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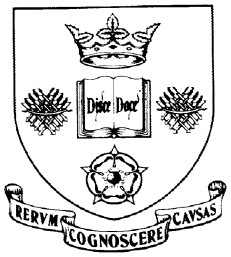

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Social Capital: Bridging the Theory and Empirical Divide

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Social capital:
Bridging the theory and empirical divide

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ABSTRACT
We explore the measurement of social capital in an attempt to bring the empirical work closer to the theoretical literature. Specifically we use the Survey of Health Aging and Retirement in Europe for 2004 and 2006 to construct a composite index of social capital, using principal component analysis. We explore the extent to which the underlying latent factors coincide with the theoretical components of social capital. Our results suggest that the proxy variables load on to four theoretical components. Both men and women have higher social capital in Nordic welfare regimes compared to those in Central or Southern Europe.

I. INTRODUCTION

Social capital is a rapidly expanding research theme within economics and more broadly across the social sciences[1]; it has also become a popular concept with policy makers in both developed and developing countries (World Bank, 2011; OECD, 2002). In his comprehensive review Woolcock (1998) defines social capital as " ... a broad term encompassing the norms and networks facilitating collective action for mutual benefit." (p.155). Despite, or perhaps as a result of, the considerable coverage given to social capital, there remains a large gap between the theoretical discussion of this concept and the empirical work that has explored various proxies for social capital both as inputs to and outputs from social and economic processes. In their critical review Durlauf and Fafchamps (2004) accuse social capital research of 'conceptual vagueness' and Durlauf (2002) has argued that in much empirical work the definitions of social capital are ambiguous and conflate a number of disparate ideas. The concept of social capital remains a controversial one and its use in understanding social and economic processes has been questioned; Arrow (1999) for example has suggested that the term 'social capital' be abandoned and Fine (2002) has called for wholesale rejection of the concept. However, despite the criticisms, Durlauf and Fafchamps (2004) are clear that social capital is still a key topic for social science research.

In this paper we strive to reduce the controversy that exists around social capital research by empirically exploring its measurement, with the aim of bringing the empirical work closer to the theoretical constructs. Our motivation is a belief that a closer match between theory and empirical measurement will improve the usefulness of social capital as a concept in both research and policy making. Specifically we use rich data from two waves of the Survey of Health Aging and Retirement in Europe (SHARE) to construct a composite index of social capital using principal component analysis (PCA); the data include more than 38,000 individuals across 15 countries. We explore the extent to which the underlying latent factors coincide with the components of social capital that have been identified in the theoretical

[1] A search of the SCOPUS database shows 94 papers with 'social capital' in the title from 1960 to 1990, and 5,497 from 1991 to July 2012.

literature. Further, we explore the main predictors of this social capital index (SCI) using a finite mixture model, which also accounts for different welfare regimes across Europe.

In many empirical applications the chosen definition of social capital is largely data driven and limited by the very narrow range of proxies that the chosen data set contains; for example Alesina and La Ferrara (2000) use only membership in voluntary organisations, from the US General Social Survey and Kan (2007) uses only a measure of whether or not people think there is someone living nearby that would help them in an emergency, from the US Panel Study of Income Dynamics. In contrast the SHARE data contains 22 possible proxies for social capital, including for example social participation, family contacts, volunteering, social support and experience of trust. Our guiding principle is that social capital is a multidimensional concept that cannot be adequately proxied by one measure and hence we draw on all of these variables to construct our new composite SCI. The SCI has a number of advantages for use in empirical work. Firstly, it contains a broad range of empirical proxies for the theoretical components of social capital, thus is a good reflection of the multidimensional concept. Secondly, these empirical proxies are explicitly linked to the theoretical constructs of social capital using PCA. Thirdly, the SCI allows us to measure the level of intensity of social capital rather than simply binary indicators for the presence of social capital proxies, which have been commonly used in existing work (see for example Smith, 2010; Sirven and Debrand, 2008).

In section II we consider the sociological and economic literature on social capital to provide a framework for our empirical work, and to identify the different components of social capital that have been discussed in this literature. Section III outlines the data and our empirical approach. The results are presented in section IV and discussed in section V. Finally section VI summarises our main findings and includes some concluding remarks.

II. THE CONCEPT OF SOCIAL CAPITAL

Social capital as a theoretical concept has emerged from within both economic and sociological traditions, providing two distinct but overlapping disciplinary perspectives. This dual approach may well have contributed to the 'conceptual vagueness' discussed above. We take this 'vagueness' as a given and attempt to summarise the two approaches in order to understand the different components of social capital that have been identified in the literature.

The sociological approach to social capital is reviewed by Portes (1998), who argues that the concept has been exported from sociological theory into everyday language, with an accompanying loss in precision and movement away from its original meaning. Social capital is a very old idea in sociology, and emerges naturally from a discipline that emphasises methodological collectivism and structure (as opposed to the individualism and agency of economics). Portes (1998) associates the first modern use of the term social capital to Bourdieu (1983) whose work suggests two distinct elements; firstly, social relationships themselves that give individuals access to the resources of other group members, and secondly, the amount and quality of those resources. Paxton (1999) also stresses two related, but slightly different, components of social capital; a 'quantitative' one that refers to the objective associations between individuals, and a 'qualitative' one that refers to the type of associations, which must be reciprocal and trusting. Chalupnicek (2010) has argued that a tension exists in sociology between social capital as an asset of an individual and the importance of its social context. Coleman (1990), for example, takes the former approach in his work on the role of social capital in the creation of human capital; whereas the latter approach is expounded by Putnam (2000) in his work on the decline of civic society in the US. Putnam (2000) stresses two different dimensions along which different forms of social capital can be compared: bonding (or exclusive), which is inward looking and reinforces strong ties among close and homogenous groups, such as those within families, and bridging (or inclusive), which is more outward looking and based on weaker ties between people from more diverse social groupings, such as groups of work colleagues or some religious movements. These dimensions are theoretically distinct but may not be empirically separable since many groups simultaneously fulfil a bonding and bridging function.

Sociological work has focused more on understanding social capital in a conceptual sense, rather than measuring it, indeed sociologists often point to the intangible nature of social capital (Coleman, 1990). However, there are exceptions to this and Putnam (2000) is a significant example, presenting as he does, a huge amount of empirical evidence for the US which he offers as measures of social capital; these include rates of joining voluntary associations, citizens' trust of one another and rates of voting. Putnam (2000) also creates an 'index of social capital' for each US state by averaging measures of fourteen separate social capital proxies (Putnam 2000: Ch 16). Also Paxton (1999) uses twelve variables from the US General Social Survey, which measure different aspects of individuals' trust in each other, their trust in institutions and the nature of their associations. In both cases these are simple aggregate indices with no attempt to give the index any theoretical basis.

The economic approach to social capital is critically reviewed by Durlauf and Fafchamps (2004) who identify three key ideas: (i) social capital generates positive externalities for members of a group; (ii) these externalities are achieved through shared trust, norms and values; (iii) shared trust, norms and values arise from informal forms of organisations based on social networks. However, they also point out that there appears to be some confusion in the literature as to whether all three of these ideas are necessary for social capital. Norms and trust, for example, could be based on formal institutions without social networks and Knack and Keefer (1997) have referred to this as social capital. These ideas have a long tradition in economics, for example Arrow (1972) shows how social connections can compensate for expensive formal structures in facilitating financial transitions, and Kreps et al (1982) show how increased interaction facilitates cooperation. Indeed Bruni and Sugden (2000) point out that, in his *Lectures on Jurisprudence,* Adam Smith (1763/1978) presents a theory of social capital that is quite similar to that of the modern theories of Granovetter (1985) and Putnam (1993). Smith argues that " … reputations for trustworthiness are transmitted through networks of trading relationships; the denser the network … the greater is the value of reputation and so … the greater is the degree of the trust." (Bruni

and Sugden, 2000: 33). The theoretical emphasis of the economic social capital literature is on trust, and in particular how trust can improve the efficiency of social exchange (see for example Bellamare and Kroger, 2004; Bowles and Gintis, 2002).

In terms of empirical measurement economic applications tend to use measures that proxy for the components of social capital classified in (ii) and (iii) above; this is largely because the externalities referred to in (i) are hard to measure. So measures of generalised trust such as that from the World Values Survey are used by, for example, Carlson (2004); measures of organisational membership from the British Household Panel Survey are used by Smith (2010); and measures of social interaction are used by Sirven and Debrand (2008; 2012). Some papers use individual proxies (see for example Bolin et al, 2003; Hofferth et al, 1999), which seems wholly inadequate in light of the theoretical understanding of social capital as a multidimensional concept. More commonly a selection of individual proxies are used (see for example DiPasquale and Glaeser, 1999; Huang et al, 2009; D'Hombres et al, 2010). Sometimes a number of proxy variables are combined to form an index of social capital (see for example Putnam, 2000: Ch 16; Owen and Videras, 2009). However, in these latter studies there is rarely any attempt to link these to the broader theoretical constructs. An exception to this is Sabatini (2008, 2009) who uses his own data set of around two hundred measures of four main social capital dimensions (strong family ties, weak informal ties, voluntary organisations, and political participation) to explore the relationship between bonding and bridging social capital and the quality of economic development in Italian regions.

Islam et al. (2006) have systematically reviewed the literature on social capital and their analysis extends the bonding and bridging dimensions of social capital described above to also include structural and cognitive components. Structural social capital refers to the density of social networks and patterns of civic engagement, and cognitive social capital involves people's perceptions of the level of interpersonal trust, sharing and reciprocity. We adopt this four-point classification of cognitive, structural, bridging

and bonding social capital in the empirical work that follows, because it is very much in line with the different forms of social capital identified in both the sociological and economic theoretical literature. For example bridging and bonding alone do not adequately reflect the need to distinguish between the quantity and quality of associations stressed by Paxton (1999), whereas distinguishing between cognitive and structural dimensions facilitates this. Further, the concept of cognitive social capital includes an emphasis on trust that is central to any economic theory of social capital, but is not adequately covered by bridging and bonding.

For our theoretical approach to modelling we follow the framework set out by Glaeser et al. (2002), where, for the individual, social capital accumulation is treated largely as a standard investment decision, similar to investment in physical and human capital. This model makes a number of predictions; for example, social capital rises and then declines with age, and expected mobility reduces social capital investment. Further, Bolin et al. (2003) propose that health improves with social capital investment, when the net marginal cost of health investment decreases with the level of social capital. We use data from 15 European countries so we also account for the effect of different welfare regimes on social capital accumulation. Esping-Andersen (1990; 1999) develops a typology of welfare regimes that are defined by the degree of commodification and familialisation of public services (Albertini et al, 2007). It is therefore reasonable to expect these regimes to have consequences for social capital accumulation. Albertini et al (2007), for example, have studied intergenerational transfers of time and money in different European countries and find important differences between the welfare regimes; we adopt their classification here, which recognises key differences in institutions and values across three groups of countries: Nordic, Central and Southern European.

III. DATA AND EMPIRICAL APPROACH

We use data from the 2004/5 and 2006/7 waves of the SHARE survey; a cross-national micro-database including more than 38,000 Europeans over the age of 50 years, in 15 countries. The data comprises rich information on health, socioeconomic characteristics, housing, and social support. SHARE has been used in a number of economic studies; for example Christelis et al (2010) investigate cognitive abilities and portfolio choice, and Kalwij and Vermeulen (2007) consider the health and labour force participation of older people. SHARE includes a large number of variables that can be used to proxy for the theoretical components of social capital. These variables are listed in Appendix Table A1 and summarised in Figure 1, which also links each proxy to the theoretical component that is most closely related to, in a theoretical sense. For example, bonding includes strong links within families, so the proxies which measure help within the household and family are included here; the various measures of social participation are related to structural social capital; bridging includes reaching out to build links between groups and religious affiliations are included there. Cognitive social capital includes perception and experience of trust, appreciation and conflicts.

We use all possible proxy variables for social capital from the SHARE data; there are 22 in total which cover: social participation in various organisations; giving help (outside and inside the family); giving financial gifts to friends and family; perception and experience of trust; experience of conflicts with friends and family; their perception of the appreciation they receive from their family; religious affiliation and participation in regular prayer. We construct a composite measure of social capital using PCA, a data reduction technique that aims to reduce a large set of variables into a smaller number of latent components. The essence of PCA is that the data are reduced into correlations from combinations of all variables and these patterns of correlations are assumed to be indicative of the underlying theory (Sabatini, 2008).

For a given set of *j* response variables, *x* (our proxies such as participation in voluntary work, or having close family ties) $x_1,\ldots,x_j$, the aim is to estimate a set of *k* latent components $z_1,\ldots,z_k$, that contain essentially the same information, so that $x \in z$. The latent components will account for the dependencies among the response variables in the sense that if they are held fixed, the observed variables would be independent (Jöreskog, 1979). This can be estimated as:

$$E(x_{ij} \mid z_1, z_2, \ldots z_k) = \lambda_{i1} z_1 + \lambda_{i2} z_2 + \ldots + \lambda_{ik} z_k \qquad (1)$$

Where λ_i is the loading on each of the *k* latent factors *z* for each individual *i*, constructed from *j* number of response variables, *x*. We obtain the correlation between each of the underlying variables,

$$\rho_{ij} = \sum_{l=1}^{k} \lambda_{il} \lambda_{jl} \qquad (2)$$

If a linear pattern is assumed, then the standard correlation method is that of Pearson correlations. However, this assumes that both the response variables and the latent components are normally distributed with zero means and unit variances. In our case many of our response variables are categorical, so we estimate polychoric correlations (Kolenikov and Angeles, 2009)[2]. A general rule of thumb is to retain factors with an eigenvalue greater than or close to 1 (Pugno and Verme, 2011). In general, the factor with the largest eigenvalue has the most variance. The eigenvalue measures the variance in all the variables which is accounted for by that factor. We select all 22 possible proxies for social capital components from the SHARE data, drawing on the existing literature to inform our choice. Our hypothesis is that these proxy variables will load onto a number of factors, and these factors will represent the theoretical components of social capital.

[2] Polychoric correlations estimate the correlation between continuous unobserved latent variables, using information from observed ordinal variables; this is done using the *polychoricpca* procedure in Stata v.12

Our new SCI for each individual, may therefore be represented by, $z_i = \sum \lambda_{in} z_n$ where n=1….to N, number of factors. For ease of interpretation the predicted index is re-scaled to a range between 0 and 1 as follows:

$$z_i^* = (z_i - Min(z_i))/(Max(z_i) - Min(z_i)) \qquad (3)$$

Where z^* represents the final scaled composite SCI.

To further explore the properties of our new SCI and consider its face validity, we estimate the main predictors of SCI using the model:

$$z_{it}^* = \propto + \beta X_{it} + \gamma_i + \varepsilon_{it} \qquad t=1,2 \qquad (4)$$

where t is for each wave (2004/5 and 2006/7), z represents the SCI, X includes a range of individual and household characteristics, γ are the unobserved individual effects and ε is the random error term.

Equation (4) could be estimated with a conventional ordinary least squares (OLS) model but if social capital is drawn from different sub-populations, e.g. people with low investment in social capital versus those with higher levels of investment in social capital, then a standard OLS model is not sufficient because it will simply provide the average across the whole population, not for each sub-group. Since most people participate in social activities to some extent, the variables used in previous analyses (e.g. Smith, 2010), which distinguish only between social participants and non-participants cannot provide rich evidence in terms of the characteristics of these different groups of individuals. A better distinction may be to look at high and low levels of social participation. Therefore, we estimate equation (4) using a finite mixture model (FMM), where we assume that all sub-populations are drawn from normal distributions. In the FMM the SCI variable is assumed to be drawn from a population of C distinct

classes, or sub-populations, in proportions π_j (otherwise known as mixing probabilities) and the density function for the C component finite mixture is predicted as:

$$f(y_i|x_i;\theta_1,\theta_2,\dots,\theta_C;\pi_1,\pi_2,\dots,\pi_C) = \sum_{j=1}^{C}\pi_j f_j(y_i|x_i;\theta_j) \quad (5)$$

where $0 < \pi_j < 1$ and $\sum_{j=1}^{C}\pi_j = 1$

Assuming a normal distribution for the different classes, the density function is given as:

$$f(y_i|\theta,\pi) = \sum_{j=1}^{C}\pi_j \frac{1}{\sqrt{2\pi\sigma_j^2}}\exp\left(-\frac{1}{2\sigma_j^2}(y_i - x_i\beta_j)^2\right) \quad (6)$$

The model is then estimated using maximum likelihood and provides a representation of heterogeneity for a small number of finite classes, where each mixture component provides a local approximation to some part of the true distribution[3].

The predicted posterior probabilities (mixing probabilities) that observation y_i belongs to class j, where j=1,2,..C is calculated as

$$\Pr[y_i \in class\ j] = \frac{\pi_j f_j(y_i \mid x_i,\theta_j)}{\sum_{j=1}^{C}\pi_j f_j(y_i \mid x_i,\theta_j)}$$ and the mean of the predicted finite distribution is calculated as

$$E(y_i \mid x_i) = \sum_{j=1}^{C}\pi_j\lambda_i .$$

[3] Quantile regressions could also be used in this context but even though these models can detect heterogeneous responses, they provide no way to characterize the source of the heterogeneity (Deb et al, 2011).

Model specification is evaluated via the Akaike and Bayesian information criteria (AIC and BIC respectively). We begin estimation with two classes and continue until the lowest AIC and BIC is achieved and/or where the model dictates a sensible convergence to the maximum. The advantage of this FMM approach is that it allows us to represent the heterogeneity in a small number of groups[4].

The dependent variable of the FMM is the new social capital index (SCI). Control variables include age, gender, marital status, household income, retirement status and health. Separate models are estimated for men and women because even though they have similar levels of social capital, there are likely to be different correlations with explanatory variables such as health or labour force status. We also estimate two specifications, with and without controls for welfare regimes, classified as Nordic, Central (the baseline category) and Southern European[5].

To further explore the face validity of our new SCI we also consider its relationship with a variety of health measures, since this has been a major preoccupation of the econometric literature on social capital (see for example: Bolin et al., 2003; Van Groezen et al., 2011; Sirven and Debrand, 2008, 2012; Kohli et al.; 2009; Petrou and Kupek, 2008). Here we consider simple bivariate regressions between SCI and five different measures of health: self-assessed health on a 5 point scale from very poor to excellent; a measure of daily health limitations measured as a binary variable if a person has limitations in daily activities; the Euro-D depression scale, a measure of depression with higher levels indicating more depressed (Prince et al., 1999); life satisfaction, measured on a scale of 0 to 10; the CASP measure of quality of life in older people (Hyde et al., 2003).

[4] The finite mixture models are estimated in Stata v.12 using the *fmm* procedure.
[5] The SHARE countries are classified as *Nordic*: Denmark, Sweden; *Central European*: Austria, France, Netherlands, Poland, Czech Republic, Ireland, Switzerland, Germany, Belgium; *Southern European*: Greece, Italy, Israel, Spain.

IV. RESULTS

1. Descriptive statistics and construction of the SCI

Descriptive statistics and definitions of all variables (proxy and constructed) are provided in Tables A1 and A2. The mean age of individuals in the sample is 65, with over half of men retired and about 40 per cent of females retired. The self-assessed health of individuals is scored at approximately 3 on the 1 to 5 scale. In general, all individuals have some level of social capital, as measured by our proxy variables. The final sample sizes are 22,449 and 26,582 for men and women, respectively.

Table 1 reports the results of the PCA. The first four factors identified have an eigenvalue greater than or close to 1; the fifth factor has an eigenvalue of 0.74, hence only the first four factors are retained. This suggests that there are four main factors onto which all 22 input variables load. The weights for each factor show that together they contribute around 90% of the total variance in SCI; and the relative weights show that, for example, factor 1 explains 42% of the total variance in SCI factor 2 28% and so on.

Table 1 here

The next step is to ascertain which proxy variables are associated with each factor and therefore to relate the factors to the theoretical constructs of social capital. We explore this by viewing the factor loadings (see Table 2); the weights and correlations between each variable and each of the factors. The higher the load, the more relevant the variable is to that factor. We highlight in bold the strongest factor loadings for each component. For example, in column [1], we show that for most of the cognitive proxy variables, the loadings are all positive and large in magnitude. Hence we could determine that factor 1 represents cognitive social capital. Moving on to column [2], it could also be said that factor 2 is determined mainly by structural social capital proxy variables. In a similar fashion, we determine that

factor 3 relates to bridging social capital and factor 4 comprises the variables that represent bonding social capital[6].

Table 2 here

These results show that the PCA has reduced the 22 proxy variables to four latent factors, and that these factors appear to coincide with the four theoretical constructs of social capital identified in the literature. Finally, we aggregate these four factors to produce the composite SCI. This predicted index ranges from 1.5219 to 19.4317, so for ease of interpretation, it is rescaled on a 0 to 1 scale as shown in equation (3). The density of the SCI suggests a mixed normal distribution, with potential for 2 or 3 components in the FMM that follows (Figure 2) [7].

2. Social capital and health

The relationship between our SCI and health is explored via simple bivariate regressions and these results are reported in Table 3. The general findings are that there is a significant association between a range of health measures and SCI, suggesting that better health is associated with higher levels of social capital. For both men and women, SCI is positively correlated with the broad measure of self-assessed health, physical health measured by daily limitations, and general well-being measured by life satisfaction. Furthermore, the SCI correlates positively with quality of life measured by CASP, and SCI is negatively associated with depression. The associations between health and social capital are in the same direction for men and women, but all correlations between social capital and health are slightly larger for men.

Table 3 here

[6] We also explored the use of contact with children (daily, often, weekly, continuous, 2-4 weeks, monthly, no contact; contact with parents (daily, weekly, 2-4 weeks, monthly, no contact); giving a financial gift (relative, friend, colleague, neighbour), but these variables proved highly collinear with each other and hence were dropped from the analysis.

[7] As a robustness check we also performed 4 separate analyses for each of the four theoretical constructs, structural, cognitive, bonding and bridging and we find similar results. That is, in each of the four analyses, we obtained one factor (z), and when we aggregate the four different z latent factors, we obtain a distribution of SCI, similar to that found from our main model where we simply include all of the x variables.

3. Finite Mixture Model Estimation Results

We estimate equation (4) as a FMM for males and females separately. In both cases the preferred specification is the two class model, suggesting two sub-populations[8]. The results are presented in Table 4. Two models are shown for both men and women; model (i) includes no controls for different welfare regimes, whereas in model (ii) these controls are included.

For females in model (i), the two latent classes have mixing proportions of 0.15 and 0.85. This suggests that the probability that a person is of this type (in this class) is 15% vs. 85%. The average level of social capital intensity is 0.3362 for class 1 compared to 0.4084 for class 2, indicating that individuals in class 2 have higher levels of social capital overall. For class 1 individuals, older women have lower social capital levels, and women with better self-assessed health have higher social capital. Marital status, retirement status and income are not associated with SCI. For class 2 older age is associated with higher levels of social capital, health has a stronger positive relationship with social capital, women who are married have lower social capital and again retirement status and income are not significant. These results are very similar when we control for welfare regimes in model (ii). For both class 1 and class 2 the Nordic welfare regime is associated with higher levels of social capital, whereas for class 1 the Southern regime is associated with lower social capital and for class 2 it is associated with higher social capital.

Table 4 here

The results for men are also presented in Table 4. In model (i), two latent classes are identified with mixing proportions of 0.57 and 0.43. The average level of social capital intensity in class 1 is 0.3331 compared to 0.4455 for class 2. Hence while the relative amounts of social capital are similar for men and women in class 1 and 2, there are more men than women in the lower social capital class, so overall older men have less social capital than older women. Age is associated with higher social capital in both

[8] By observing the AIC and BIC, we could infer that the lower information criterion suggests the 3 class model is more appropriate; for example, in the 2 class model for females, the BIC is -42975.56 compared to -43,413.35 in the 3 class model. However, on inspection of the coefficient estimates, the 2 class model appears is most sensible. Relying solely on the information criteria tends to lead to over-parameterisation of the model (Deb et al, 2011; Heckman and Singer, 1984).

classes for men. Men who are married have lower levels of social capital in both classes. Health and retirement status are positively associated with social capital only for class 2. When welfare regime effects are taken into account the share in class 1 increases, the effects of age and retirement status are no longer significant, and income has a significant negative relationship with social capital for class 1. For class 1 those in Nordic regimes have significantly higher social capital.

V. DISCUSSION

The results of our FMMs consider the main predictors of our new index of social capital intensity and our results indicate similar relationships to those found in other literature, where a much narrower proxy for social capital usually employed. For example Bolin et al. (2003) found that overall older people and males had less social capital (defined as having a close friend outside the household). Sirven and Debrand (2012) also showed that people living with a spouse had less social capital (measured as social participation). Smith (2010) also reports similar results in that people in a couple having lower levels of social capital (perhaps because they neglect other wider relationships) and the retired have higher levels of social capital. She does not differentiate between men and women, but our results show that this may be significant for men only.

Our analysis of welfare regime effects suggests that people in Nordic regimes have higher levels of social capital overall, based our new composite index. There are few papers to compare these results with, but Abertini et al (2007) identify a North-South gradient in intergenerational family transfers with Nordic countries having more frequent exchange of time and money. Also Kohli et al. (2009) indicate that Northern Europeans are more likely to have higher levels of formal relations whereas Southern Europeans demonstrate higher levels of informal family relations. The authors propose that their results correspond to the basic geography of different welfare regimes but they emphasise that there is also the need to observe contextual differences in terms of the definition of social capital, e.g. there may be

country-specific traditions of associations. Sirven and Debrand (2008, 2012) find that people in Northern European countries (Sweden and Denmark) have higher levels of social capital, but this must be interpreted in the context of their definition, which is a simple dichotomous measure of involvement in social activities.

Both Durlauf and Fafchamps (2004) and Sobel (2002) stress that the empirical literature on social capital often confuses cause and effect; and many empirical applications with social capital as both an input and an output variable are characterised by endogeneity. Our work is not exempt from this issue, but we abstract from it here because the FMMs we estimate above are not causal models. We simple measure the association between our new index of social capital intensity and the main explanatory variables identified in the previous literature. The bivariate correlations with a number of health measures shown in Table 3 support the face validity of our new index, given the theoretical predictions concerning the relationship between social capital and health outlined by Bolin et al (2003).

VI. CONCLUSION

In this paper, we have developed a new index of social capital intensity, using PCA to reduce 22 proxy variables to four latent factors that coincide with four theoretical constructs for cognitive, structural bridging and bonding social capital. The new index has a number of advantages over existing work. The wide range of empirical proxies it is constructed from can adequately reflect a concept that is multidimensional. The empirical proxies and subsequent latent factors are explicitly linked to the theoretical constructs of social capital. Further the index allows us to measure the level of intensity of social capital rather than just simple binary indicators for the presence or absence of various social capital proxies. Our results therefore provide new evidence to bridge the gap between theoretical arguments and empirical applications.

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Table 1: Principal Component Analysis of all social capital proxy variables from SHARE

	Eigenvalue	Proportion of variance in SCI	Cumulative proportion of variance
Factor 1	5.1004	0.4189	0.4189
Factor 2	3.4121	0.2802	0.6991
Factor 3	1.4950	0.1228	0.8219
Factor 4	0.9844	0.0808	0.9027
Factor 5	0.7411	0.0609	0.9636

Notes: Factors with eigenvalues greater than, or close to, 1 are retained. Almost 90% of variance in SCI is explained by the first 4 factors.

Table 2: Factor loadings from Principal Components Analysis

Proxies for Social Capital	[1] Factor 1	[2] Factor 2	[3] Factor 3	[4] Factor 4
Cognitive				
Trust	-0.1164	0.0997	0.0514	-0.0987
Appreciation	-0.1695	0.7799	0.0259	0.0086
Conflict with parent	**0.8013**	0.085	0.172	-0.035
Conflict with parent-in-law	**0.7989**	0.1211	0.1721	0.0269
Conflict with partner	**0.8364**	0.1586	0.1928	0.0305
Conflict with child	**0.8448**	0.1665	0.1732	0.0422
Conflict with family	**0.8426**	0.1628	0.153	0.0376
Conflict with others	**0.863**	0.13	0.1868	0.0792
Structural				
Frequency of help to others	-0.1716	**0.6669**	-0.1406	0.311
Frequency of volunteering	-0.0962	**0.6376**	0.1453	-0.386
Frequency of caring	-0.1025	**0.5809**	-0.037	0.4297
Frequency of helping family/friends	-0.2479	**0.681**	-0.0486	0.0581
Frequency of training/education	-0.0922	**0.3947**	-0.0034	-0.2558
Frequency of club membership	-0.058	**0.3641**	-0.0333	-0.3058
Frequency of religious activity	-0.0784	**0.2529**	0.3911	-0.139
Frequency of political activity	-0.077	**0.3792**	0.0455	-0.3288
Help to Others	-0.1729	**0.6273**	-0.1142	0.1666
Giving financial gifts	-0.0949	**0.2709**	-0.0064	-0.0622
Bridging				
Having a religious affiliation	-0.6604	-0.0938	**0.6708**	0.0938
Praying frequently	-0.5413	-0.0997	**0.8017**	0.1415
Bonding				
Giving help to others in HH	-0.0146	0.0751	-0.0197	**0.4262**
Minding grandchildren	-0.0728	0.1894	0.0072	-0.0026

Note: Bold indicates strongest factor loading for each variable.

Table 3: Bivariate regressions between health and social capital

	SAH	Daily Limitations	Depression (Euro-D)	Life satisfaction	CASP	N
Male	0.0103**	-0.0093**	-0.0053**	0.0096**	0.0039**	22,449
	(0.0007)	(0.0016)	(0.0005)	(0.0007)	(0.0002)	
Female	0.0086**	-0.0079**	-0.0034**	0.0019**	0.0030**	26,589
	(0.0007)	(0.0016)	(0.0004)	(0.0006)	(0.0002)	

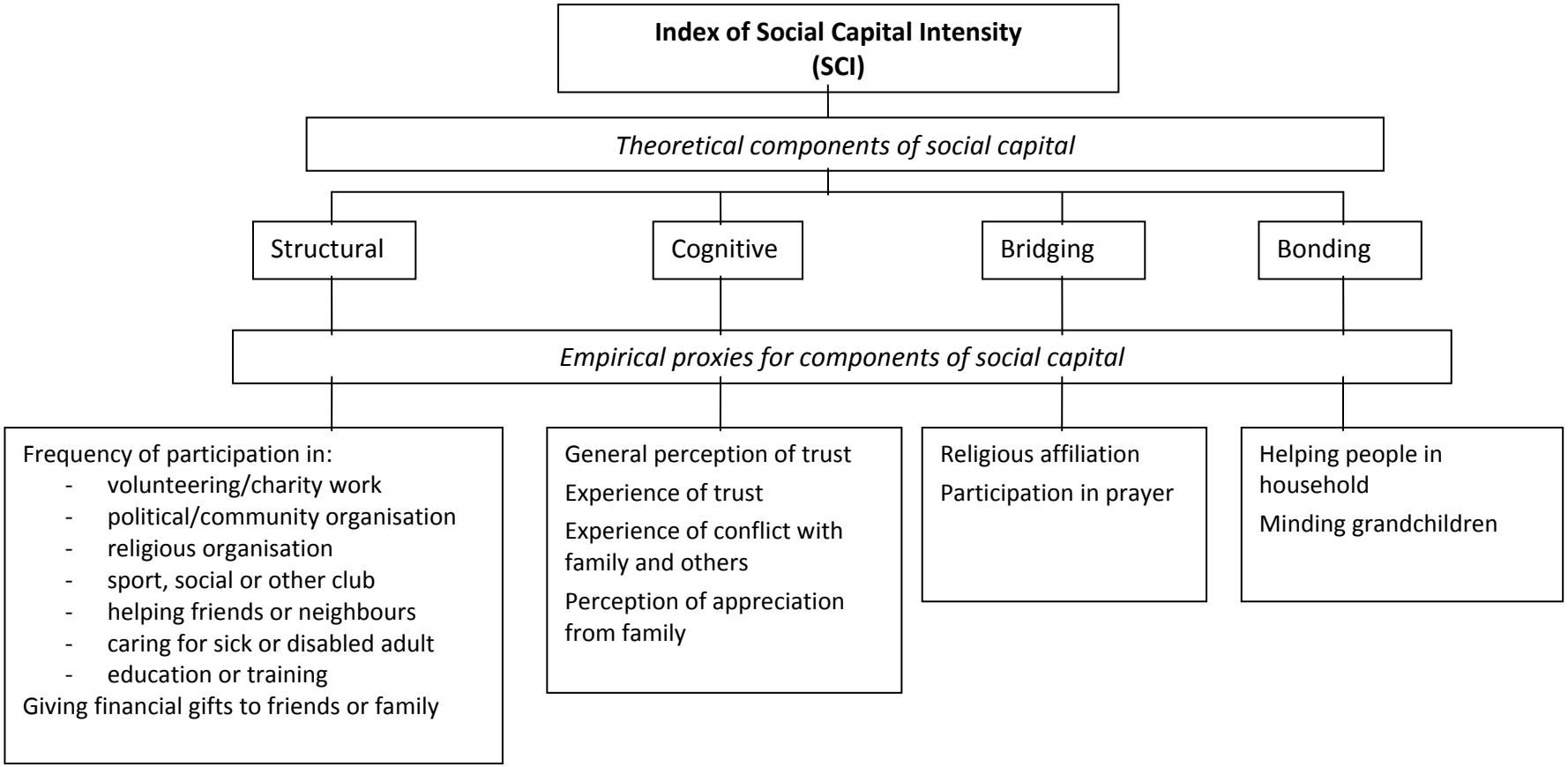
Notes: Models are estimated as bivariate OLS regressions, $SCI = a + bH + u$. Where SCI = social capital index, H = health measure, u = random error term. ** denotes significance at p=0.05.

Table 4: Finite Mixture Models. Dependent variable is social capital index (SCI).

	Females				Males			
	(i)		(ii)		(i)		(ii)	
	Class 1	Class 2	Class 1	Class 2	Class 1	Class 2	Class 1	Class 2
Age	-0.0000**	0.0017**	-0.0000**	0.0015**	0.0005**	0.0021**	0.0004	0.0021
	(0.0000)	(0.0003)	(0.0000)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0004)
Married	0.0000	-0.0203**	0.0000	-0.0217**	-0.0143**	-0.0205**	-0.0147**	-0.0201**
	(0.0001)	(0.0044)	(0.0001)	(0.0043)	(0.0069)	(0.0101)	(0.0044)	(0.0081)
Health	0.0004**	0.0110**	0.0003**	0.0111**	0.0066	0.0217**	0.0046*	0.0217**
	(0.0001)	(0.0049)	(0.0001)	(0.0042)	(0.0045)	(0.0075)	(0.0026)	(0.0056)
Retired	0.0002	-0.0101	-0.0001	-0.0046	0.0027	0.0083**	0.0057	0.0091
	(0.0001)	(0.0118)	(0.0001)	(0.0093)	(0.0034)	(0.0067)	(0.0031)	(0.0067)
Income	0.0000	-0.0017	0.0000	-0.0008	-0.0036*	0.0025	-0.0041**	0.0031
	(0.0000)	(0.0022)	(0.0000)	(0.0019)	(0.0019)	(0.0031)	(0.0012)	(0.0033)
Nordic	-	-	0.0021**	0.0316*	-	-	0.0493**	0.0002
			(0.0005)	(0.0196)			(0.0198)	(0.0248)
Southern	-	-	-0.0003*	0.0460*	-	-	0.0176	-0.0132
			(0.0002)	(0.0251)			(0.0221)	(0.0288)
Constant	0.3369**	0.3068**	0.3376**	0.2915**	0.2185**	0.2185**	0.3319**	0.2246**
	(0.0006)	(0.0396)	(0.0007)	(0.0360)	(0.0479)	(0.0478)	(0.0313)	(0.0413)
Π (mixing proportion)	0.1533**	0.8467**	0.1537**	0.8462**	0.5738**	0.4261**	0.6133**	0.3886**
	(0.0169)	(0.0169)	(0.0169)	(0.0169)	(0.2573)	(0.2573)	(0.1395)	(0.1395)
Mean SCI	-		0.3362	0.4084	-		0.3331	0.4455
N	26589		26589		22449		22449	

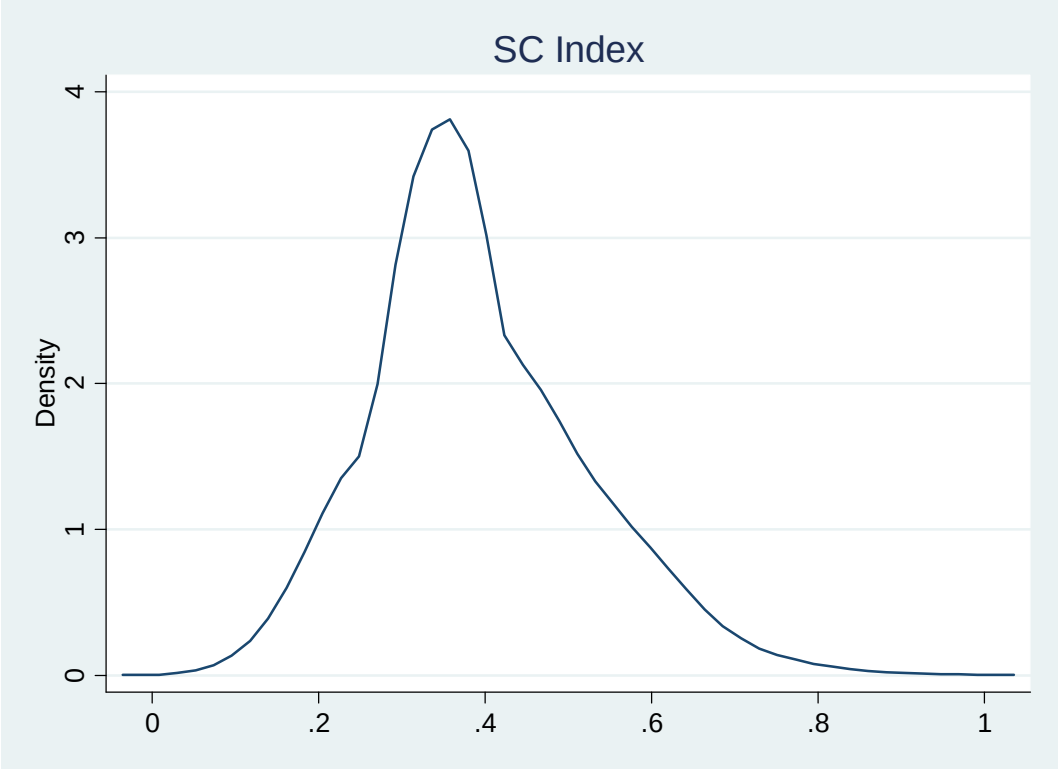
Notes: Models are estimated with robust standard errors and clustered on country level, relaxing the assumption that observations within countries are completely independent. Unobserved time invariant individual effects are also controlled for. ** denotes significance at p=0.05. * denotes significance at p=0.10.

Figure 1: Components of Social Capital



Source: Adapted from Islam et al. (2006)

Figure 2: Distribution of social capital index (SCI).



APPENDIX

Table A1: Definitions and Descriptive Statistics for Proxy and Constructed Variables

Proxies for Social Capital	Definition	Mean	
Structural:			
Frequency of participation in:		Male	Female
Caring for sick/disabled adult	In last 4 weeks: 0=never 1=less than weekly, 2= weekly, 3=daily	0.1303	0.1892
Sport, social or other club		0.4244	0.3486
Religious organisation		0.1799	0.2522
Helping friends or neighbours		0.3492	0.3543
Volunteering/charity work		0.2501	0.2146
Education or training		0.1038	0.1299
Political/community organisation		0.0907	0.0451
Help to others outside HH	In the last 12 months: = 1, = 0 otherwise	0.1230	0.1043
Frequency of help to anyone	=1 less often =4 daily	0.7211	0.8217
Giving financial gift	=1, =0 otherwise	0.2433	0.1865
Cognitive			
Trust	=1 low trust =5 high trust	2.4838	2.8088
Conflict with partner			
Conflict with parents		4.5327	4.5535
Conflict with parents in law	=1 often, =2 sometimes, =3 rarely,	4.0019	4.1283
Conflict with children	=4 never	4.0285	4.0780
Conflict with family		4.1716	4.1916
Conflict with others		4.0783	4.1834
Appreciated by others	=1 strongly disagree =4 strongly agree	1.3244	1.3155
Bonding			
Helping someone in HH	=1, =0 otherwise	0.0508	0.0620
Minding grandchildren	=1, =0 otherwise	0.2665	0.3332
Bridging			
Religion affiliation	=1 , = otherwise	0.3767	0.3957
Pray frequently	=1 never, =6 more than once a day	0.9753	1.3986
Constructed			
Cognitive		0.5982	0.6297
Structural		0.4658	0.4491
Bridging	Derived continuous index	0.2411	0.2087
Bonding		0.2745	0.3336

Table A2: Definitions and Descriptive Statistics for Variables in the Finite Mixture Models

	Definition	Mean	
		Male	Female
SC Index (Dependent Variable)	Derived from PCA (range 0-1)	0.3776	0.4034
Age	in years	64.9	64.9
Marital Status	1 if married/living with spouse, 0 otherwise	0.8464	0.6724
Household Income	log net household income (in euros)	10.37	10.31
Labour market status	1 if retired, =0 otherwise	0.5765	0.4369
Self Assessed Health	1 to 5, 5=excellent	3.056	2.933
Dummies for Welfare regimes:			
Nordic	1 if in that regime, 0 otherwise	0.1647	0.1555
Central		0.5131	0.5238
Southern		0.2759	0.2819

Notes: Nordic: Denmark, Sweden; Central: Austria, France, Netherlands, Switzerland, Portugal, Czech Republic, Ireland, Germany, Belgium; Southern: Greece, Italy, Spain, Israel.