Individual heterogeneity in the association between social participation and self-rated health. A panel study on BHPS

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Abstract

In the last ten years interest in social capital as mechanism for understanding actual and perceived health has been increasing among economists. Although pathways by which social participation, as dimension of social capital, may have positive effect on health are well understood, empirical evidence on the relationship between social participation and self-rated health is mixed and it has never addressed the empirical problem of individual heterogeneity. This longitudinal study investigates the relationship between social participation (being member, active, and both member and active) in associations and self-rated health taking into account individual heterogeneity bias. The paper uses five waves of the British Household Panel Survey from 1991 to 1995 (unbalanced panel N=45,745). Three types of estimations are implemented. The first is an OLS with fixed effects on the original ordinal variable self-rated health *(SOH)*. The second uses a dichotomization of the ordered variable self-rated *(SOH2)* and applies a logistic fixed effect estimation. The last estimator is the ordered logit with fixed effects implemented by Baetschmann et al. (2015). All the empirical estimations show a positive and weak significant relationship between active membership and self-rated health.

Keywords: self-rated health, social participation, individual heterogeneity, social capital, ordered logit fixed effects model, British Household Panel Survey

JEL classification: C01, C33, C35, H10, Z10

1. Introduction

In the last ten years, interest in social capital as mechanism for understanding actual and perceived health has been increasing among economists (Folland 2006; Scheffler and Brown 2008; Ronconi et al. 2012; Ljunge 2014). Social capital is defined by political scientists and sociologists as "features of social organization, such as trust, norms and networks that can improve the efficiency of society by facilitating coordinated actions" (Putnam 1993, 167) and as "the capacity of individuals to command scarce resources by virtue of their membership in networks" (Portes 1998, 12). It presents a collective and individual level (Kawachi et al. 2004), the latter commonly measured by trust and social participation (Giordano et al. 2011).

Social participation may have positive effect on health by several pathways well understood in literature. Sociologists, psychologists and political scientists have pointed out the following mechanisms: (i) *social influence*, members of social networks obtain guidance about health relevant behaviors, which may have positive influence on general health (Berkman et al. 2000); (ii) *social integration*, integration in social networks may have positive effects on general health through social roles, self-esteem and belonging (Cohen 2004; Umberson and Montez 2010); (iii) *social support*, i.e. social relationships are channels of emotional (i.e. demonstrations of caring, esteem and value, encouragement), informational (i.e. provision of facts and advice that may help an individual to solve problems) and instrumental (i.e. offering behavioral and material assistance) support (Thoits 2011).

While the theoretical background is well established, the same cannot be said from an empirical point of view. Investigations on the association between individual social participation and perceived health, mainly domain of the epidemiological field, show inconclusive results (see Table 1). Several studies found no correlations (Veenstra 2000; Nyqvist et al. 2008; D'Hombres et al. 2010; Goryakin et al. 2014; Meng and Chen 2014), some others found positive associations (Lindstrom 2004; Petrou and Kupek 2008; Nieminen et al. 2010; Hurtado et al. 2011), others found negative links (Fiorillo and Sabatini 2011). The main limitation of this field of research is that it uses cross-sectional design, which is unable to address the problem of individual heterogeneity. Taking into account individual heterogeneity bias implies the availability of micro-levels panel survey that are also important when attempting to estimate the causal relationship with self-rated health because unobservable features, like personality and motivation, may be associated with reporting health and social participation.

Indeed, Giordano and Lindstrom (2010) and Giordano et al. (2012) use longitudinal data, the British Household Panel Survey (BPHS), to study the individual relationship among trust and social participation and self-rated health. They select a subsample of observations that includes

Table 1. Papers on social participation and perceived health

Author(s)	Design	Dimension	Country	Year	Results
Veenstra (2000)	Cross sectional	Individual level	Canada	1999	Social participation is not strongly related to self-rated health
Lindstrom (2004)	Cross sectional	Individual level	Sweden	1999/2000	Low social participation is associated with bad self-rated health
Nyqvist et al. (2008)	Cross sectional	Individual level	Finland	2000/2001	Social participation does not explain self-reported health
Petrou and Kupek (2008)	Cross sectional	Individual level	England	2003	Civic participation is positively related to better self-reported health
Nieminen et al. (2010)	Cross-section	Individual level	Finland	2000	Social participation is associated with good self-rated health
Fiorillo and Sabatini (2011)	Cross-section	Individual level	Italy	1993, 1995, 1998, 2000	Social participation is negatively related to self-rated good health
Hurtado et al. (2011)	Cross-sectional	Individual level	Colombia	2004–2005	Associational membership is linked to better self-rated health
Meng and Chen (2014)	Cross sectional	Individual level	China	2005	Social participation is not related to self-rated health
D'Hombres et al. (2010)	Cross-section with instrumental variables	Individual level	Eight former Soviet countries	2000	The effect of being member of a Putnamesque organisation is insignificantly related to self-rated health
Goryakin et al. (2014)	Cross-section with instrumental variables	Individual level	Nine former Soviet Republics	2010	Being a member of a Putnamesque organisation is found to be insignificantly related to self-rated good health
Giordano and Lindstrom (2010)	Panel data	Individual level	UK	1999 and 2005	Social participation is found associated with good self-rated health
Giordano et al. (2012)	Panel data	Individual level	UK	2000, 2003, 2005, 2007	Social participation is found associated with good self-rated health

individuals who are interviewed at beginning and at the end of the period of analysis with a relevant time gap that could highlight sample selection problems and although they use longitudinal data, they implement a random effect rather than a fixed effect estimation. Therefore, they cannot exclude individual heterogeneity and they do not provide any precaution to account for omitted variable problem.

In this paper, we aim at testing the longitudinal relationship between social participation and self-rated health in the UK taking into account individual heterogeneity bias. We contribute to the

literature in several ways. First, we use a continuous longitudinal data, the BPHS for all years between 1991 and 1995. Second, we consider individuals who are both passive and active members in associations: the grouping of the two positions can be considered a further measure of social capital. Third, in addition to OLS and logistic framework with fixed effects, we use the ordered logit with fixed effects implemented by Baetschmann et al. (2015).

Our results show a lack of relationship between social participation, measured by either being a member or being both a member and active in associations, and self-rated health and a weak relationship between being active member and self-rated health. Overall, we find little evidence for the positive association between social participation and perceived health.

In what follows, Section 2 sets out the data, variables and the econometric model while Section 3 reports the results. Last Section discusses and concludes.

2. Methods

Data

We use data from waves 1–5 of the British Household Panel Survey covering the survey years 1991-1995. We limit our study to the first five waves because only for those years our social capital variables are present continuously. The BHPS is a longitudinal survey of randomly selected private households in Great Britain. Individuals within selected households are interviewed annually with a view of identifying social and economic changes within the British population. The BHPS data contain information on various domains of the respondents' lives, ranging from income to jobs, household consumption, education, health, and social and political values. We use an unbalanced panel of individuals aged 16 and over, excluding missing data on any relevant variables. Table 2 shows participation rates and individuals observed across the waves.

For the aim of this paper, the BHPS has a number of strengths. It is a national representative sample, it is a longitudinal dataset, which is able to track changes in individual's events over time, and it includes a number of variables useful to identify both social participation and general perceived health.

Dependent variable

The dependent variable is self-related health. In years from 1991 to 1995, the same individuals were asked: "Please think back over the last 12 months about how your health has been. Compared to people of your own age, would you say that your health has on the whole been excellent, good, fair, poor, very poor?".

Table 2. Participation rates and individuals observed across waves.

	1991	1992	1993	1994	1995
Total # obs	10264	9845	9600	9481	9249
Response #	9822	9352	8904	8965	8718
Non-response	4.31%	4.99%	7.25%	5.44%	5.74%
Unbalanced non-response	9822	19174	28078	37043	45761

Notes: BHPS, UK; individuals aged 16 and over.

The first variable *SOH* is represented by the ordinal variable that takes five values from the lowest value that represents the lowest health level (very poor) to the highest level that represents the highest health level (Excellent).

Moreover, we use a dichotomization of the ordered variable *SOH2*. *SOH2* takes value 0 if *SOH* is equal to very poor, poor and fair; otherwise, it takes value 1 if *SOH* is equal to good and excellent.

Self-related health is widely used in the literature as a convenient aggregate of all aspects of health (Bilger and Carrieri 2013) and previous studies have shown self-rated health to be correlated with objective measures of health such as mortality (Idler and Benyamini 1987).

Social participation

Our independent variables of interest are *Member* and *Active*. In 1991-1995 years, the same individuals were asked: "Are you currently a member of any of the kinds of organizations on this card" and "Are you currently active in any of the kinds of organizations on this card".

Member indicates if the interviewed has been member of at least one of the organizations listed below during the year. *Active* specifies if she or he has had an active role in at least one of the organizations listed below. They are both dummy variables and take value equals to 1 if the respondent is a member/active of/in at least one of the organizations.

The kinds of organisations used for determining both the above variables are: Environmental (orgmc, orgac), Parental (orgmd, orgad), Tenants or Residents (orgme, orgae), Religious (orgmf, orgaf), Voluntary Service (orgmg, orgag), Community (orgmh, orgah), Social (orgmi, orgai), Sports club (orgmj, orgaj), Womens Institute (orgmk, orgak), Womens Group (orgml, orgal) and Others (orgmm, orgam).

It is possible that an *Active* within the organization is not a *Member* in the organisations. For this reason, we add the interaction variable in our regressions, *Member*Active*. The interaction variable is the product between *Member* and *Active*, and it aims at capturing contemporarily the effect of both variables.

Control variables

In order to control for other factors that might simultaneously influence perceived health and social participation, we include in the analysis a full set of socio-demographic variables that are largely used in the literature (Contoyannis et al. 2004).

We grouped several features as socio-economic status (Ses) variables: i) *Married*, a dummy variable taking value 1 if the person is married; ii) *Children* is the number of children; iii) *O_CSE*, *HND_A*, *DEGREE* three level of education (taking no qualification as reference group); iv) C_age and C_age2 the demeaning age and age square[1].

The economic group of control variables is constituted by *LNINCOME*, which is the equivalent uninflated income, and by *Unemployed*, a dummy indicating if the interviewed has not a job position in the year.

The group of controls for the health status includes *hl2gp*, the number of visits by the general practitioner and *HFPR*, a dummy that indicates if the interviewed has health problems (arms, legs, hands, sight, hearing, skin conditions/allergy, chest, heart/blood pressure, stomach or digestion, diabetes). Finally, we control for year dummies and regional dummies.

Table 3 reports descriptive statistics.

Methodology

Our main aim is analysing the effect of social capital on self-related health status avoiding heterogeneity. This kind of analysis is usually implemented in short panels with a large number of observations employing fixed effects to deal with individual heterogeneity problems. We implement three types of regressions. The first uses OLS with fixed effects on the *SOH* ordered variable. This regression should account for heterogeneity but it could bias estimated parameters because of violation of the OLS assumption (Cameron and Trivedi 2005). The second framework utilizes the dichotomized variable *SOH* 2 as dependent variable and implements a logistic fixed effect estimation. Also in this case, we accounted for heterogeneity, but the process of dichotomization can influence the regression parameters (Greene 2012). Finally, the last estimator we use is the ordered logit with fixed effects implemented by Baetschmann et al. (2015).

[1] We demean the variable age to avoid the effect of collinearity of introducing the variable and its square in a regression. As a consequence of that all, our regressions have a limited VIF.

Table 3. Descriptive Statistics.

		mean	sd	min	max
SOH	= Self related health ordered variable 1=poor 5=Excellent	3.880	0.919	1	5
SOH2	= Self related health dichotomous variable 1= Excellent or good	0.725	0.446	0	1
Member	= 1 if member of at least one of the organizations	0.513	0.500	0	1
Active	= 1 if active in at least one the organizations	0.475	0.499	0	1
Member*Active	= 1 if both member and active	0.412	0.492	0	1
C_age	= demeaned age = age-mean(age)	-0.0198	18.39	-29.01	52.99
Married	= 1 if married	0.568	0.495	0	1
Children	= number of children in the household	0.589	0.949	0	9
DEGREE	= 1 if graduated	0.0871	0.282	0	1
HND_A	= 1 if higher school	0.299	0.458	0	1
O_CSE	= 1 if lower than lower school	0.108	0.311	0	1
LNINCOME	= logarithm of equalised real income, adjusted using the Retail Price Index and McClement's scale to adjust for household size and composition	9.213	0.717	-0.524	12.04
Unemployed	= 1 if unemployed in the year	0.336	0.472	0	1
hl2gp	= number of visits to GP: 1 = none, 5 = more than ten	2.384	1.192	1	5
HMPR	= 1 if there are any physical problem	0.0583	0.234	0	1
# Observation		45745			

The first two estimation methods are almost common in the empirical literature and widely known while the last needs to be described in some details. Riedl and Geishecker (2014) compare six estimation strategies for the ordered logistic regression with fixed effects, all based on dichotomization. From their study, the "Blow Up and Cluster" (Hereafter BUC) estimation method (Baetschmann et al. 2015) results to be the less biased one. Their method is based in two stages. Given the number of the ordered categories k, in the first stage the BUC substitutes k-1 observation to the original one and dichotomises each observation obtained. Thereafter, the estimation is on the new overall sample using fixed effects logit. Because of the construction of the new sample, observations cannot be considered independent, because of that, the estimation implements individual clusters.

We apply BUC estimator to analyze whether *Member*, *Active*, and *Member*Active* are correlated to *SOH* controlling for all other variables (*Z*):

$$SOH_{it} = \alpha + \beta_1 Member_{it} + \beta_2 Active_{it} + \beta_3 Member_{it} * Active_{it} + \gamma Z_{it} + u_i + \varepsilon_{it} \quad (1)$$

where u_i is the unobserved individual specific component assumed to be time invariant and correlated with the observed explanatory variables.

We introduce also the lagged variable for social participation variables. We use only one lagged variable. In this way, we try to understand if being a member and/or an active member of an

organization in the last year (time t-1) can improve self-related health in the following year (time t). Even if, the persistence of being member and/or an active member of associations could be of relevance in our study. The BUC estimator with social participation lagged variables is

$$SOH_{it} = \alpha + \beta_1 Member_{it-1} + \beta_2 Active_{it-1} + \beta_3 Member_{it-1} * Active_{it-1} + \gamma Z_{it} + u_i + \varepsilon_{it} \quad (2)$$

However, because of the introduction of a lag independent variable there is a reduction in the number of observations. Thus, to compare results of contemporarily and lagged variables we operate also regressions reducing the observation to the case of lagged variables. In this last state, the BUC equation is

$$SOH_{it-1} = \alpha + \beta_1 Member_{it-1} + \beta_2 Active_{it-1} + \beta_3 Member_{it-1} * Active_{it-1} + \gamma Z_{it-1} + u_i + \varepsilon_{it-1} \quad (3)$$

3. Results

Tables from 4 to 6 report results of the estimation methods. In each table, we have four regressions. In the first column, we have the regression for all the control variables and social participation variables in the same year of the health status (equation 1). In the second column, we have the same regression but the sample takes into account if the observations have an existing lagged variable. In the latter case, we restrict the sample to the presence of lagged (equation 3). In the third column, we have the regression only on the lagged variables of social participation (equation 2), while in the last column, we report results for all contemporary and lagged social participation variables. We do not show results of time and regional dummies for shortness. Under the coefficients, we report some typical measures of fit and testing. Among others, we show the variation inflation factors (VIF) that is always low enough to affirm that there is no effect of collinearity on coefficients significance.

Table 4 illustrates results of the OLS regressions for the ordered dependent variable *SOH*. Findings show that all coefficients of social participation variables except one are positively correlated with self-rated health. Nevertheless, none of the coefficients is significant at 5 percent level; some of them are significant at 10 percent level, as the case of *Active* in Columns 2 and 4. Indeed, when we insert contemporary and lagged social participation variables in Column (4), the *Active* coefficient remains stable compared to the same coefficient estimated in Column (2) on a more restricted sample. Hence, OLS estimations with fixed effects support a week association between active membership and self-perceived health. Indeed, this result can be due to a bias of the OLS estimation for the ordered variable, for this reason we implement further regressions on dichotomous dependent variable (*SOH2*) as well as on ordered dependent variable (*SOH*).

Table 4. OLS fixed effects estimates on SOH.

	(1) t	(2) t-1	(3) SP_{t-1}	(4) t, SP_{t-1}
Member	0.017	0.023		0.026
	(0.014)	(0.016)		(0.017)
Active	0.024	0.037+		0.038+
	(0.015)	(0.019)		(0.019)
Member*Active	0.017	0.020		0.021
	(0.011)	(0.014)		(0.014)
Member t-1			0.015	0.019
			(0.016)	(0.016)
Active t-1			-0.004	0.003
			(0.018)	(0.018)
Member t-1*Active t-1			0.013	0.013
			(0.014)	(0.014)
C_age2	-0.000+	-0.000**	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
C_age	-0.028+	-0.038*	-0.038*	-0.039*
	(0.016)	(0.019)	(0.019)	(0.019)
Married	0.043*	0.056*	0.052+	0.056*
	(0.022)	(0.028)	(0.028)	(0.028)
Children	0.030***	0.040***	0.041***	0.040***
	(0.009)	(0.012)	(0.012)	(0.012)
DEGREE	0.122*	0.136*	0.130+	0.138*
	(0.054)	(0.068)	(0.068)	(0.068)
HND_A	0.067*	0.048	0.047	0.048
	(0.027)	(0.035)	(0.034)	(0.035)
O_CSE	-0.040	0.025	0.018	0.025
	(0.050)	(0.091)	(0.092)	(0.091)
LNINCOME	0.020*	0.015	0.015	0.015
	(0.008)	(0.010)	(0.010)	(0.010)
Unemployed	-0.019	-0.028+	-0.024	-0.028+
	(0.012)	(0.017)	(0.017)	(0.017)
hl2gp	-0.200***	-0.196***	-0.195***	-0.196***
	(0.005)	(0.006)	(0.006)	(0.006)
HFPR	-0.167***	-0.161***	-0.160***	-0.161***
	(0.011)	(0.013)	(0.013)	(0.013)
Constant	4.130***	4.309***	4.322***	4.301***
	(0.108)	(0.135)	(0.134)	(0.135)
Year Dummies	YES	YES	YES	YES
Regional Dummies	YES	YES	YES	YES
N	45745	32531	32754	32531
adj. R^2	0.097	0.092	0.091	0.092
AIC	65477.5	42784.7	43236.8	42788.3
BIC	65783.1	43070.0	43522.3	43098.7
rmse	0.495	0.467	0.468	0.467
F	63.54	43.98	44.02	40.43
ll	-32703.8	-21358.4	-21584.4	-21357.2
VIF	3.20	3.31	3.31	3.25

Notes: Standard Deviation in parentheses; + p<0.1,* p<0.05, ** p<0.01, *** p<0.001.

Table 5. Logit fixed effects estimates on SOH2.

	(1) t	(2) t-1	(3) SP_{t-1}	(4) t, SP_{t-1}
Member	-0.034	-0.115		-0.081
	(0.076)	(0.095)		(0.098)
Active	0.055	0.191+		0.206+
	(0.087)	(0.114)		(0.117)
Member*Active	0.005	0.016		0.028
	(0.061)	(0.078)		(0.079)
Member t-1			0.178+	0.169+
			(0.095)	(0.098)
Active t-1			0.036	0.074
			(0.106)	(0.111)
Member t-1*Active t-1			0.106	0.097
			(0.076)	(0.077)
C_age2	-0.001**	-0.002***	-0.002***	-0.002***
	(0.000)	(0.001)	(0.001)	(0.001)
C_age	-0.325***	-0.465***	-0.478***	-0.467***
	(0.094)	(0.117)	(0.117)	(0.118)
Married	0.212+	0.315*	0.292+	0.313*
	(0.108)	(0.150)	(0.151)	(0.150)
Children	0.081+	0.194**	0.186**	0.194**
	(0.049)	(0.072)	(0.072)	(0.072)
DEGREE	0.305	0.204	0.267	0.215
	(0.348)	(0.453)	(0.453)	(0.454)
HND_A	0.084	-0.036	-0.026	-0.034
	(0.150)	(0.211)	(0.210)	(0.212)
O_CSE	-0.225	0.380	0.296	0.377
	(0.236)	(0.391)	(0.376)	(0.391)
LNINCOME	0.105*	0.132*	0.117+	0.132*
	(0.050)	(0.062)	(0.062)	(0.063)
Unemployed	-0.046	-0.125	-0.105	-0.121
	(0.062)	(0.087)	(0.086)	(0.087)
hl2gp	-0.711***	-0.738***	-0.729***	-0.737***
	(0.023)	(0.030)	(0.029)	(0.030)
HFPR	-0.661***	-0.658***	-0.652***	-0.658***
	(0.057)	(0.073)	(0.073)	(0.073)
Year Dummies	YES	YES	YES	YES
Regional Dummies	YES	YES	YES	YES
N	17705	10946	11088	10946
pseudo R^2	0.130	0.139	0.137	0.140
AIC	11739.9	7117.6	7232.4	7120.2
BIC	12012.3	7365.8	7481.1	7390.3
chi2	1289.7	848.7	837.0	847.8
df_m	35	34	34	37
VIF	3.44	3.59	3.60	3.50

Notes: Standard Deviation in parentheses; + p<0.1,* p<0.05, ** p<0.01, *** p<0.001.

Table 6. Ordered logit fixed effects estimates on SOH.

	(1) t	(2) t-1	(3) SP_{t-1}	(4) t, SP_{t-1}
Member	0.054	-0.058		0.063
	(0.055)	(0.091)		(0.070)
Active	0.100	0.212+		0.151+
	(0.061)	(0.110)		(0.080)
Member*Active	0.057	0.038		0.078
	(0.043)	(0.074)		(0.056)
Member t-1			0.044	0.056
			(0.066)	(0.069)
Active t-1			-0.019	0.014
			(0.074)	(0.076)
Member t-1*Active t-1			0.028	0.030
			(0.054)	(0.056)
C_age2	-0.001**	-0.002***	-0.001***	-0.001***
	(0.000)	(0.001)	(0.000)	(0.000)
C_age	-0.129*	-0.285*	-0.163*	-0.162*
	(0.065)	(0.116)	(0.081)	(0.082)
Married	0.115	0.246	0.143	0.153
	(0.084)	(0.155)	(0.113)	(0.113)
Children	0.103**	0.231**	0.170***	0.168***
	(0.035)	(0.073)	(0.050)	(0.051)
DEGREE	0.544*	0.353	0.703*	0.733*
	(0.237)	(0.445)	(0.306)	(0.309)
HND_A	0.253*	0.137	0.180	0.177
	(0.107)	(0.211)	(0.145)	(0.145)
O_CSE	-0.082	0.148	-0.028	0.022
	(0.177)	(0.387)	(0.310)	(0.307)
LNINCOME	0.079*	0.114+	0.061	0.063
	(0.033)	(0.061)	(0.042)	(0.043)
Unemployed	-0.014	-0.111	-0.059	-0.070
	(0.045)	(0.086)	(0.065)	(0.065)
hl2gp	-0.676***	-0.791***	-0.693***	-0.696***
	(0.018)	(0.030)	(0.022)	(0.022)
HFPR	-0.613***	-0.650***	-0.614***	-0.614***
	(0.043)	(0.072)	(0.053)	(0.053)
Year Dummies	YES	YES	YES	YES
Regional Dummies	YES	YES	YES	YES
Number of individuals	7121	2882	5617	5568
Individual-year observations	44120	16681	27378	27059
BuC Observations	196488	196488	196488	196488
pseudo R^2	0.113	0.165	0.116	0.117
AIC	29641.6	10430.0	18158.3	17924.8
BIC	29946.0	10692.5	18437.7	18228.4
chi2	2059.0	973.0	1340.6	1336.7
df_m	35	34	34	37

Notes: Standard Deviation in parentheses; + p<0.1,* p<0.05, ** p<0.01, *** p<0.001.

Table 5 shows results of the logit fixed effects for the perceived health dichotomised variable *SOH2*. In all columns, coefficients on *Member* present a negative sign but are not statistically significant. In all other cases, where there are lagged and contemporarily social participation variables, *Active* and *Member* are positively related to self-perceived health in column 2 and 4. In these cases, not only the contemporarily *Active* but also the lagged *Member* is significant at 10 percent level. Hence, using a dichotomous variable of self-perceived health does not help in showing a robust positive relationship between active membership and self-rated health.

In table 6, we show results of the BUC regressions. Findings on social participation variables are similar to those reported in tables 4 and 5. The greatest part of coefficients are positively related to the state of health, and in the case of *Active* in column 2 and column 4, coefficients are significant at 10 percent level. In these two cases, intensity seems to be closer to the dichotomous case showed in table 4 rather than to the OLS estimates. Therefore, using an ordered logistic regression with fixed effects still leads to weak correlation between active membership in organizations and self-perceived health.

Control variables show the same sign as in the literature (see among others D'Hombres et al. 2010, Goryakin 2014, Fiorillo and Sabatini 2015). In particular, age and its square are negatively related with self-rated health, and this is true in all regressions and in all estimates, there are only some difference in the significance. Being married is positively related to the state of health and its significance is different in the ordered fixed effect cases: for the OLS and the dichotomous regressions are similar, meanwhile, in the case of BUC, the estimates are never significant. The number of children is always significant in all models on the state of health. The higher is the level of education the better is self-perceived health. Income is always positively related to self-rated health. On the contrary, unemployed is negatively related to the state of health. The number of general practitioner visits and health problems are always negatively and significantly related to the state of health.

4. Discussion and conclusions

In this paper, we examined the relationship between social capital, measured by social participation in associations, and self-rated health in a large representative sample of the British population using BHPS and controlling for Ses, economic and health variables. We explicitly took into account unobserved individual heterogeneity using panel data with fixed effects models.

Self-rated health has been showed to be correlated to social participation in several cross-sectional studies. In particular, previous cross-section and panel data with random effect

investigations on the UK found a strong relationship between self-rated health and social participation (Petrou and Kupek 2008; Giordano and Lindstrom 2010; Giordano et al. 2012).

In this study, we have shown that the relationship between self-rated health and social participation is weak. Neither the relationship between being member in association and health nor the relationship between being both a member and active and health are statistically significant. The only statistical significant association we found was between active membership and self-rated health. Hence, the main result of this longitudinal paper, which uses fixed effects estimators, is that little evidence was found for the positive association between social participation and perceived (general) health.

Our results highlight both methodological and theoretical reflections. From a methodological point of view, it seems relevant to use micro longitudinal data with fixed effects estimators to take into account individual heterogeneity bias. To emphasize this point, we run OLS, logit and ordered logit estimations applied to pooled cross section data. Results reported in Appendix A, Tables A1-A3, show robust significant correlations between social participation variables and self-rated health.

From a theoretical point of view, our results may point out that social participation may have a dark side, to evaluate fully in future studies. For example, social relationships can be stressful and relationships stress undermines health trough behavioural and psychological pathways (Umberson and Montez 2010). Following another strand of the literature, also caring of sick people and of elderly may be harmful for health. Therefore, when social participation implies this kind of accomplishments as *Active* within an association the effects on health may be ambiguous and may involve personal health costs. Furthermore, social participation could have harmful effects on individual's health because of the stress linked to the sense of reciprocity and to the obligations towards others that come from social participation itself (Kawachi and Berkman 2001). As in our study, we are unable to identify the mechanisms by which social participation weakly improves general health, future investigations on such channels are welcome.

APPENDIX A

Table A1. OLS estimates on SOH

	(1) Fixed Effects b/se	(2) Pooled b/se
Member	0.017	0.035**
	(0.013)	(0.013)
Active	0.024+	0.095***
	(0.015)	(0.015)
Member*Active	-0.024	-0.003
	(0.019)	(0.020)
C_age2	-0.000*	0.000***
	(0.000)	(0.000)
C_age	-0.028+	-0.002***
	(0.015)	(0.000)
Married	0.043*	0.051***
	(0.019)	(0.009)
hhsize	-0.001	-0.017***
	(0.007)	(0.004)
Children	0.030***	0.033***
	(0.009)	(0.006)
DEGREE	0.121*	0.119***
	(0.057)	(0.014)
HND_A	0.067**	0.091***
	(0.026)	(0.009)
O_CSE	-0.040	0.014
	(0.044)	(0.012)
LNINCOME	0.020*	0.086***
	(0.008)	(0.006)
Unemployed	-0.019+	-0.105***
	(0.011)	(0.009)
hl2gp	-0.200***	-0.306***
	(0.004)	(0.003)
HFPR	-0.167***	-0.381***
	(0.010)	(0.008)
Constant	4.222***	4.034***
	(0.137)	(0.061)
Regional Dummies	Yes	Yes
Year Dummies	Yes	Yes
N	45745	45745
adj. R^2	-0.241	0.312
AIC	65481.5	104992.4
BIC	65804.5	105315.5
rmse	0.580	0.762
F	99.66	577.2
ll	-32703.7	-52459.2

Notes: + p<0.1,* p<0.05, ** p<0.01, *** p<0.001.

Table A2. Logit estimates on SOH2

	(1) Fixed Effects	(2) Pooled	(3) Pooled Constrained
	b/se	b/se	b/se
Member	-0.034	0.090*	0.013
	(0.074)	(0.042)	(0.056)
Active	0.055	0.223***	0.145*
	(0.085)	(0.053)	(0.069)
Member*Active	-0.017	0.005	-0.073
	(0.109)	(0.068)	(0.089)
C_age2	-0.001**	0.000***	0.000**
	(0.000)	(0.000)	(0.000)
C_age	-0.326***	-0.003**	0.002+
	(0.091)	(0.001)	(0.001)
Married	0.210*	0.107***	0.068+
	(0.105)	(0.030)	(0.040)
Hhsize	0.006	-0.035*	-0.037+
	(0.038)	(0.014)	(0.019)
Children	0.077	0.097***	0.084**
	(0.052)	(0.019)	(0.026)
DEGREE	0.311	0.433***	0.065
	(0.371)	(0.053)	(0.072)
HND_A	0.084	0.260***	0.081*
	(0.145)	(0.030)	(0.040)
O_CSE	-0.224	0.027	-0.014
	(0.232)	(0.040)	(0.053)
LNINCOME	0.104*	0.241***	0.112***
	(0.045)	(0.020)	(0.027)
Unemployed	-0.046	-0.302***	-0.092*
	(0.061)	(0.031)	(0.041)
hl2gp	-0.711***	-0.731***	-0.483***
	(0.022)	(0.011)	(0.014)
HFPR	-0.661***	-1.104***	-0.517***
	(0.056)	(0.028)	(0.036)
Constant		0.694***	0.565*
		(0.197)	(0.272)
Regional Dummies	YES	YES	YES
Year Dummies	YES	YES	YES
N	17705	45745	17705
pseudo R^2	0.130	0.226	0.083
AIC	11741.9	41703.1	22218.4
BIC	12022.1	42026.1	22506.4
ll	-5835.0	-20814.5	-11072.2
chi2	1747.2	12155.6	2004.5

Notes: + p<0.1,* p<0.05, ** p<0.01, *** p<0.001.

Table A3. Ordered logit estimates on SOH

	(1) Fixed Effects	(2) Pooled	(3) Pooled Constrained
	b/se	b/se	b/se
Member	0.054	0.239***	0.212***
	(0.055)	(0.038)	(0.045)
Active	0.101	0.087**	0.073+
	(0.061)	(0.032)	(0.037)
Member *Active	0.057	-0.009	-0.033
	(0.043)	(0.049)	(0.059)
C_age2	-0.001**	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
C_age	-0.129*	-0.004***	-0.003**
	(0.065)	(0.001)	(0.001)
Married	0.117	0.110***	0.126***
	(0.085)	(0.023)	(0.027)
Hhsize	-0.006	-0.048***	-0.051***
	(0.028)	(0.010)	(0.013)
Children	0.106**	0.087***	0.093***
	(0.038)	(0.014)	(0.017)
DEGREE	0.540*	0.299***	0.250***
	(0.237)	(0.035)	(0.043)
HND_A	0.252*	0.237***	0.207***
	(0.107)	(0.022)	(0.026)
O_CSE	-0.083	0.016	0.068+
	(0.177)	(0.030)	(0.035)
LNINCOME	0.080*	0.228***	0.196***
	(0.034)	(0.015)	(0.018)
Unemployed	-0.014	-0.235***	-0.248***
	(0.045)	(0.024)	(0.028)
hl2gp	-0.676***	-0.725***	-0.713***
	(0.018)	(0.009)	(0.010)
HFPR	-0.613***	-0.979***	-0.926***
	(0.043)	(0.021)	(0.025)
Regional Dummies	YES	YES	YES
Year Dummies	YES	YES	YES
N	44120	45745	32033
pseudo R^2	0.113	0.137	0.131
AIC	29643.6	100014.9	73078.9
BIC	29956.6	100364.1	73413.9
Ll	-14785.8	-49967.4	-36499.5
chi2	2060.4	15896.6	11029.8

Notes: + p<0.1,* p<0.05, ** p<0.01, *** p<0.001.

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