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study of associations
between social
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Abstract

The objective of this study is to estimate associations between social capital and health when other factors are controlled for. Data from the survey of level-of-living conditions by Statistics Norway are merged with data from several other sources. The merged files combine data at the individual level with data that describe indicators of community-level social capital related to each person's county of residence. Both cross-sectional and panel data are used.

We find that one indicator of community-level social capital — voting participation in local elections — was positively associated with self-assessed health in the cross-sectional study and in the panel data study. While we find that religious activity at the community-level has a positive effect in the cross-sectional survey and a non-significant effect in the panel survey, we find that sports organizations have a negative effect on health in the cross-sectional survey and a non-significant effect in the panel study. This result indicates that sports organizations represent bonding social capital.

1. Introduction

The objective of this study is to estimate associations between social capital and health when other factors are controlled for. The paper adds to the increasing literature that consists both of comparative cross-country studies at the aggregate level and of disaggregated studies within a country. While cross-country studies have failed in finding associations at the aggregate level (Kennelly et al., 2003), strong associations have been found in disaggregated studies (Bolin et al., 2003, Brown et al., 2006 and Miller et al., 2006). In between we find cross-country studies that employ data both at the national level and at the individual level. Using data from the European Social Survey, Poortinga (2006) finds beneficial properties of social capital at the individual level. At the same time, the aggregate social trust and civic participation variables are found to have a complex interaction with social capital at the individual level. This suggests that social capital may not uniformly benefit individuals living in the same community or society.

The present study is exploratory in the sense that hypotheses are not derived from a rigorous model, but rather put forward informally. The approach is compatible with Putnam's definition of community capital as networks, as well as with Glaeser et al. (2000), who suggest an economic approach to social capital using a model of optimal individual investment decisions. The empirical analyses employ data from two types of surveys: a cross-sectional survey from 1998 and a panel that is surveyed annually during the period 1997-2002. In each analysis I study whether self-assessed health is associated with socio-demographic factors, indicators of human capital and indicators of social capital. Hence, a static health production function is estimated (Grossmann, 1972). Both social capital at the individual level and social capital at the community level are included. The reason for this is the potentially external effect of social capital at the individual level: If I engage in a social

interaction, it has an impact on me as well as on the people I interact with. The possible mechanisms by which social capital affects health are discussed in Scheffler (200x) in his introduction to this special issue. Here, it is sufficient to say that social capital may give access to information about a healthy life-style. Local communities may also enforce social norms that discourage destructive behavior and provide psychosocial support that mitigate stress and mental problems.

The article is organized as follows. Section 2 presents the datasets, explains the variables and displays some descriptive statistics. The estimation strategy and the empirical results are presented in Section 3. Finally, Section 4 contains some concluding remarks.

2. Data and descriptives

The data for this study were obtained by merging data from the level-of-living conditions survey by Statistics Norway; from the Commune Database compiled by Norwegian Social Science Data Services (NSD); and from several other sources. The merged files combine data at the individual level with indicators of community-level social capital related to each person's county of residence.

The level-of-living conditions surveys contain information on self-assessed health, socio-demographic characteristics, and some information on individual social capital. There are two types of surveys; an annual cross-sectional survey having health as a theme every 3-5 years, and an annual and less detailed survey of a panel of households. Both types of surveys are used in this paper.

The 1998 level of living conditions survey consists of a sample of 5000 respondents from the Norwegian non-institutionalized population, aged 16 and older. The sample is representative with respect to sex, age, marital status, and geographical region. Interviews were conducted with 3449 persons. In addition to a major focus on health-related questions, the survey also included questions on living conditions, education, income, employment, etc. In particular, the survey is quite detailed regarding an individual's participation in organized community life in terms of memberships and voting.

A supplementary analysis used data from a panel set up in 1997 consisting of a representative sample of 5000 individuals. In 2002 the panel contained 2562 persons who had been interviewed annually a total of six times. Parallel to the attrition, the panel was supplemented with new individuals, so that in 2002 the panel consisted of a total of 5119 individuals. Of these, 3590 people were interviewed, a response rate of 70.1 percent.

Norway has 19 counties and 434 municipalities. In 2002, county population varied from 73,732 in Finnmark to 512,589 in Oslo (both a county and a municipality). The population of municipalities varies even more; from 233 in Utsira to 512,589 in Oslo.

There are important trade-offs involved in what community level to choose for data on community social capital. Immediately, one would probably think that the municipality is superior because a municipality is more homogenous than a county. With survey data this is however not so obvious, since we would have a very small number of observations in the smaller municipalities. Therefore, the county was used as the regional unit for measuring community social capital¹.

¹ Also, information about the residential municipality of respondents was not available, so it was not possible to analyze whether or not the choice of community level would have an impact on the results from the study.

Data necessary for using the Petris Index (Scheffler, 200x) were not available at the regional level in Norway. Therefore other indicators of community social capital were used. The four county-level measures used included²:

1. Number of people attending church services relative to population
2. Membership in sports organizations relative to population
3. Number of votes as a proportion of the number entitled to vote in local elections
4. Fundraising per capita in annual national campaigns

The first two are structural measures that reveal something about the degree of organizational activity in the community. Church membership is very large. Norway has a state church and the overwhelming majority of people belong to it. For most, church membership seems to be a formality; a much lower proportion go to church regularly. Hence, the number of people attending church services relative to the population says something more accurate about involvement in organized religion.

Next to the church, sports organizations have the most members.

The last two measures are more of a cognitive kind. The proportion of people who vote in local elections tells something about the concern for and involvement in the local community. The same applies to the somewhat vaguer indicator that describes the result of local fundraising per capita. In Norway there is a major annual fundraiser for a humanitarian purpose. These campaigns also turn out to be competitions between local communities in the act of giving, and a ranked list is published in the media each year. Since the contributed sum

² In a previous version of the paper local opinion about safety in the neighborhood and downtown based on annual surveys was included as control variables. These were later removed since they did not have an effect.

can be considered a public good, the total contribution per capita is an indicator of mutual involvement in the community.

The variables indicate the variety and strength of social networks in the community. While attending church services and being a member of a sports organization perhaps represents bonding capital, participation in local elections may reflect a concern for the community as a whole; hence, voting may be considered an indicator of bridging capital³. Both bridging and bonding social capital are likely to help with the communication of healthy lifestyle information and probably also create and maintain norms that pull in the same direction.

Indicators 1, 3, and 4 are compiled from the Commune Database (<http://www.nsd.uib.no/english/data/regional.html>) by the Norwegian Social Science Data Service (NSD). The Commune Database contains demographic and occupational information, welfare-related statistics, and data on the provision of public services at the municipality level. Data on memberships in sports organizations are from the Norwegian Confederation of Sports.

Two health indicators are considered as dependent variables: self-assessed general health and self-assessed mental health. The first is an individual's answer to the question: "How would you assess your health in general?" The answer has five alternatives: very good, good, neither good nor bad, bad, and very bad. Self-assessed mental health comes from the Norwegian translation of the five questions that constitute the mental health component (MH) of SF-36 (<http://www.sf-36.org/tools/sf36.shtml>). MH is measured according to a 0-100 scale with 100 as the highest possible score.

³ According to Putnam (2000) bonding social capital creates benefits only for participants in a particular network, while bridging social capital also creates benefits for a broader group of people.

Table 1 shows variable definitions and basic descriptives for the 1998 cross-sectional survey and for the 1997-2002 panel.

Table 1 about here

In both data sets the proportion of respondents who consider their health to be very good or good is around 80 percent and somewhat higher in the cross-sectional data compared with the panel data. The cross-sectional data set is more detailed than the panel data set with regard to individual lifestyle information. From Table 1 we see that 62 percent of the respondents do light physical activity three hours or more per week, and 28 percent do a similar amount of hard physical training. The proportion of participants who consider themselves to have at least one close friend is 84 percent. About 80 percent have at least a high school education. The proportion living in a marriage or partnership is 67 percent in the cross-section and 53 percent in the panel data set. The main reason for the different proportions is that cohabitation is registered in the cross-sectional dataset only. Some 76 percent of participants voted in the previous local election, and 8 percent are members of a religious organization (for some in addition to being a member of the state church). Finally, 27 percent are members of a sports organization.

Table 2 about here

Table 2 shows descriptives for the continuous variables. The average of MH is 80.5, which is quite similar to what has been found internationally. We notice that the mean income in the panel dataset is considerably larger than the mean income in the cross-sectional survey. We

also see that the coefficient of variation (standard deviation/mean) of income is considerably larger in the cross-sectional dataset than in the panel dataset. The reason for these differences seems to be some negative incomes of huge absolute value in the cross-sectional survey.

Table 3 about here

The indicators of community social capital are described in Table 3 for two years. The figures are quite similar from one year to the next if fundraising is disregarded. These variables are merged with the survey data (cross-sectional and panel) according to the residential county of the respondent.

3. Estimation and results

The cross-sectional dataset contains two levels (individual and county), while the panel dataset contains three levels (time, individual, and county). Due to unobserved heterogeneity at the individual level, the error terms are likely to be correlated across years and the assumption of ordinary least squares of independent error terms is then not fulfilled. This argument also applies to the county level, since due to unobserved heterogeneity at the county level, error terms are likely to be correlated for individuals who live in the same county. Unobserved heterogeneity is adjusted for by estimating multilevel models using the program *gllamm* (Rabe-Hesketh and Skrondal, 2005) in Stata 9. In the program the hierarchical structure of data is modeled as random intercepts.

Since general health is measured by an ordinal scale with five points, we estimate an ordered probit model with the county as a second level. An ordered probit model is derived from a linear regression model for a latent continuous response variable y^*

$$y_i^* = \beta x_i + u_i$$

where u_i has a normal distribution. Observed ordinal responses are generated from the latent continuous response via a threshold model:

$$y_i = \begin{cases} 1 & \text{if } y_i^* \leq \kappa_1 \\ 2 & \text{if } \kappa_1 < y_i^* \leq \kappa_2 \\ 3 & \text{if } \kappa_2 < y_i^* \leq \kappa_3 \\ 4 & \text{if } \kappa_3 < y_i^* \leq \kappa_4 \end{cases}$$

where the κ_i are estimated and displayed in Tables 4 and 5.

The measure of mental health appears as a continuous variable between 0 and 100, and we estimate a linear regression model with county as a second level.

Since only the 1998 survey contains information of individual membership in organizations, this survey is analyzed separately.

Table 4 about here

Table 4 displays the results from the estimation of the models with cross-section data. In general, the analyses confirm previous studies showing that level of education is positively related to self-assessed general health, while the relation to mental health (MHI) is non-significant for the group with a university education. The level of income has a non-

significant association with health in general. One of the indicators used for individual social capital (having at least one close friend) is always positively associated with general health and mental health.

The associations between community social capital and health are somewhat mixed. The analysis distinguishes between individual and community social capital. We can see that being a member of a religious organization is not associated with better health in general, while religious activity in the community as a whole is associated with better general health. For mental health it seems to be the other way around. Hence for the general health, religious activity appears in this study as bridging social capital since it is associated with good health irrespective of whether a particular individual is active. This is contrary to membership in sports organizations, which is positively associated with general health for members, and negatively associated with the proportion of the population in the community being members. Hence, the result suggests that these organizations represent bonding social capital, in the sense that the benefit for their members has a negative externality to non-members in the community. For mental health the association with membership in sports organizations is insignificant at both the individual level and the community level. Voting participation at the community level is positively associated with general health, while mental health is associated with voting participation at the individual level.

The last line of Table 4 displays the estimated variance at the county level. We see that estimated variance is not significantly different from zero. This implies that we are not able to reject the null hypothesis of no clustering of individuals at the county level.

To study whether the association between community social capital and health depends on an individual's human capital, the analysis included interaction terms between community social capital and individual income and education. These were not found to be significant.

Causality could not be determined from the cross-sectional survey data. One can, for instance, easily argue that healthy people are more likely than unhealthy ones to belong to sports organizations, or that it might be easier for healthy people to have close friends. Selection problems should also be considered. For instance, people who are not religious may choose to move from counties with a high rate of church attendance.

To adjust for some of these potential problems we estimate a panel data model with a maximum of six years of observations (1997-2002) per individual. The dataset that we use contains information of self-assessed general health, but not of self-assessed mental health. This dataset is less rich with regard to individual social capital, which means that only indicators of community social capital can be included in the regressions. Since self-assessed health is measured along an ordinal scale, we estimate an ordered probit model with three levels: 21770 observations of 5055 individuals within 19 counties. This represents an average of 4.8 observations per individual. The model was first estimated with counties as fixed effects and then with counties as random effects. The results of the estimation are shown in Table 5.

Table 5 about here

Table 5 shows that the significance of the estimated coefficients is not much influenced by whether the county level is included as a fixed or a random effect. Years of education, level of

income, and being male are all positively related to self-assessed health. As expected, self-assessed health declines with age. Interestingly, we see that only one of the significant community social capital variables from the cross-sectional survey is statistically significant in the panel data analysis. While voting participation at the community level contributes positively to self-assessed health, church attendance does not have a significantly positive effect. The last part of Table 5 shows the results of the analyses when *%Vote* is replaced with *Fundraising*⁴. We see that *Fundraising* has a positive impact on self-assessed health without influencing much the estimated effects of other variables.

4. Concluding remarks

The purpose of this study is to explore associations between individual social capital, community social capital, and self-assessed health, as found in population surveys merged with community databases. One indicator of social capital—voting participation in local elections—was positively associated with self-assessed health in both cross-sectional and in the panel data studies. That voting participation is positively related to self-assessed health was also found by Islam et al. (2006) in their analysis of Swedish survey data. While they had at most three observations of each individual, the present study has a maximum of six observations per individual, thus strengthening confidence in the results. The found associations between community organizations and health were somewhat mixed. While we find that church attendance at the community-level has a positive effect in the cross-sectional survey, the effect is non-significant in the panel survey. Hence, the evidence is not quite convincing. This is contrary to several studies from the US, as for instance Brown et al. (2006). A reason might be that the church in the US probably has more of social functions

⁴ Due to correlation both variables could not be included simultaneously

compared with attending a church service in Norway. These possible cultural differences would be interesting to explore further.

We find that sports organizations have a negative effect on health in the cross-sectional survey and a non-significant effect in the panel study. This result indicates that sports organizations represent bonding social capital. Perhaps a lot of organized sport in the community makes those who do not attend feel worse than they otherwise would have done? An important follow-up to this study would be find out more about the factors that impact on whether organizations are characterized by bonding or bridging social capital.

What can we surmise from the apparent link between voting participation and self-assessed health? It seems likely that something additional to casting one's vote every fourth year is going on. Voting participation may be an indicator of concern for and involvement in the local community. More theoretical modeling and empirical in-depth analyses seem to be needed in order to draw useful policy implications.

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Table 1 Descriptive statistics – frequencies of values of discrete variables.

Variable	Definition		Percentage	
			Cross-section 1998 (# obs. = 3134)	Panel 1997-2002 (# obs. = 21770)
Health	Self-assessed general health	Very good	37	28
		Good	44	49
		Neither good nor bad	13	16
		Bad	5	6
		Very Bad	1	1
Lightphys	No. hours per week during leisure with light physical activity	Not active	9	
		Less than 1 hour per week	7	
		1-2 hours per week	22	
		3 hours or more per week	62	
Hardphys	No. hours per week during leisure time with hard physical activity	Not active	36	
		Less than 1 hour per week	14	
		1-2 hours per week	22	
		3 hours or more per week	28	
Close	Have at least one close friend		84	
Junior-high	Highest level of education is junior high- school		20	17
High-school	Highest level of education is high- school		54	55
University	University degree		26	28
Man	Male respondent		49	48
Married	Married or partnership		67	53
Vote	Voted at previous local election		76	
Religious	Member of religious organization		8	
Sport	Member of sports organization		27	
Sparsely	Live in a sparsely populated area		32	

Table 2. Descriptive statistics of continuous variables – mean (std dev)

Variable	Definition	Cross-section 1998 (# obs. = 3134)	Panel 1997-2002 (# obs. = 21770)
Age	Respondent's age	45.0 (17.8)	43.9 (16.8)
MH (No. obs. = 2616)	The mental health component of SF-36	80.5 (14.8)	
Income	Household after tax income in NOK ⁵	342,563 (1079183)	455,925 (290,010)

⁵ 1USD is approximately NOK 6.5

Table 3 Indicators of community social capital at the county level

Variable	Definition	Year	Mean (std dev)	Min	Max
%vote	Number of votes as percent of number entitled to vote in local elections	1995	60 (2)	56	64
		2003	58 (2)	55	62
#Church	Attendance at church services relative to no. inhabitants	1998	1.7 (0.4)	1.0	2.6
		2002	1.6 (0.4)	0.9	2.3
#Sport	Membership in sports organizations relative to no. inhabitants	1998	0.3 (0.05)	0.2	0.4
		2002	0.3 (0.05)	0.2	0.4
Fundraising	Fundraising in NOK per capita in national campaign	1998	40.5 (4.1)	31.8	48.4
		2000	34.8 (3.0)	30.0	43.7
		2002	5.3 (0.2)	4.7	5.6

Table 4 Associations between indicators of Self-assessed Health and individual and community level capital 1998.

	Self-assessed General Health: Ordered Probit model with two levels: 3134 individuals in 19 counties estimated with gllamm in STATA 9.		Self-assessed Mental Health (MH): Linear model with two levels: 2568 individuals in 19 counties estimated with gllamm in STATA 9.	
	Coef.	Std.dev.	Coef.	Std.dev.
Lightphys	0.124***	0.022	1.395***	0.329
Hardphys	0.141***	0.019	0.676**	0.257
Close	0.142**	0.056	1.735***	0.385
High-school	0.269***	0.054	1.824**	0.793
University	0.440***	0.068	0.692	0.902
Low income	-0.052	0.052	-0.362	0.730
High income	-0.005	0.054	-0.322	0.756
Highest income	-0.133*	0.068	0.388	0.943
Man	-0.024	0.041	2.689***	0.566
Age	-0.010***	0.001	0.093***	0.020
Married	0.038	0.044	3.431***	0.649
Religious	-0.015	0.074	2.223**	1.053
#Church	0.146***	0.054	0.459	0.754
Vote	0.101**	0.051	1.476**	0.732
%Vote	5.250***	1.112	13.296	15.600
Sport	0.116***	0.048	0.381	0.642
#Sport	-1.403**	0.564	-3.172	7.924
Constant			51.791	9.128
κ_1	0.816			
κ_2	1.706			
κ_3	2.470			
κ_4	3.801			
Random part				
Var county level	4.0 e-17	4.9 e-10	1.9 e-11	7.2 e-06

The symbols *, (**) and (***) mean that an effect is statistically significant at 10, (5) and ((1)) percent level.

Table 5 Associations between Self-assessed General Health and community social capital variables in the Norwegian Level of Living Conditions Panel 1997-2002. Ordered Probit model with three levels: 21770 observations of 5055 individuals in 19 counties.

	General health							
	County fixed effects				County random effects estimated with glamm in STATA 9.			
	Coef.	Std dev	Coef.	Std dev	Coef.	Std dev	Coef.	Std dev
High-school	0.205***	0.022	0.206***	0.022	0.374***	0.060	0.381***	0.060
University	0.431***	0.025	0.432***	0.025	0.782***	0.066	0.798***	0.066
Low income	0.124***	0.023	0.125***	0.023	0.097***	0.037	0.103***	0.037
High income	0.228***	0.025	0.230***	0.025	0.170***	0.041	0.176***	0.041
Highest income	0.371***	0.027	0.373***	0.027	0.271***	0.047	0.281***	0.047
Man	0.109***	0.015	0.108***	0.015	0.196***	0.043	0.196***	0.043
Age	-0.017***	0.001	-0.017***	0.001	-0.032**	0.001	-0.031***	0.001
Married	0.003	0.018	0.002	0.018	0.034	0.038	0.030	0.038
#Church	0.067	0.073	0.052	0.072	0.067	0.057	0.019	0.069
%vote	1.640***	0.521			3.330***	0.527		
Fundraising			0.011***	0.002			0.020***	0.003
#Sport	-0.057	0.456	-0.172	0.448	-0.040	0.419	-0.053	0.467
κ_1	-1.902		-2.565		-2.938		-4.238	
κ_2	-0.883		-1.545		-1.285		-2.580	
κ_3	-0.069		-0.731		0.082		-1.210	
κ_4	1.388		0.726		2.455		1.163	
Random part								
Var level 2					1.768	0.056	1.771	-0.056
Var level 3					0.006	0.005	0.028	-0.013

The symbols *, (**) and (***) mean that an effect is statistically significant at 10, (5) and ((1)) percent level.