productivity and, ultimately, a society's economic prosperity. As a result, knowing whether social relations influence individual health of workers can provide useful information on key policy issues.

In this paper we analyse new data from an income and living conditions survey carried out in 2006 by the Italian Statistics Office (IT-SILC) to examine the role of social relations in workers' health. We consider two aspects of social relationships: i) the intensity of ties that we proxy by the frequency of meetings with friends and that we label *individual social relations* and ii) the average frequency with which people meet friends at the community level that we label *contextual social relations*.

We employ two types of health status measures: self-reported and objective health. The former is measured through self-perceived health (SPH) the latter from chronic conditions (CC) and limitations in activities of daily living (LADLs). We use probit and ordered probit models after accounting for the possibility of selection of individuals into the labour market by a Heckman selection model.

We find that social relations are a key predictor of health status of workers with interesting differences among health outcomes. We find individual social relations positively associated with the probability of declaring good self-perceived health and negatively correlated with the likelihood of suffering from chronic limitations while no statistically significant relationship with limitations in daily activities is found. On the other hand, we find the contextual social relations variable negatively linked with chronic condition and limitations in daily activities but not correlated with self-perceived health.

We carry out robustness checks to deal with possible problems when interpreting our results. We address for variables that simultaneously influence health status and social relations by adding several control variables concerning demographic and worker characteristics, housing features, neighbourhood quality, municipality size and regional dummies. Moreover, we add variables to capture both other social relational aspects of individual behaviour, such as membership of various kinds of associations, and other factors that might be harmful for health, such as unmet need for medical examination and treatment. Finally, as social relations might have different effects for workers with different type of jobs, we perform a further robustness analysis, stratifying our sample according to three categories of employment types: professional, skilled and unskilled.

Although our results are consistent with the argument that social relations influence workers' health, a limitation of our study is that we cannot prove causality. However, to our knowledge, this paper contributes to the literature by carrying out the first assessment of the relationship between social relations and individual health of workers in Italy. Moreover, our study makes several other contributions to this area: we estimate a Heckman selection model to control for unobserved worker heterogeneity; we employ both subjective self-reported health as well as a more objective measure of health based on chronic conditions and limitations in activities of daily living; and we adopt a multilevel approach to examine in the same framework the individual and contextual effect of social relations on individual health status of workers. In so doing, we fill a gap in the literature on social capital (see Poortinga 2006a,b) which does not consider the frequency of meetings with friends as a measure of social capital, either at the individual or contextual level, in health outcomes.

The remainder of the paper is structured as follows. The next section briefly presents our hypotheses. We then describe data and methodology (Sections 3 and 4). Section 5 describes and discusses empirical results. With our concluding remarks we summarise the main issues covered and suggest avenues for future research.

2. Social relations and workers' health

Suggestions

In recent years, the literature has extensively analysed the impact of social relations on individual health. Various aspects of the relational sphere of individual lives have been addressed, from relationships with family and friends to membership of various kinds of associations, often grouped together under the common label of social capital (see Fiorillo and Sabatini 2011b). In this paper, we adopt a multilevel approach and consider two measures of social relations i) the frequency of meetings with friends, as recently studied elsewhere (Giordano and Lindstrom, 2010; Ronconi et al. 2010), that we label individual social relations and; ii) the average frequency with which people meet friends at the community level, as recently adopted by Fiorillo and Sabatini (2011c), that we label contextual social relations.

Social relations may improve workers' health through the following channels:

1) Transmission of health information. Networks of relationships are a place to share past experiences on diseases, doctors, health facilities and therapies. This channel of information fosters matching procedures (in the sense that patients spend less time finding the appropriate doctor), lowers the cost of health information, speeds up the diffusion of knowledge of health innovation and eliminates mistaken perceptions on the role of healthcare, discouraging individuals from undertaking inappropriate treatments.

2) Mutual assistance mechanisms. In case of sickness, the support of friends plays a fundamental role in ensuring access to healthcare services and facilities, for example through financial assistance, transportation services and help in dealing with doctors. Social contacts may foster individual access to services even when public protection schemes are designed to provide universal coverage (van Doorslaer et al. 2004). For example, empirical evidence on the Italian National Health System (NHS) – which theoretically covers all citizens on equal terms – suggests that the wealthy are more likely to be admitted to hospital than the poor (Masseria and Giannoni 2010). With reference to Italy, Atella et al. (2004) find that individuals who might be considered vulnerable from a societal perspective – i.e. the sick, women and those with low incomes – are less likely to seek care from specialists and more likely to seek care from general practitioners. Since, in the Italian NHS, services are accessible by all citizens on a universal basis, health inequalities may also be related to people's ability to acquire suitable information and to find the right contacts in the right places, which in turn is influenced by the extension of one's social network.

3) "Buffering effect". Meetings with friends provide moral and affective support which mitigates the psychological distress related to sickness. This "buffering effect" may play a

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role in improving patients' ability to recover, thereby improving the health status of sick people. Moreover, the "buffering effect" may play a key role in reducing occupational stress as well as modifying perceptions of work-associated distress (Cummings 1990; Lu 1999). Workers who feel supported by others may feel less stressed. If you know that your friends will support you and there is someone with whom you can talk things through, stressful working situations may be more tolerable. The "buffering effect" of a cohesive network or community also works for healthy people by preventing depression and mental disorders often related to social isolation and acting as a source of self-esteem and mutual respect (Kawachi et al. 1999).

4) Public good. At the contextual level, social relations may serve as a "public good", with positive spillover effects onto the health of broader society (Putnam 2000). For example, strong community ties may lead to greater community mobilizations and enact local health policies with potential benefits to all citizens (Kim et al. 2011). Furthermore, strong community ties are more successful at bonding together to fight potential budget cuts of local services, and as a result have better access to local services and amenities (Kawachi et al. 1999).

Theoretical background

To provide a theoretical background for the relationship between social relations and health we refer to the model of health production developed by Contoyannis and Jones (2004) and assume that an individual's health is produced as follows:

$$H = h(C, SR, \overline{SR}, X, e) \tag{1}$$

where H is a measure of individual health, C is the set of consumption, SR represents individual social relations, $\overline{SR}$ are contextual social relations, and X and e are the set of observable and unobservable personal characteristics, respectively.

In light of the arguments outlined above, we expect to find a significant and positive relationship between self-perceived health and social relations

$$SPH = f(C, \underset{+}{SR}, \underset{+}{\overline{SR}}, X, e) \tag{1.1}$$

while a significant and negative relationship, respectively, between chronic conditions, limitations in activities of daily living and social relations

$$CC = g(C, \underset{-}{SR}, \underset{-}{\overline{SR}}, X, e) \tag{1.2}$$

$$LADSLs = i(C, \overline{SR}, \underline{\overline{SR}}, X, e) \tag{1.3}$$

3. Data

We use data from the income and living conditions survey carried out by the Italian Statistics Office (IT-SILC) in 2006. The original sample contained 46522 observations providing information on the following types of living conditions: income, education, health, work conditions, social exclusion, housing and social participation. This last information is an appealing feature of the dataset but is not provided in other waves of the survey. Hence no panel dimension is available for our study. After excluding individuals who were not employees, we were left with a subsample of 15169 employees aged between 16 and 64 in 2006. All the variables used in our empirical analysis are described in detail in Table 1 in Appendix A.

Health measures

We use three different variables to measure health status. The first is self-perceived health (SPH) which is measured by the five conventional levels: "very poor", "poor", "fair", "good" and "very good". SPH is widely used in the literature as a convenient aggregate of all aspects of health (Bilger and Carrieri 2012) and previous studies have shown SPH to be correlated with objective health measures such as mortality (Idler and Benyamini 1997). It is, by its very nature, subjective. For this reason, we use other health variables with a greater level of objectivity, namely the presence of chronic (long-standing) illness or condition (CC) which admits two values "yes" or "no"[2], and the presence of limitations in activities of daily living (LADLs) with three possible responses: "not limited", "limited", and "strongly limited". CC and LADLs measures, although self-reported, are based on the incidence of specific health conditions and limitations, which individuals are more likely to recall and report truthfully.

Social relations

The information on social participation is self-assessed by individuals who are asked to report i) frequency of getting/being in contact with friends and relatives; ii) participation in informal and formal voluntary activities; iii) participation in cultural events.

We measure social relations at the individual level through the frequency with which respondents usually meet up with friends (those who do not live in the same household as the

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[2] The main characteristics of a chronic condition are that it is permanent and may be expected to require a long period of supervision, observation and care.

respondent should be considered) in their spare time during a usual year. Six responses are considered: "daily", "every week", "several times a month", "once a month", "at least once a year" and "never". *Individual social relations* is a dummy variable equal to 1 if the respondent gets together with friends every day during a usual year.

We measure social relations at a contextual level by the average frequency with which people meet friends at the community level. The reference group of individuals is the group of people at the municipality level in the same age group and at the same education level. We consider three categories of municipality size (thinly, intermediate and densely inhabited), three age groups (16-30, 31-50 and 51-64) and three education levels (primary, secondary and tertiary). Thus we have 27 reference groups in each of the 20 Italian regions. *Contextual social relations* is calculated as the mean value of the daily frequency of meetings with friends for each of the 27 reference groups in each of the 20 Italian regions. We obtain 540 combinations across which 15169 observations of the sample are distributed.

Other covariates

In order to account for other factors which might influence health status and social relations, we include in the analysis a set of control variables: demographic and worker characteristics as well as housing features, neighbourhood quality and size of municipality.

At the individual level, we account for age, gender (*male)* with *female* as the reference category, for marital status, by including categories for *married*, *separated*, *divorced* and *widowed* against a base category of being single. We consider the respondent's country of birth (*European Union*, *other*), the number of individuals living in the household (*household size*), and number of children in the household by age (*age 0-2*, *age 3-5*, *age 6-15*, *age 16-24*). Three indicators were constructed to represent the level of education attained based on the International Standard Classification of Education (ISCED): *pre-primary*, *primary* and *secondary*, with *tertiary* being the reference category. We further control for the natural logarithm of annual net labour income (*labour income*) and tenure status (*homeownership*).

As worker characteristics we include in the analysis the numbers of hours usually worked per week in the main job (*weekly hours*), the numbers of years, since starting the first regular job, that the respondent has spent at work (*experience*), and a work contract of unlimited duration (*permanent job*). Moreover, two categories control for type of occupation: employed in professional and/or in managerial occupations (*job-professionals*) and employed in skilled occupations (*job-skilled*) with *job-non skilled* as reference category. We also control for membership of different business sectors, as defined by the Statistical Classification of

Economic Activities (NACE). We include categories for working in *agriculture*, *construction*, *wholesale*, *hotels*, *transport*, *finance*, *real estate*, *education*, *public administration*, *health and social work*, and *other sectors* against a base category of working in *manufacturing*.

Housing features concern the number of rooms available to the household (*number of rooms*) and three categories of housing problems (*humidity*, *warmth* and *dark*). We measure the quality of the surrounding environment through three indicators of subjective perception (*noise*, *pollution* and *crime*) and we also control for two categories of the size of municipality (*densely populated area* and *intermediate area*) with *thinly populated area* as reference category. Regional fixed effects are also included to account for the high regional heterogeneity in health status existing in Italy.

Descriptive analysis

Tables 1-3 present the sample distribution of the dependent variables. On average, about 74 percent of employees report good and very good health, while 12 percent present chronic conditions and 9 percent limitations in ADLs.

Summary weighted statistics are reported in Table 4 for the whole sample, as well as for the poor and good health subsample[3]. On average, 20 percent of respondents meet friends every day. The average frequency with which people meet friends at the community level is 22 percent. Over half of the respondents are male and married, and are educated up to secondary level. The average age is 40 years. Moreover, 40 percent of respondents have children aged between 16 and 24 while 71 percent of respondents are homeowners. Finally, on average, respondents work 37 hours per week and have 16 years' work experience.

Respondents who declare poor health for all health measures, on average meet friends less frequently, are older, employed less in professional and skilled occupations and work fewer hours per week but have more work experience. In addition, respondents are employed more in public administration and report several housing and neighbourhood problems.

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[3] Under "poor health" the following categories are grouped: "very poor" and "poor" for SPH, and "severe limitations" and "limitations" for LADLs.

Table 1. Self-perceived health

	Number of individuals	Percentage
5 (very good)	2611	17.21
4 (good)	8635	56.93
3 (fair)	3564	23.50
2 (poor)	318	2.10
1 (very poor)	41	0.27

Table 2. Chronic condition

	Number of individuals	Percentage
1 (yes)	1770	11.67
2 (no)	13399	88.33

Table 3. Limitations in ADLs

	Number of individuals	Percentage
3 (strongly limited)	214	1.41
2 (limited)	1183	7.80
1 (not limited)	13772	90.79

Table 4. Descriptive statistics (mean)

Variable	All	Poor Health			Good Health		
		SPH	CC	LADLs	SPH	CC	LADLs
Individual social relations	0.20	0.21	0.15	0.16	0.22	0.20	0.20
Contextual social relations	0.22	0.19	0.18	0.19	0.24	0.23	0.23
Male	0.57	0.48	0.52	0.52	0.58	0.58	0.58
Married	0.59	0.62	0.63	0.67	0.57	0.59	0.59
Separated	0.02	0.05	0.04	0.03	0.02	0.02	0.02
Divorced	0.03	0.07	0.05	0.05	0.02	0.02	0.02
Widowed	0.01	0.04	0.02	0.02	0.01	0.01	0.01
Age	39.99	46.11	43.71	44.51	38.28	39.52	39.56
Pre primary edu	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Primary edu	0.06	0.15	0.07	0.11	0.05	0.06	0.06
Secondary edu	0.77	0.76	0.77	0.77	0.77	0.77	0.77
Household size	3.14	2.93	3.01	3.08	3.17	3.16	3.15
Children 0-2	0.09	0.03	0.08	0.04	0.11	0.10	0.10
Children 3-5	0.10	0.03	0.07	0.07	0.10	0.10	0.10
Children 6-15	0.35	0.31	0.36	0.39	0.35	0.35	0.34
Children 16-24	0.40	0.51	0.40	0.43	0.39	0.40	0.40
EU birth	0.01	0.01	0.01	0.01	0.01	0.01	0.01
OTH birth	0.08	0.08	0.05	0.05	0.09	0.09	0.09
Labour income	9.61	9.45	9.64	9.60	9.61	9.61	9.61
Homeowner	0.71	0.66	0.72	0.70	0.70	0.70	0.71
Weekly hours	37.77	36.10	37.25	37.01	38.01	37.83	37.84
Experience	16.08	21.12	19.23	19.91	14.59	15.68	15.70
Permanent job	0.84	0.85	0.87	0.85	0.84	0.84	0.84
Job professional	0.33	0.26	0.33	0.28	0.35	0.33	0.34
Job skilled	0.30	0.27	0.30	0.30	0.30	0.30	0.29
Agriculture	0.03	0.04	0.02	0.04	0.03	0.04	0.03
Construction	0.07	0.08	0.05	0.06	0.07	0.07	0.07
Wholesale	0.10	0.08	0.09	0.08	0.11	0.10	0.11
Hotels	0.03	0.02	0.03	0.03	0.03	0.03	0.03
Transport	0.05	0.04	0.05	0.06	0.05	0.05	0.05
Finance	0.03	0.00	0.04	0.02	0.03	0.03	0.03
Real estate	0.06	0.03	0.04	0.04	0.06	0.06	0.06
Education	0.09	0.10	0.12	0.11	0.08	0.09	0.09
Public administration	0.10	0.10	0.11	0.11	0.09	0.10	0.10
Health and social work	0.08	0.12	0.10	0.09	0.08	0.08	0.08
Other sectors	0.08	0.13	0.07	0.09	0.08	0.08	0.08
Number of rooms	3.47	3.27	3.42	3.42	3.48	3.48	3.48
Humidity problem	0.21	0.35	0.28	0.33	0.19	0.20	0.20
Warmth problem	0.08	0.16	0.10	0.13	0.07	0.07	0.07
Dark problem	0.07	0.11	0.09	0.12	0.07	0.07	0.07
Noise	0.25	0.37	0.31	0.34	0.23	0.24	0.24
Pollution	0.22	0.30	0.29	0.29	0.21	0.21	0.21
Crime	0.15	0.27	0.20	0.21	0.14	0.14	0.14
Densely populated area	0.44	0.49	0.47	0.44	0.44	0.43	0.44
Intermediate area	0.39	0.36	0.36	0.37	0.39	0.39	0.39
Observations	15169	359	1770	1397	11246	13399	13772

4. Methodology

To study the association between social relations and workers' health we need to reflect on the self-selection of individuals in the labour market. Individuals may choose to stay out of the labour market because they get unemployment benefits as well as disability benefits. This is possible for the respondents who state they suffer from chronic (long-standing) illness or condition and limitations in activities of daily living. Hence we use the Heckman selection model in our empirical analysis, a method which helps assess the impact of social relations, after accounting for the possibility of selection of individuals into the labour market. The model consists of two equations: a labour force participation equation and a health equation.

Suppose that L_i^* is the continuous latent variable associated with the decision to work. This can be expressed as

$$L_i^* = Z_{1i}\beta_1 + \varepsilon_{1i} \tag{2}$$

where Z_{1i} is a vector containing individual characteristics that influence the decision to enter the labour market, β_1 is a vector of parameters to be estimated and ε_{1i} is a random error term. If $L_i^* > 0$, the wage market exceeds the reservation wage, the individual chooses to work. If $L_i^* \leq 0$, the individual chooses not to work. L_i^* is unobservable but relates to the observable binary variable L_i, that takes the value of 1 if the individual works and 0 if the individual does not work.

Allowing for the potential bias related to the individual decisions to participate in the labour force, the health equation can be written as

$$H_i^* = Z_{2i}\beta_2 + \alpha SR_i + \theta \overline{SR}_i + \chi Y_i + \varphi \lambda_i + \varepsilon_{2i} \tag{3}$$

where H_i^* is a latent health for individual i; SR_i is the individual social relations variable; $\overline{SR}_i$ is the contextual social relations variable; Y_i is the individual income; Z_{2i} is a matrix of control variables; $\lambda_i = \phi(Z_{1i}\beta_{1)})/ \Phi(Z_{1i}\beta_{1)})$ is the inverse Mills ratio for labour force participation equation where $\phi(.)$ is the normal probability distribution and $\Phi(.)$ is the normal cumulative distribution. β_2, α, θ, χ, φ are parameters to be estimated and ε is a random-error term.

Following Durlauf (2002), when social relations act as a contextual effect, one can test the presence of contextual social relations by testing whether θ is zero in (3).

Health equation (3) is a latent variable model, as our measures of health are all qualitative, whether binary or ordinal. SPH is measured by five conventional responses: vey bad, bad, fair, good, very good. Thus, the structure of Equation (3) makes it suitable for estimation as an ordered probit model. Instead, CC is a measured by a dummy variable (yes or no). Hence, Equation (3) makes it appropriate for estimation as an standard probit model. Finally, limitations in ADLs present three possible responses: not limited, limited and strongly limited. Therefore, we use once again an ordered probit model to estimate Equation (3).

5. Results

In this section, we present estimations of the empirical models described in Section 3. We start by estimating the labour force participation equation (2) and we compute the inverse Mills ratio. Results are shown in Appendix B, Table 2. Then we estimate the health equation (3) and use an ordered probit model for SPH and LADLs and a probit model for CC. For all estimates, we compute the robust standard errors.

5.1. Self-perceived health

Table 6 reports the results for the SPH equation. For reasons of clarity, we display findings in Panels A, B and C. The results in Panel A for the employees sample show that the individual social relations variable is positively associated with the degree of self-perceived health state (significant at 1 %). The marginal effects suggest that the health benefits of individual social relations are slightly increasing. Meeting friends every day decreases the probability of reporting poor health by 0.5 percent (moving from a very bad perceived state) and increases the probability of declaring good health by 1 percent (moving from a fair perceived state). This result is in line with Fiorillo and Sabatini (2011b) who found for the Italian whole population that meetings with friends daily is associated with a 1.8 higher probability of reporting self-perceived good health.

Contextual social relations are not associated with self-perceived health. The coefficient presents the expected positive sign but is not statistically significant. This result is also in line with Fiorillo and Sabatini (2011c) who found for the Italian whole population that the average frequency with which people meet friends at the community level is not correlated with the higher probability of reporting self-perceived good health.

Table 6. Panel A. Effects of social relations and individual characteristics on SPH

	All		Poor		Good	
	coeff.	Std. err	dy/dx	std. err.	dy/dx	Std. err
Individual social relations	0.182***	0.025	-0.005	0.001	0.010	0..001
Contextual social relations	0.095	0.102	-0.003	0.003	0.007	0.008
Male	0.041	0.028	-0.001	0.001	0.003	0.002
Married	- 0.074***	0.028	0.002	0.001	-0.005	0.002
Separated	-0.147**	0.065	0.005	0.003	-0.016	0.009
Divorced	-0.257***	0.068	0.010	0.003	-0.034	0.012
Widowed	-0.202**	0.088	0.008	0.004	-0.025	0.014
Age	-0.031***	0.002	0.001	0.000	-0.002	0.000
Pre primary edu	0.140	0.168	-0.004	0.004	0.006	0.003
Primary edu	- 0.127**	0.055	0.004	0.002	-0.013	0.007
Secondary edu	-0.093***	0.031	0.003	0.001	-0.006	0.002
Household size	0.028***	0.011	-0.001	0.000	0.002	0.001
Children 0-2	0.091***	0.033	-0.003	0.001	0.007	0.003
Children 3-5	- 0.005	0.032	0.000	0.001	-0.000	0.002
Children 6-15	-0.028*	0.017	0.001	0.000	-0.002	0.001
Children 16-24	-0.025	0.016	0.001	0.000	-0.002	0.001
EU birth	0.222***	0.080	-0.006	0.002	0.006	0.002
OTH birth	0.175***	0.042	-0.006	0.002	0.007	0.001
Labour income (ln)	0.047**	0.021	-0.001	0.001	0.004	0.002
Homeowner	- 0.022	0.023	0.001	0.001	-0.002	0.002
Mills ratio	-0.221***	0.050	0.006	0.001	-0.017	0.004
Observations	14484					
R-squared	0.072					
Log Likelihood	-14221.02					

Note: The dependent variable *Self-perceived health* is an ordinal variable (1 = very poor, 2 = poor , 3= fair, 4= good, 5 = very good). See Appendix A Table 1 for a detailed description of regressors. Regional dummies are omitted for reasons of space. The estimated cut-points are not reported. Standard errors are corrected for heteroskedasticity. The symbols ***, **, * denote that the coefficient is statistically different from zero at 1, 5 and 10 percent.

Table 6. Panel B. Effects of worker characteristics on SPH

	All		Poor		Good	
	coeff.	Std. err	dy/dx	std. err.	dy/dx	Std. err
Weekly hours	0.001	0.001	-0.000	0.000	0.000	0.000
Experience	-0.001	0.002	0.000	0.000	-0.000	0.000
Permanent job	0.031	0.029	-0.001	0.001	0.003	0.003
Job professional	0.179***	0.028	-0.005	0.001	0.012	0.002
Job skilled	0.076***	0.028	-0.002	0.001	0.005	0.002
Agriculture	- 0.041	0.058	0.001	0.002	-0.004	0.006
Construction	-0.022	0.040	0.001	0.001	-0.002	0.003
Wholesale	0.036	0.037	-0.001	0.001	0.003	0.002
Hotels	-0.049	0.061	0.002	0.002	-0.004	0.006
Transport	-0.038	0.045	0.001	0.001	-0.003	0.004
Finance	-0.002	0.056	0.000	0.002	-0.000	0.004
Real estate	-0.034	0.046	0.001	0.001	-0.003	0.004
Education	-0.035	0.042	0.001	0.001	-0.003	0.004
Public administration	-0.009	0.038	0.000	0.001	-0.001	0.003
Health and social work	-0.050	0.041	0.002	0.001	-0.004	0.004
Other sectors	-0.007	0.041	0.000	0.001	-0.000	0.003

Table 6. Panel C. Effects of housing features, neighbourhood quality and size of municipality on SPH

	All		Poor		Good	
	coeff.	Std. err	dy/dx	std. err.	dy/dx	Std. err
Number of rooms	0.027***	0.009	-0.001	0.000	0.002	0.001
Humidity problem	- 0.248***	0.024	0.009	0.001	-0.027	0.004
Warmth problem	-0.193***	0.041	0.007	0.002	-0.022	0.006
Dark problem	-0.092**	0.039	0.003	0.001	-0.009	0.004
Noise	-0.062**	0.026	0.002	0.001	-0.005	0.002
Pollution	-0.088***	0.029	0.003	0.001	-0.008	0.003
Crime	-0.056*	0.033	0.002	0.001	-0.005	0.003
Densely populated area	0.150***	0.031	-0.004	0.001	0.010	0.002
Intermediate area	0.090***	0.026	-0.003	0.001	0.007	0.002
Regional dummies	Yes		Yes		Yes	

The individual characteristics are important predictors of self-perceived health of employees. The degree of self-perceived health is found to decrease with age and marital status. In particular, being separated and/or divorced is negatively associated, respectively, with a 1.6 and 3.4 percent higher probability of declaring good perceived health (moving from fair perceived state). Previous empirical studies found no correlation in this respect (Fischer and Sousa-Poza 2009). Moreover, having children aged 6-15 is negatively statistically correlated (at 10%) with SPH, too. On the other hand, the degree of self-perceived health increases with the following characteristics: male, education, labour income, household size, having young children (aged 0-2) and whether the respondent was born in the European Union or other countries. These last three variables are associated respectively with 0.7, 0.6 and 0.7 percent higher probability of reporting good perceived health. The association between employees with children aged between 0 and 2 and self-perceived good health seems to support the hypotheses on the "relational" incentives towards healthy behaviour: as noted by Folland, "responsibility to others requires at a minimum that one stay alive and healthy" (2007, 2345). Moreover, results on male and education are in line with the findings of Datta Gupta and Kristensen (2008). Finally, the inverse Mills ratio coefficient is negative and significant at 1 percent. This means that there is an overestimation of the degree of self-perceived health, if we do not consider the selectivity problem of individuals in the labour market.

Regarding worker characteristics, we find that the only important predictor is occupation. Employees who are employed in professional and skilled occupations report a higher perceived health state than workers engaged in no-skilled occupation. The association is statistically significant at 1 percent. The presence of housing problems and low neighbourhood quality (both self-assessed) seem to be significant explanatory variables.

Table 7. Panel A. Effects of social relations and individual characteristics on CC

	coeff.	Std. err	dy/dx	std. err.
Individual social relations	-0.129***	0.040	-0.022	0.006
Contextual social relations	-0.331**	0.164	-0.059	0.029
Male	0.032	0.043	0.006	0.007
Married	0.045	0.043	0.008	0.007
Separated	0.110	0.088	0.021	0.018
Divorced	0.333***	0.084	0.071	0.021
Widowed	0.077	0.112	0.014	0.022
Age	0.018***	0.003	0.003	0.000
Pre primary edu	-0.082	0.244	-0.014	0.039
Primary edu	-0.128	0.084	-0.021	0.013
Secondary edu	0.005	0.047	0.001	0.008
Household size	-0.049***	0.017	-0.009	0.003
Children 0-2	0.023	0.054	0.004	0.010
Children 3-5	-0.030	0.053	-0.005	0.009
Children 6-15	0.080***	0.026	0.014	0.005
Children 16-24	0.023	0.025	0.004	0.004
EU birth	0.015	0.116	0.003	0.021
OTH birth	-0.365***	0.075	-0.052	0.008
Labour income (ln)	-0.106***	0.031	-0.019	0.005
Homeowner	0.040	0.035	0.007	0.006
Mills ratio	0.194***	0.072	0.034	0.013
Observations	14484			
R-squared	0.057			
Log Likelihood	-4869.74			

Note: The dependent variable *Chronic conditions* is a binary variable (1 = yes, 0 = no). See Appendix A Table 1 for a detailed description of regressors. Regional dummies are omitted for reasons of space. Standard errors are corrected for heteroskedasticity. The symbols ***, **, * denote that the coefficient is statistically different from zero at 1, 5 and 10 percent.

Table 7. Panel B. Effects of worker characteristics on CC

	coeff.	Std. err	dy/dx	std. err.
Weekly hours	0.002	0.002	0.000	0.000
Experience	0.000	0.003	0.000	0.000
Permanent job	0.008	0.047	0.001	0.008
Job professional	-0.074*	0.044	-0.013	0.008
Job skilled	-0.022	0.042	-0.004	0.007
Agriculture	-0.218**	0.097	-0.034	0.013
Construction	-0.080	0.066	-0.014	0.011
Wholesale	-0.056	0.058	-0.010	0.010
Hotels	0.019	0.093	0.003	0.017
Transport	-0.075	0.070	-0.013	0.011
Finance	0.123	0.083	0.023	0.017
Real estate	-0.075	0.073	-0.013	0.012
Education	0.118*	0.061	0.022	0.012
Public administration	0.107*	0.056	0.020	0.011
Health and social work	0.176***	0.059	0.034	0.012
Other sectors	-0.002	0.061	-0.000	0.011

Table 7. Panel C. Effects of housing features, neighbourhood quality and size of municipality on CC

	coeff.	Std. err	dy/dx	std. err.
Number of rooms	-0.024*	0.014	-0.004	0.002
Humidity problem	0.205***	0.035	0.039	0.007
Warmth problem	0.225***	0.054	0.045	0.012
Dark problem	0.046	0.054	0.008	0.010
Noise	0.074**	0.037	0.013	0.007
Pollution	0.155***	0.041	0.029	0.008
Crime	0.074*	0.037	0.014	0.009
Densely populated area	-0.032	0.048	-0.005	0.008
Intermediate area	-0.029	0.041	-0.005	0.007
Regional dummies	Yes		Yes	

Employees who judge that their accommodation is both damp and cold exhibit, respectively, a 2.7 and 2.3 percent lower probability of reporting good self-perceived health (moving from a fair perceived state). Moreover, our estimation also reveals a negative association, significant at the conventional level, between the perception of noise and pollution in the area of residence and the self-perceived health. Furthermore, the size of municipality in which the employees are residents is positively and statistically correlated, at 1 percent, with SPH. Employees who are resident in a densely populated area have a 1 percent higher probability of declaring good self-perceived health. Finally, results on regional dummies (not reported) show no statistically significant geographical differences.

5.2. Chronic conditions

Table 7 reports the results for CC equation. For reasons of clarity, we also display findings in Panels A, B and C. In Panel A, we observe a negative relationship between individual social relations and chronic conditions, statistically significant at 1 percent. Meeting friends every week reduces the probability of suffering from chronic conditions by around 2 percent. Moreover, there also emerges a negative association between contextual social relations and chronic conditions, statistically significant at 5 percent. The average frequency with which people meet friends at the community level reduces the probability of suffering from chronic conditions by around 6 percent.

The results for the individual control variables indicate that gender and education are not significant predictors of chronic conditions. Instead, being divorced and having children aged 6-15 increase the likelihood of reporting chronic conditions, respectively, by 7 and 1.4 percent. Age also presents a positive and statistically significant (at 1 %) correlation with CC. On the other hand, household size, being born outside the EU and labour income decrease the probability of suffering from chronic conditions. In particular, being born outside the EU is

associated with 5.2 percent lower probability of reporting chronic conditions. The evidence on age and household size are in line with the results of Su et al. (2006). The inverse Mills ratio coefficient is positive and significant at 1 percent. This means that there is an underestimation of suffering from chronic conditions if we do not consider the selectivity problem of individuals in the labour market.

Among worker characteristics, a significant (at 10%) negative correlation exists between managerial positions and chronic conditions. Industry also seems important. Working in the education sector, public administration and doing social work is found to worsen chronic conditions. Working in agriculture, on the other hand, is associated with an decrease in the probability of suffering from chronic conditions.

Housing problems and low neighbourhood quality also seem to be important explanatory variables in this sample. Employees who state that their accommodation is damp and cold exhibit, respectively, a 3.9 and 4.5 percent higher probability of suffering from chronic conditions. Moreover, employees who perceive noise, pollution and crime problems in their area of residence also have a higher probability of suffering from chronic conditions. The size of municipality in which the employees are resident is not statistically significant. Finally, evidence on regional dummies (not reported) points out some geographical differences: Southern regions (Campania, Puglia and Sicily) present a negative and highly significant association with chronic conditions.

5.3. Limitations in activities of daily living

We turn to self-reported measure of limitations in daily activities. Here, we face the problem that such limitations may be so severe that they inhibit participation in the labour market. Indeed, in the sample of individuals who do not participate in the labour market (no workers) we found that 1957 respondents (13%) report limitations and 855 (6%) state severe limitations. However, in the sample of employees, we have observations to estimate robustly the relationship between social relations and limitations in activities due to health problems. We show the results in Table 8, again in Panels A, B and C. The findings in Panel A show that individual social relations have no correlation with the limitations of daily activities. The coefficient has the expected sign but is not statistically significant. Instead, the contextual social relations variable is a highly significant predictor of LADLs. The coefficient is negatively associated with the limitations of daily activities, as expected. In particular, contextual social relations reduce the probability of being limited in ADLs by 7.2 percent and the probability of being severely limited in ADLs by 1.5 percent.

Table 8. Panel A. Effects of social relations and individual characteristics on LADLs

	All		Limited		Severely limited	
	coeff.	Std. err	dy/dx	std. err.	dy/dx	Std. err
Individual social relations	-0.022	0.042	-0.003	0.005	-0.000	0.001
Contextual social relations	-0.602***	0.180	-0.072	0.021	-0.015	0.005
Male	0.117***	0.045	0.014	0.005	0.003	0.001
Married	0.148***	0.048	0.017	0.005	0.003	0.001
Separated	0.169*	0.099	0.022	0.014	0.005	0.004
Divorced	0.450***	0.088	0.067	0.016	0.018	0.005
Widowed	0.258**	0.110	0.035	0.017	0.008	0.005
Age	0.016***	0.003	0.001	0.000	0.000	0.000
Pre primary edu	0.063	0.256	0.008	0.033	0.002	0.007
Primary edu	-0.006	0.085	-0.001	0.010	-0.000	0.002
Secondary edu	0.040	0.055	0.004	0.006	0.001	0.001
Household size	-0.025	0.018	-0.003	0.002	-0.001	0.000
Children 0-2	-0.192***	0.063	-0.023	0.007	-0.005	0.002
Children 3-5	0.010	0.054	0.001	0.006	0.000	0.001
Children 6-15	0.058**	0.027	0.007	0.003	0.001	0.001
Children 16-24	-0.020	0.026	-0.002	0.003	-0.000	0.001
EU birth	-0.177	0.136	-0.019	0.013	-0.003	0.002
OTH birth	-0.302***	0.080	-0.030	0.006	-0.005	0.001
Labour income (ln)	-0.143***	0.033	-0.017	0.004	-0.003	0.001
Homeowner	0.015	0.036	0.002	0.004	0.000	0.001
λ	0.453***	0.072	0.054	0.009	0.011	0.002
Observations	14484					
R-squared	0.069					
Log Likelihood	-4640.77					

Note: The dependent variable *limitations in activities of daily living* is an ordinal variable (1 = no, 2 = limited , 3= severely limited). See Appendix A Table 1 for a detailed description of regressors. Regional dummies are omitted for reasons of space. The estimated cut-points are not reported. Standard errors are corrected for heteroskedasticity. The symbols ***, **, * denote that the coefficient is statistically different from zero at 1, 5 and 10 percent.

Table 8. Panel B. Effects of worker characteristics on LADLs

	All		Limited		Severely limited	
	coeff.	Std. err	dy/dx	std. err.	dy/dx	Std. err
Weekly hours	-0.002	0.002	-0.000	0.000	-0.000	0.000
Experience	0.003	0.003	0.000	0.000	0.000	0.000
Permanent job	0.045	0.048	0.005	0.005	0.001	0.001
Job professional	-0.120**	0.047	-0.014	0.005	-0.003	0.001
Job skilled	0.008	0.044	0.001	0.005	0.000	0.001
Agriculture	-0.053	0.089	-0.006	0.010	-0.001	0.002
Construction	-0.058	0.068	-0.007	0.007	-0.001	0.001
Wholesale	-0.033	0.062	-0.004	0.007	-0.001	0.001
Hotels	0.014	0.097	0.002	0.012	0.000	0.002
Transport	-0.049	0.074	-0.006	0.008	-0.001	0.002
Finance	-0.050	0.101	-0.006	0.011	-0.001	0.002
Real estate	-0.042	0.081	-0.005	0.009	-0.001	0.002
Education	0.115*	0.065	0.014	0.009	0.003	0.002
Public administration	0.086	0.060	0.011	0.008	0.002	0.002
Health and social work	0.200***	0.063	0.026	0.009	0.006\	0.002
Other sectors	0.084	0.062	0.010	0.008	0.002	0.002

Table 8. Panel C. Effects of housing features, neighbourhood quality and size of municipality on LADLs

	All		Limited		Severely limited	
	coeff.	Std. err	dy/dx	std. err.	dy/dx	Std. err
Number of rooms	-0.022	0.015	-0.003	0.002	-0.000	0.000
Humidity problem	0.241***	0.036	0.031	0.005	0.007	0.001
Warmth problem	0.272***	0.052	0.037	0.008	0.009	0.002
Dark problem	0.131**	0.054	0.017	0.007	0.004	0.002
Noise	0.066*	0.039	0.008	0.005	0.002	0.001
Pollution	0.148***	0.043	0.019	0.006	0.004	0.001
Crime	0.155***	0.046	0.020	0.006	0.004	0.001
Densely populated area	-0.194**	0.051	-0.022	0.006	-0.004	0.001
Intermediate area	-0.122**	0.077	-0.014	0.005	-0.003	0.001
Regional dummies	Yes		Yes		Yes	

As in previous findings, education is not a significant predictor of LADLs while marital status and age have a positive and statistically significant effect on limitations in daily activities. In particular, being divorced and widowed increase the probability of being hampered in daily activities by, respectively, 6.7 and 3.5 percent (Column 2). Furthermore, being male and having children aged 6-15 is also associated with a higher likelihood of limitations in ADLs.

Other significant (at 1%) individual characteristics are having young children (aged 0-5), being born in a country outside the European Union and labour income. The negative signs of the coefficients of these variables suggest that they reduce the probability of health limitations in daily activities. Finally, the inverse Mills ratio coefficient is positive and significant at 1 percent. This means that there is an underestimation of LADLs if we do not consider the selectivity problem of individuals in the labour market.

Among worker characteristics, first, a significant negative correlation is present with the professional job variable. High managerial positions are associated with a higher probability of reducing health limitations in daily activities. Second, a positive association exists with the sectors education and social work . An increase in these variables is related with 1.1 and 2.6 percent higher probabilities, respectively, of declaring limitations in ADLs.

The presence of housing problems and low neighbourhood quality seem to be significant explanatory variables as well for LADLs. Employees who state that their accommodation is damp, cold and dark have, respectively, a 3.1, 3.7 and 1.7 percent higher probability of reporting health limitations in daily activities (Column 2). Moreover, our estimates also show a positive association, significant at 1 percent, between the perception of pollution and crime in the area of residence and LADLs. In addition, the size of municipality in which the employees live is negatively and statistically correlated, at a conventional level, with

limitations in activities of daily living. Employees who are resident in densely and intermediate populated areas have a 2.2 and 1.4 percent lower probability of declaring health limitations, respectively. This is probably because employees with limitations live in such areas due to their better accessibility. Finally, results on regional dummies (not reported) do not illustrate statistically significant geographical differences.

5.4. Robustness check

Although we allow for many control variables which might influence health status and social relations, the observed association between social relations and health measures could hide the effect of other factors which cause both a high propensity to meet friends and to feel well. Thus a potential problem with the interpretation of results is omitted variable bias. We address this problem by adding further control variables. First of all, we consider variables aimed at capturing additional social relational aspects of individual behaviour such as membership of various kinds of associations. In previous studies, membership of organisations has been found to be correlated with health in some studies (Poortinga 2006b; Giordano and Lindstrom 2010; Fiorillo and Sabatini 2011b) and insignificant in others (Petrou and Kupek 2008; Yip et al. 2007). Membership of organisations is a dummy variable equal to 1 if the respondent, during the last twelve months, participated in activities of organisations. The organisations we accounted for are political parties or trade unions, professional, religious, recreational, voluntary and others. Secondly, we consider unmet need for medical examination and treatment. The aim of including this variable is to capture the person's own assessment of whether he or she needed to consult a medical specialist, but was not able to do so. Even if in the Italian National Health System services may be accessed by all residents on a universal basis, access to health care may still be limited by the existence of waiting lists and other forms of rationing. Such variables are described in detail in Table 1 in Appendix A.

Tables 9, 10 and 11 show the results for the three health measures. The significance, sign and size of social relations variables remain unchanged. Membership of organisations is not a significant predictor of health except participation in professional organisations, in all three equations, and participation in other organisations, in SPH (significant at 10 %) and CC (significant at 5 %) equations. Participation in activities of professional organisations raises the likelihood of reporting good health by 0.7 percent, decreases the probability of reporting a chronic condition by 2.4 percent and reduces the likelihood of reporting limitations in daily activities by 2 percent.

Table 9. Social relations, membership, unmet need for medical examination and other controls on SPH

	All		Poor		Good	
	coeff.	Std. err	dy/dx	std. err.	dy/dx	Std. err
Individual social relations	0.176***	0.026	-0.005	0.001	0.010	0..001
Contextual social relations	0.095	0.102	-0.003	0.003	0.008	0.008
Unmet need for medical examination	-0.523***	0.041	0.026	0.003	-0.092	0.011
Membership of organisations						
Political parties or trade unions	- 0.064	0.039	0.002	0.001	-0.006	0.004
Professional	0.135***	0.041	-0.004	0.001	0.007	0.001
Religious	-0.003	0.027	0.000	0.001	-0.000	0.002
Recreational	0.014	0.032	-0.000	0.001	0.001	0.002
Voluntary	-0.048	0.038	0.001	0.001	-0.004	0.004
Other organisations	0.082**	0.041	-0.002	0.001	0.005	0.002
Control variables	Yes		Yes		Yes	
Mills ratio	-0.229***	0.050	0.007	0.002	-0.018	0.004
Observations	14484					
R-squared	0.078					
Log Likelihood	-14128.36					

Note: The symbols ***, * denote that the coefficient is statistically different from zero at 1, and 10 percent.

Table 10. Social relations, membership, unmet need for medical examination and other controls on CC

	coeff.	Std. err	dy/dx	std. err.
Individual social relations	-0.131***	0.040	-0.022	0.006
Contextual social relations	-0.343**	0.166	-0.060	0.029
Unmet need for medical examination	0.522	0.051	0.120	0.014
Membership of organisations				
Political parties or trade unions	0.078	0.057	0.014	0.011
Professional	-0.148**	0.063	-0.024	0.009
Religious	0.031	0.040	0.005	0.007
Recreational	0.033	0.047	0.006	0.008
Voluntary	0.051	0.053	0.009	0.010
Other organisations	0.110*	0.057	0.020	0.011
Control variables	Yes		Yes	
Mills ratio	0.208***	0.072	0.036	0.013
Observations	14484			
R-squared	0.069			
Log Likelihood	-4813.64			

Note: The symbols ***, ** denote that the coefficient is statistically different from zero at 1, and 5 percent.

Table 11. Social relations, membership, unmet need for medical examination and other controls on LADLs

	All		Limited		Strongly limited	
	coeff.	Std. err	dy/dx	std. err.	dy/dx	Std. err
Individual social relations	- 0.020	0.042	-0.002	0.005	-0.014	0.004
Contextual social relations	-0.627***	0.181	-0.073	0.021	-0.000	0.001
Unmet need for medical examination	0.642***	0.047	0.102	0.010	0.029	0.004
Membership of organisations						
Political parties or trade unions	0.056	0.061	0.007	0.008	0.001	0.002
Professional	- 0.191***	0.070	-0.020	0.007	-0.004	0.001
Religious	0.055	0.042	0.007	0.005	0.001	0.001
Recreational	0.042	0.051	0.005	0.006	0.001	0.001
Voluntary	0.056	0.058	0.007	0.007	0.001	0.001
Other organisations	0.016	0.063	0.002	0.007	0.000	0.001
Control variables	Yes		Yes		Yes	
Mills ratio	0.478***	0.073	0.056	0.009	0.011	0.002
Observations	14484					
R-squared	0.086					
Log Likelihood	-4558.08					

Note: The symbols *** denote that the coefficient is statistically different from zero at 1 percent.

On the other hand, participation in activities of environmental organizations, civil rights groups, neighbourhood associations, peace groups etc… raises the probability of declaring chronic conditions by 2 percent. Moreover, unmet need for medical examination is a highly significant predictor of health status. If the workers really needed examination or treatment but he/she did not reduce the probability of declaring good SPH by 9.2 percent, the probability of declaring a chronic condition rises by 12 percent and increases the likelihood of reporting limitations in daily activities by 10 percent.

Social relations might have different effects for workers with different type of jobs. For this reason we perform a second robustness analysis, stratifying our sample according to three categories of job types: professional, skilled and unskilled. We analyse the effects of social relations on health status for professional, skilled and unskilled employees separately. Tables 12 – 14 present the results, respectively, for self-perceived health, chronic conditions and presence of limitations in activities of daily living

Table 12. Social relations and other control variables on SPH by type of job

	Job Professional		Job Skilled		Job Unskilled	
	coeff.	Std. err	coeff.	std. err.	coeff.	Std. err
Individual social relations	0.250***	0.048	0.137***	0.047	0.156***	0.040
Contextual social relations	0.078	0.179	0.087	0.189	0.057	0.169
Control variables	Yes		Yes		Yes	
Mills ratio	-0.350***	0.094	-0.196 **	0.087	-0.223***	0.085
Observations	4957		4333		5197	
R-squared	0.078		0.083		0.090	
Log Likelihood	-4711.29		-4243.03		-5062.48	

Note: The symbols *** denote that the coefficient is statistically different from zero at 1 percent.

Table 13. Social relations and other control variables on CC by type of job

	Job Professional		Job Skilled		Job Unskilled	
	coeff.	Std. err	coeff.	std. err.	coeff.	Std. err
Individual social relations	- 0.206 ***	0.078	-0.029	0.072	-0.142**	0.064
Contextual social relations	-0.345	0.287	-0.154	0.307	-0.421	0.277
Control variables	Yes		Yes		Yes	
Mills ratio	0.159	0.136	0.197	0.127	0.251**	0.120
Observations	4957		4333		5194	
R-squared	0.078		0.084		0.089	
Log Likelihood	-1649.02		-1416.83		-1668.86	

Note: The symbols *** denote that the coefficient is statistically different from zero at 1 percent.

Table 14. Social relations and other control variables on LADLs by type of job

	Job Professional		Job Skilled		Job Unskilled	
	coeff.	Std. err	coeff.	std. err.	coeff.	Std. err
Individual social relations	- 0.039	0.085	0.011	0.075	-0.025	0.065
Contextual social relations	-0.153	0.329	-1.116***	0.331	-0.690**	0.290
Control variables	Yes		Yes		Yes	
Mills ratio	0.340**	0.145	0.686***	0.125	0.503***	0.118
Observations	4957		4333		5194	
R-squared	0.106		0.096		0.105	
Log Likelihood	-1350.81		-1393.17		-1718.90	

Note: The symbols *** denote that the coefficient is statistically different from zero at 1 percent.

When we compare the coefficients estimated for the overall sample (Tables 6-8, Panel A) with those estimated for the employees with professional, skilled and unskilled jobs, the coefficients on social relations appear to be quite robust. The coefficients appear to be particularly robust for all types of jobs in self-perceived health status. For the other health status some coefficients lose statistical significance, but this is not an unexpected result given that the sub-samples are smaller than the overall sample.

5.5.Discussion

The overall results from estimates for employees strengthen the claims concerning the existence of health disparities in Italy based on socio-economic status (Fiorillo and Sabatini 2011a, b). Even if services in the Italian National Health System may be accessed by all residents on a universal basis, separated/divorced, older, poorer, and unskilled employees are exposed to a higher probability of reporting poor self-perceived health and a higher probability of suffering from chronic conditions and presence of limitations in activities of daily living.

Social relations are confirmed to be a key predictor of the health status of workers. Our findings of a significant association between the two measures of social interactions and health status in Italy for employees strengthen the claims on the beneficial rule of social relations and community cohesion. However, differences among health status exist with regard to these effects.

Indeed, when the models are fitted jointly with individual and contextual social relations, the individual social relations variable, measured by meetings with friends, is found positively associated with the probability of declaring good self-perceived health and negatively correlated with the likelihood of suffering from chronic limitations, while no statistically significant relationship is found with limitations in activities of daily living. On the other hand, the contextual social relations variable, measured by the average frequency with which people meet friends at the community level, is found negatively linked with chronic condition and limitations in daily activities but not correlated with self-perceived health.

These findings indicate that the channels of health information, mutual assistance and "buffering effect" influence health status but with different mechanisms. In the case of self-perceived health the health benefits come from the intensity of ties with friends while for the limitations in daily activities such benefits come from the average intensity of ties in the reference group. In the middle there is chronic condition status for which health benefits come from both intensity of ties with friends and the average intensity of ties in the reference group.

Results concerning the relationship between living in an area with low neighbourhood quality and health status are similar across all three health models, suggesting that low neighbourhood quality strongly damages the health of workers. These results are in line with many other empirical studies and confirm previous evidence on the Italian whole population (see Bilger and Carrieri 2012). Similar estimates across all three health models are also found regarding the relationship between housing conditions and health status. These findings show that living in a house which is damp, cold and poorly-lit is a significant negative predictor of various health outcomes of workers, thereby confirming previous research (Dunn 2000; Macyntre et al. 2000).

An interesting result is the significant and negative association between unmet need for medical examination or treatment and health outcomes. Because in the dataset we have information on the reasons for unmet examination when we control for the answer "too expensive" we found similar estimates to those reported in tables 9 – 11. This evidence further reinforces the claims about the existence of health disparities in Italy based on socio-economic conditions.

Another interesting finding in all three models is the relevance of being born outside EU countries. This variable is a highly significant predictor of good health outcomes. This finding might reflect the differences in socio-economic status and cultural characteristics between Italy and the migrants' countries of origin.

A limitation of our of results is reverse causality. Workers in a poor health state might be forced to reduce their social relations against their will. Because we use cross-sectional data we cannot rule out the possibility of reverse causality in driving our results. Hence, we cannot prove causality. However, we are confident about the robustness of our results for several reasons. First, we account for the self-selection of the individuals in the labour force participation using a Heckman selection model. The statistical significance of the inverse Mills ratio in all three models of health outcomes indicates that there is an overestimation or underestimation in health status, if we do not consider the selectivity problem of individuals in the labour market. Second, we employ both subjective self-reported health as well as a more objective measure of health based on chronic conditions and limitations in activities of daily living. Cronbach's α value (0.59) statistic and Cramer's V statistical association statistic between bad health and chronic conditions (0.29), bad health and limitations in ADLs (0.36) and between chronic conditions and limitations in ADLs (0.42) indicates that the three measures of health need to be examined separately, i.e. independently of one another. Third,

we address the potential omitted variable bias adding many control variables that may simultaneously influence health status and social relations. In particular, following previous empirical analysis in Italy we allow in our model for the main determinants of social relations: education and income (Fiorillo 2008). All these factors eliminate or strongly reduce the importance of health status in social relations, which in turn limits the bias that might affect estimates of the social relations effects.

6. Conclusions

In this paper, we analysed the relationship between two measures of social relations: frequency of meetings with friends and the average frequency with which people meet friends at the community level, and three measures of workers' health ' - self-perceived health, chronic conditions and limitations in activities of daily living - using data from income and living conditions survey carried out in 2006 by the Italian Statistical Office (IT-SILC).

We find that social relations have a positive influence on health outcomes of workers in Italy and that differences among health status exist with regard to these effects. Improving the health of workers could reduce health inequalities and could increase work performance. The implication at a macro-economic level of an improvement in the health conditions of workers is relevant in Italy, where the level of labour productivity is low compared to the other developed countries (OECD 2013). Policy makers should consider the benefits, both at social and economic level, of public policies designed to improve the social and physical infrastructure of social relations.

Future research would benefit from panel data. Panel data would allow unobservable individual-specific factors to be controlled for and could be used to examine how exogenous shocks in social relations can explain changes in health outcomes of Italian workers.

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Appendix A. Table 1. Description of variables

Variable	*Description*
Dependent variable	
SPH	Self-perceived health, coded so that 1=very good, 5=very poor
CC	Dummy=1, if the respondent suffers from a chronic (long-standing) illness or condition; 0 otherwise
LADLs,	Respondent's self-assessment whether hampered in daily activity by any health problem, coded such that 1= not limited, 3=strongly limited
Key independent variables	
Individual social relations	Dummy, 1 if the respondent gets together with friends every week during a usual year; 0 otherwise
Contextual social relations	The mean value of the individual's frequency of meetings with friends for each of 27 reference groups in each of 20 Italian regions
Demographic and socio-economic characteristics	
Male	Dummy, 1 if male; 0 otherwise**. Reference group: female**
Married	Dummy, 1 if married; 0 otherwise; **Reference group: single status**
Separated	Dummy, 1 if separated; 0 otherwise
Divorced	Dummy, 1 if divorced; 0 otherwise
Widowed	Dummy, 1 if widowed; 0 otherwise
Age	Age of the respondent between 16 and 64
Pre primary edu	Dummy, 1 if the respondent has no education; 0 otherwise. **Reference group: tertiary education**
Primary edu	Dummy, 1 if the respondent has attained primary education; 0 otherwise.
Secondary edu	Dummy, 1 if the respondent has attained secondary education; 0 otherwise.
Household size	Number of household members
Children 0 -2	Number of own children aged 0 - 2. **Reference group: no children**
Children 3 -5	Number of own children aged 3 - 5
Children6 - 15	Number of own children aged 6 - 15
Children16 -24	Number of own children aged 16 to 24 attending school
EU birth	Dummy, 1 if the respondent was born in a European Union country; 0 otherwise. **Reference group: country of residence**
OTH birth	Dummy, 1 if the respondent was born in any other country; 0 otherwise
Labour income (ln)	Natural log of annual net labour income
Homeowner	Dummy, 1 if the respondent owns the house where he /she lives; 0 otherwise
Housing feature	
Number of rooms	Number of rooms of dwelling available to the household
Humidity problem	Dummy, 1 if the respondent judges that the dwelling is damp; 0 otherwise
Warmth problem	Dummy, 1 if the respondent is unable to pay to keep the home adequately warm; 0 otherwise
Dark problem	Dummy, 1 if the respondent feels the dwelling is too dark, not enough light; 0 otherwise

Variable	Description
Worker characteristics	
Weekly hours	Number of hours usually worked per week in main job
Labour market experience	Number of years, since starting the first regular job, that the respondent has spent at work
Permanent job	Dummy, 1 if the respondent has a work contract of unlimited duration; 0 otherwise
Occupation	
Job-Professional	Dummy, 1 if the respondent is employed in a professional and/or managerial occupation; 0 otherwise; **Reference group: Job-Non-skilled**
Job-Skilled	Dummy, 1 if the respondent is employed in a skilled occupation; 0 otherwise;
Sector	
Agriculture	Dummy, 1 if the activity sector is agriculture: 0 otherwise. **Reference group: manufacturing**
Construction	Dummy, 1 if the activity sector is construction: 0 otherwise
Wholesale	Dummy, 1 if the activity sector is wholesale and : 0 otherwise
Hotels	Dummy, 1 if the activity sector is hotels and restaurants: 0 otherwise
Transport	Dummy, 1 if the activity sector is transport: 0 otherwise
Finance	Dummy, 1 if the activity sector is finance intermediation: 0 otherwise
Real Estate	Dummy, 1 if the activity sector is real estate: 0 otherwise
Education	Dummy, 1 if the activity sector is education: 0 otherwise
Public administration	Dummy, 1 if the activity sector is public administration: 0 otherwise
Health and social work	Dummy, 1 if the activity sector is health and social work: 0 otherwise
Other sectors	Dummy, 1 if the activity sector is another sector: 0 otherwise
Neighbourhood quality	
Noise	Dummy, 1 if the respondent feels noise from neighbours is a problem for the household; 0 otherwise
Pollution	Dummy, 1 if the respondent feels pollution, grime or other environmental problems are a problem for the household, 0 otherwise
Crime	Dummy, 1 if the respondent feels crime, violence or vandalism is a problem for the household; 0 otherwise
Size of municipality	
Densely populated area	Dummy, 1 if the respondent lives in local areas where the total population for the set is at least 50,000 inhabitants. **Reference group: Thinly-populated area**
Intermediate area	Dummy, 1 if the respondent lives in local areas, not belonging to a densely-populated area, and either with a total population for the set of at least 50,000 inhabitants or adjacent to a densely-populated area.

Variable	Description
Membership of organizations	
Political parties or trade unions	Dummy, 1 if the respondent, during the last twelve months, participated in activities related to political groups, political association, political parties or trade unions. Attending meetings connected with these activities is included; 0 otherwise
Professional	Dummy, 1 if the respondent, during the last twelve months, participated in activities related to a professional association. Attending meetings connected with these activities is included; 0 otherwise
Religious	Dummy, 1 if the respondent, during the last twelve months, participated in activities related to churches, religious communions or associations. Attending meetings connected with these activities is included; 0 otherwise
Recreational	Dummy, 1 if the respondent, during the last twelve months, participated in recreational/leisure activities arranged by a club, association or similar. Attending meetings connected with these activities is included; 0 otherwise
Voluntary	Dummy, 1 if the respondent, during the last twelve months, participated in the unpaid work of charitable organizations, groups or clubs. It includes unpaid charitable work for churches, religious groups and humanitarian organizations. Attending meetings connected with these activities is included; 0 otherwise
Other organizations	Dummy, 1 if the respondent, during the last twelve months, participated in the activities of environmental organizations, civil rights groups, neighbourhood associations, peace groups etc. Attending meetings connected with these activities is included; 0 otherwise
Unmet need for medical examination	Dummy 1, if there was at least one occasion when the person really needed examination or treatment but did not; 0 otherwise

Appendix B

Table 2. Labour force participation equation

Variable	Coeff.	Robust Std. Err.	dy/dx	Robust Std. Err
Unemployment benefits (ln)	0.039***	0.003	0.015	0.001
Disability benefits (ln)	-0.093***	0.005	-0.036	0.002
Male	0.783***	0.015	0.299	0.006
Married	0.230***	0.023	0.090	0.009
Separated	0.292***	0.058	0.110	0.021
Divorced	0.412***	0.062	0.151	0.020
Widowed	0.176***	0.058	0.067	0.218
Age 30-39	0.719***	0.026	0.260	0.008
Age 40-49	0.877***	0.028	0.311	0.008
Age 50-59	0.363***	0.030	0.137	0.011
Age 60-64	-0.716***	0.041	-0.278	0.015
Low secondary edu	0.261***	0.026	0.101	0.010
Upper secondary edu	0.604***	0.026	0.228	0.009
Post secondary edu	0.856***	0.038	0.285	0.010
University edu	1.056***	0.034	0.340	0.008
Household size	-0.035***	0.008	-0.013	0.003
Children 0 - 2	-0.116***	0.031	0.045	0.012
Children 3 - 5	0.001	0.029	0.000	0.011
Children 6 - 15	-0.037***	0.014	-0.014	0.005
Children 16 - 24	-0.112***	0.012	-0.044	0.005
Homeowner	-0.004	0.017	-0.001	0.007
Densely populated area	-0.142***	0.020	-0.056	0.008
Intermediate area	-0.038**	0.019	-0.015	0.007
North East	0.017	0.022	0.007	0.009
Centre	-0.075***	0.023	-0.029	0.009
South	-0.371***	0.023	-0.147	0.009
Islands	-0.462***	0.030	-0.183	0.011
No. of observations		35157		
R-squared		0.225		
Log Likelihood		-18635.59		

Note: The symbols ***, ** denote that the coefficient is statistically different from zero, respectively, at 1 and 5 percent.