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United in Diversity? An Empirical Investigation on Europe's Regional Social Capital

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United in Diversity? An Empirical Investigation on Europe's Regional Social Capital

Working Paper – No. 07

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05/2017

Abstract:

Aiming to explain the European divide with respect to social and political values, scholars in the past have relied on a simplified four- (or even two-) dimensional regime model which tranches the continent according to the social capacities of its inhabitants. This „cartography“ of „Social Europe“ proves to be outdated by the presented findings. In this work, we apply a factor analysis model to the most commonly used approximations of social capital on the European Social Survey. The analysis shows that three distinct dimensions of social capital measures are important in Europe: additionally to generalised social capital, which is usually approximated by generalised trust, there is one dimension of civic engagement and one of communitarian values. This distinction leads to a new social landscape of Europe, which highlights the relevance of considering regional and cross-border clusters in all relevant social capital dimensions. A hierarchical multi-level model that controls for individual and regional characteristics emphasises the importance of the spatial clustering in Europe with respect to social capital. In addition, we explore, as a novelty in social capital literature, a classification tree to model generalized trust. The results of the non-parametric model reveal that Protestantism and education are good benchmarks to classify trust on an individual level. Based on these findings we argue for the necessity of policies with a regional focus that take the different sub-national structures of social capacity in Europe into account.

Keywords:

classification trees, factor analysis, social capital, multi-level modeling

United in Diversity? An Empirical Investigation on Europe's Regional Social Capital

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Abstract

Aiming to explain the European divide with respect to social and political values, scholars in the past have relied on a simplified four- (or even two-) dimensional regime model which tranches the continent according to the social capacities of its inhabitants. This "cartography" of "Social Europe" proves to be outdated by the presented findings. In this work, we apply a factor analysis model to the most commonly used approximations of social capital on the European Social Survey. The analysis shows that three distinct dimensions of social capital measures are important in Europe: additionally to *generalised social capital*, which is usually approximated by generalised trust, there is one dimension of *civic engagement* and one of *communitarian values*. This distinction leads to a new social landscape of Europe, which highlights the relevance of considering regional and cross-border clusters in all relevant social capital dimensions. A hierarchical multi-level model that controls for individual and regional characteristics emphasizes the importance of the spatial clustering in Europe with respect to social capital. In addition, we explore, as a novelty in social capital literature, a classification tree to model generalized trust. The results of the non-parametric model reveal that Protestantism and education are good benchmarks to classify trust on an individual level. Based on these findings we argue for the necessity of policies with a regional focus that take the different sub-national structures of social capacity in Europe into account.

JEL classification: C 33, C 38, D 70, Z 13

Keywords: classification trees, factor analysis, social capital, multi-level modeling

1. Introduction

In 2016, the European Union stands divided. Never before, in its 65 years-old history, the Community had to face internal dissonance on as many issues as today. Most prominently, debates on the support for refugees, the economic shelter for member states in crisis, and the stagnant integration process, reveal the discrepancies between Europeans. The heated disputes have polarised and given rise to various anti-European movements in many member states. The virtues of the European citizen; solidarity, community and civicism, are in question. In explaining the European divide, scholars in the past have relied on a simplified four- (or even two-) dimensional

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regime model which tranches the continent according to the social capacities of its inhabitants.³ This "cartography" of "Social Europe" proves to be outdated by the presented findings. Our work creates a regional multifaceted topography of the European landscape of social values with two major novelties to the existing body of literature. First, in order to understand where the European divergence in social capacities originates, researchers have started to rely on the concept of social capital.⁴ However, in the past, the definition of social capital, its empirical measurement and its relation to civicism, are dominated by rotating theoretical and often highhanded assumptions. The presented work leaves theoretical arbitrariness aside and succeeds with a data-driven measurement of social capital using factor analysis and an ample selection of social indicators. Secondly, a regional perspective is imperative in a contextual analysis of Europe which is threatened by tendencies towards more political fragmentation; for instance shown by the pursuits for independence of Scotland and Catalonia. The geographical context of the presented work, unlike previous investigations, focuses therefore on sub-national levels. It examines the social capacities and opinions of 38,447 Europeans from 316 regions in 26 countries in a hierarchical three-level model on European Social Survey (ESS) data.

2. Literature Review

One of the most prominent concepts used to assess social capabilities of individuals and societies is that of social capital. Therefore, the same conceptualization is employed in this study to evaluate the differences in social capacity between European regions. However, while this contribution can be classified as part of the social capital research programme, it differs in two important points from many other articles published in this research branch: first, instead of developing empirical measurements based on one or the other theory of social capital, a strictly empirical approach defines the different dimensions of social capital in this work. In doing so, all measures that potentially indicate social capacities and that are part of the European Social Survey have been included in the empirical analysis.

Secondly, with respect to social capital in Europe, this work does not stick to the concept of *welfare regimes* (Esping-Andersen, 1990) which has been used to classify European regions into specific categories according to supposed differences in the structure of their social systems.

³For instance (Van Oorschot and Arts, 2005), (Van Oorschot et al., 2006) categorise Europe into four welfare regimes and (Kaasa and Parts, 2008) and (Parts, 2013) compare only Western to Eastern European countries.

⁴The concept was first introduced by (Bourdieu, 1986), (Coleman, 1988) and (Putnam, 1995). More on the different conceptualizations in section 2.

Instead, this study investigates differences of social capital in Europe on a sub-national, national and cross-national level. This more flexible approach allows to reveal cross-border clusters of social capital and center-periphery structures within countries that could not be detected with data aggregated on a national level.⁵ Based on these findings we argue for the necessity of policies with a regional focus that take the different sub-national structures of social capacity in Europe into account.

Besides this policy recommendation, a main reason for our study is to close the gap left open in the literature on social capital in Europe. While there exists more literature on empirical indicators of social capital than could be listed here, most of them stress only a few specific elements of the concept. The focus on some aspects of the multidimensional social capital construct, on the contrary, is due to the fuzzy definition of the concept which is itself a long-debated issue.

Beginning with the work by Pierre Bourdieu (Bourdieu, 1986), James Coleman (Coleman, 1988) and Robert Putnam (Putnam et al., 1993), (Putnam, 1995), social capital was built out of four blocks: social norms, networks, trust and civic engagement. However, the definitions used in these contributions were somewhat different to each other, so that they left room for interpretation, particularly with respect to the empirical measurement of social capital (Ackermann and Freitag, 2015). Accordingly, many subsequent studies define social capital based on one or the other of the above-mentioned works and do not include all aspects of the multidimensional concept. This has been of particular importance for early studies on the subject. As a result, some scholars identified social capital with only one indicator, most prominently *generalised trust*. Well-recognised examples for this are the articles by (Knack and Keefer, 1997) or (Glaeser et al., 2000).⁶

Others understood social capital as a multidimensional phenomenon that could not easily be captured by only one measure. This has lead to a discussion on the multidimensionality on a more theoretical basis: for example (Brehm and Rahn, 1997) define social capital as the interplay between interpersonal trust, civic engagement and confidence in government. (Lin, 1999) emphasises the interpersonal network component of social capital, while (La Due Lake and Huckfeldt, 1998, p. 567) consider it as a "by-product of the social interactions" and focus on its

⁵This is in accordance with the result that social capital is a regional phenomenon, see for instance (Beugelsdijk and Van Schaik, 2005) or (Pichler and Wallace, 2007).

⁶There are many more recent studies focusing on the socioeconomic role of trust, e. g. (Algan and Cahuc, 2010) or (Freitag and Bauer, 2013). However, in contrast to earlier contributions, these studies do not claim a specific relation between trust and social capital and avoid to use the term "social capital" in order to get around conceptual discussions.

role for political participation and (Adler and Kwon, 2002) describe social capital as a valuable resource of goodwill (sympathy, trust, forgiveness) offered to a person by others. As a consequence of these widespread interpretations, some scholars provide deep reflections on the commonalities and differences of the various definitions in order to identify the common roots of the concept, e. g. (Dasgupta and Serageldin, 2001) and (Fine, 2001).

However, these contributions could also not eventually decide on one single definition of social capital. As a consequence, some scholars started to criticise the very concept of social capital as being too fuzzy to use it in explaining socioeconomic phenomena, for instance (Durlauf, 1999), (Sobel, 2002), (Bowles, 1999) and (Paldam, 2000).

Independently of these conceptual criticisms, the number of articles that apply empirical social capital measures increased substantially in the meantime. Common to the many different contributions is their focus on the four main dimensions of social norms, trust, networks and civicism. These aspects have been investigated in different combinations in numerous empirical studies that try to capture the effect of social capital on some socioeconomic outcome: *inter alia* (Dakhli and De Clercq, 2004) investigate the effect of trust, civic activity and norms on innovation. (Edwards et al., 2015) analyse the effect of social capital (measured by civic engagement) on the social impact of voluntary organizations. (Schneider, 2009) examines the role of organizational social capital (measured by trust, norms and networks) in non-profit organizations. (Uslaner and Brown, 2005) highlight the relation between trust, civic engagement and economic inequality and (Gesthuizen et al., 2009) inspect the link between social capital (trust, participation in voluntary organizations, social interaction) and ethnic fragmentation.

The trend to investigate the socioeconomic effect of some part of the multidimensional social capital concept continues also in more recent studies with respect to online-social capital: examples are (Williams, 2006), (Valenzuela et al., 2009), (Mandarano et al., 2010), (Gil de Zúñiga et al., 2012) and (Ellison et al., 2014).

Another related branch of social capital research considers the "dark side of social capital" which means the negative outcomes of specific forms of particularised trust, and small homogeneous networks (van Deth and Zmerli, 2010). This is often related to differences in Europe: for instance (Pichler and Wallace, 2007) consider the structures of formal and informal social capital and (Paldam and Svendsen, 2000) emphasise missing social capital in Post-communist countries.

As mentioned above, it is common to all these contributions that they refer to some specific theoretical presumption of what social capital is and how it could be measured empirically. This

approach, however, leaves those aspects of social capacity aside which do not fit to the specific definition. Accordingly, social capital in this kind of studies is often approximated by only very few measurements and their relation to each other is justified on a theoretical basis. As a consequence of this theory-based restriction of empirical indicators, interrelations between various measurements that could allow to reveal the very multidimensional character of social capital are, thus, significantly limited if not ruled out.

Therefore, some scholars started to incorporate methods of statistical clustering, in particular factor analysis, to empirically assess the interrelation of the various indicators. Examples for those studies with a focus on Europe are (Kaasa and Parts, 2008) and (Parts, 2013) on the differences between Eastern and Western European countries, (Franzen and Pointner, 2007) and (Freitag and Traunmüller, 2008) on sub-national social capital differences in Germany and Switzerland and (Freitag and Kirchner, 2011), (Van Oorschot and Arts, 2005), (Van Oorschot et al., 2006) on the empirical measurement of social capital in Europe.

Only the latter group of researchers attempts to capture the empirical relation between different social capital indicators. However, even if the factor analysis makes it possible to assess the relation between the indicators, the pre-selection of variables that serve as indicators determines the results. Accordingly, some of the studies that apply factor analysis are still mainly driven by theoretically driven classification of social capital indicators. For example (Parts, 2013) and (Kaasa and Parts, 2008) use only very few variables that are presumed to capture the different social capital dimensions and ex-post check the association between them by a factor analysis. Similarly (Freitag and Kirchner, 2011) construct a social capital indicator building on a factor analysis including only four variables.

The studies (Van Oorschot and Arts, 2005) and (Van Oorschot et al., 2006) include many more variables in the factor analysis and thus attempt to empirically assess the different social capital dimensions in Europe. However, while they concentrate on cross-national differences of social capital, they miss to account for regional disparities and do not consequently apply the data driven approach of measuring the social capital dimensions. Rather than composing social capital indicators out of the many different variables the authors take into account, they use the factor analysis only as a confirmation for the variable selection that has been done a priori.

Closer to our approach is the study by (Onyx and Bullen, 2000). The authors investigate local disparities in social capital with a questionnaire containing 68 potential social capital indicators of 1,200 individuals in five Australian communities. The factor analysis applied identifies 36 variables

of the all potential indicators grouped into eight factors as important in explaining the overall variation. From these factors, which are mainly related social activities and interpersonal networks, one general social capital factor is derived. The results of the factor analysis are compared in the subsets of the five communities where the questionnaires were collected. Differences in the responses between rural and metropolitan regions lead the authors to the conclusion that the distinction between bonding and bridging social capital needs to be emphasised.

Our study combines the different approaches made by the contributions mentioned so far. Following (Onyx and Bullen, 2000), we hypothesise that there is a conceptual relation between numerous different social capital measures that can be revealed by empirical clustering. In this interpretation, social capital is a multifaceted phenomenon with different indicators linked to each other but not being the same.

Besides that, continuing the work done by Van Oorshort, Freitag and others, we use the social capital factors to illustrate the social topography of Europe. However, in contrast to studies that stick to a national or simplified cross-national perspective, we assert that social capital is a regional phenomenon with clusters on regional, national and cross-national level in Europe. Recognizing this small-scale structure of social capital could be a key of designing better policies that acknowledge the different social capabilities in the European regions and thus lead to more acceptance.

3. Data and Methods

Our analysis is based on data from the 6th (2012) and 7th (2014) wave of the European Social Survey. This multi-country survey consists of data of more than 54,000 individuals from 34 countries. It contains more than 620 variables for all these individuals. Besides many demographic and economic variables, there are also many questions included in the survey that assess social and political values, so that the data fits very well to collect many different social capital indicators. In order to include as many variables and observations as possible, we decide to merge the 6th and the 7th wave of the ESS.⁷ While we try to include all variables that are potentially relevant for the social capacities of Europeans, it turns out that the variable selection entails an important trade-off. In order to provide the most relevant data, the inclusion of the current wave of the ESS appears promising. However, while there are a couple of important survey questions asked

⁷Additionally, we perform the analysis separately for both waves which does not affect the results significantly. This is also true for different variable-country combinations for which we conducted the factor analysis as a robustness check.

only in wave seven, the data has been available only for very few European countries at the time of conducting the analysis. Therefore we decide to join the data with the 2012 edition of the ESS which leads to significantly more observations. Additionally we further have to restrict the number of variables in order to not lose too many relevant European regions, since not every survey question has been asked in all countries. Finally we end up with a data set consisting of 38,447 individuals in 316 regions of 26 European countries.

TABLE 1 ABOUT HERE

In sum, we can identify 26 variables that are potential indicators of social capital. These are displayed in table 1.⁸ Note that we do not pre-classified the variables; the four categorical variable-labels (p, c, g and n) are already the result of the empirical clustering. Some of the variables describe certain actions done by individuals (e.g. the question whether one worked for some kind of organization or association in the last 12 months), others are more closely related to interpersonal networks (e.g. the question whether one meets often with colleagues or friends), a third category is about social values (like the question whether it is important for an individual to understand different people) and a fourth type of questions is about trust. Thus, the different questions capture all categories of social capital that are discussed in the literature.

Factor Analysis

The method of empirical clustering applied in this study is a factor analysis, as outlined in section 2, a frequently used approach in the context of social capital. This is a method used to explain the variability among a set of potentially correlated variables with the expression of a smaller number of measures, called factors. In our example, it can be assumed that the variations of the various measures of social capital mainly reflect the variation of some or even only one unobserved variable. What factor analysis does is that it looks for joint variations in response to unobserved latent variables, while the potential factors are modelled as linear combinations of the observed measures.⁹

Each observable variable contributes to the linear combination with a weight, the so called *factor loading*. The interdependencies of observed variables can be used to reduce the set of

⁸All figures and tables can be found in the appendix starting on page 24.

⁹There are a couple of different methods used in factor analysis. Maximum-likelihood-estimators have been established as main methods to determine the factors after development of stable algorithms by Karl Gustav J  reskog and others.

measures to a couple of even only one common factor. Technically, a factor analysis is similar to a low-rank approximation of the matrix of observable variables.

FIGURES 1 AND 3 ABOUT HERE

In a first step, several possible factors, with different factor loadings, are compared by their eigenvalue. The *Kaiser criterion* in factor analysis recommends to use only factors with an eigenvalue of higher than one. The eigenvalues of the initial set of factors suggested in our example are displayed in a so called *screeplot*, see figure 1. Accordingly, three factors are taken into consideration. The high eigenvalue of factor one already exhibits that this factor, as a linear combination of the underlying measures, explains to a large extent the overall variation of the social capital measures.

FIGURE 2 ABOUT HERE

In a second step, in order to distribute the factor loadings of each variable more distinctively among the three factors and thereby identify each variable more precisely with one factor, a *varimax rotation* method is applied. This method is an orthogonal rotation of the factor axes, in order to maximise the variance of the squared loadings of a factor on all variables in a factor matrix (Russell, 2002). Each factor will either show small or large loadings with one variable. Figure 2 explains the procedure in a simplified way. The results of the factor analysis are presented in section 4.

Multi-Level Analysis

In order to investigate the individual and regional characteristics that are the important determinants of the three social capital factors, we apply multiple three-level hierarchical linear models (HLM) with the three factors as dependent variables and individual and regional covariates as independent variables. This approach is imperative, since the data is nested with respect to three levels: the questionnaire is based on individual level data, but the social capital theory outlined in the literature review suggests that regional and cross-national characteristics play also an important role for the level of individual social capital. The inclusion of regional and cross-national characteristics implies the application of multi-level model. Therefore, the HLM applied consists of an individual, a regional and a cross-national level.

This way of modeling allows for different slopes and intercepts of the individuals in the regression equation and thus corrects for errors that could occur if the higher-level clustering of

the individuals was ignored. Thus, we avoid biased results that could occur if we were to apply a simple multiple regression, as it is occasionally done in the social capital literature.¹⁰ In the model presented in this study we incorporate the same individual covariates as for example (Van Oorschot et al., 2006), but with the introduction of regional characteristics (GDP per capita and share of people without paid work) and the application of an HLM we extend the literature also from a methodological point of view.

¹⁰For more information about multi-level modeling see for instance (Woltman et al., 2012) or (Buxton, 2008).

4. Results

Empirical Relation between the Social Capital Indicators

The factor analysis illustrated in figure 1 and 3 shows that there are three latent factors which capture most of the variation of the 26 social capital indicators that are part of the ESS. Interestingly, the variables with the highest weight for the distinct factors have high conceptual similarities. While the variables that are highly weighted with respect to factor 1 involve questions about civic participation and political engagement (e.g. "Involved in work for voluntary or charitable organizations in the last 12 months"), the variables that determine factor 2 are very closely related to each other and refer to statements about the society in general (e.g. "Generally speaking, most people can be trusted") and the variables with the highest loading on factor 3 are entirely related to the local community (e.g. "People in the local area help one another").

Due to these conceptual commonalities between the three factors we label them according to those social capital dimensions they represent most closely. Since factor 1 is mainly about civic participation, it can be labeled *civic social capital* or *civicism*. Factor 2 involves variables with a general focus and can therefore be marked as *generalised social capital*. And since factor 3 consists essentially of variables about the local community, the term *communitarian social capital* best describes this factor.

TABLE 2 ABOUT HERE

The extent to which the factors are related to each other can easily be assessed with a look on the correlations between them, displayed in table 2. There is a positive correlation between factor 1 (civicism) and factor 2 (generalised social capital) and a negative correlation between factor 2 and factor 3 (communitarian social capital). The correlation between civicism and communitarian social capital is not significant. What does this tell us? First, people with a higher level of generalised social capital tend to be more engaged in the society. Secondly, those with a stronger focus on their local community tend to have a lower level of generalised social capital. Thirdly, the extend to which someone is politically or civically engaged does not necessarily depend the level of communitarian social capital.

While the three factors together capture much of the overall variation of all the variables, each single variable measures only a specific dimension of social capital. That means it is not appropriate to select one or the other variable arbitrarily to construct a common social capital indicator, but such a selection should be done carefully with respect to the aspect of social capital one wants to

approximate with the chosen variable. We illustrate this with factor 2 as an example: the three variables with the highest loading on factor 2 are plotted so closely within the 3D-scatterplot that it is hard to distinguish them. That means that they capture more or less the same information - all three variable have a very high loading on factor 2 and very low weight on the other two factors. This is different for the variables of factor 3. There is much more variation within this group of variables; for example c1 ("Feel people in local area help one another") is similar to other questions within the cluster but shows also some loading on factor 2. In contrast, the variables with a high loading on factor 1 are relatively closer related to each other than to the other factors.

Furthermore, other variables take only a relatively low weight with respect to all three factors. This indicates that these variables do not explain much of the overall variation. This is particularly interesting, since some of these variables have been used in the social capital literature to capture certain dimensions of social capital. For example (Freitag and Kirchner, 2011) use the questions "How often do you meet socially with friends, relatives or work colleagues?" (ESS-code: sclmeet) and "Compared to other people of your age, how often would you say you take part in social activities?" (ESS-code: sclact) as two out of four main determining variables of a common social capital indicator. The other two components of social capital used in that study - "Have you been involved in the work for voluntary or charitable organizations in the last 12 months?" (ESS-code: wkvlog) and "How often do you actively provide help for other people?" - could be associated to the dimension of social capital that is captured by factor 1 in the study presented here. This comparison implies, that the common social capital factor constructed in the (Freitag and Kirchner, 2011) article captures only one particular dimension of social capital, while it ignores other important aspects of the concept.

Hence, the presented data driven approach applied is advantageous, since it reveals the actual empirical relation between all accessible social capital indicators. In doing so, it includes all available information about the social capacities of the individuals and is interestingly very closely related to the different dimensions of social capital that have been defined on a theoretical basis in earlier contributions.

The Social Topography of Europe

The most interesting feature of the data driven clustering becomes apparent, when regional differences of the factors are considered.

FIGURE 4 ABOUT HERE

Figure 4 displays the average values of the three factor for the 316 European regions that are part of the data set. For illustration, for each country a characteristic region is labeled with country code and the data points are colored according to the geographic cluster the countries belong to, respectively the welfare regime, see (Van Oorschot and Arts, 2005). Interestingly, there is a significant variation with respect to all three factors. This is particularly remarkable, since the factor analysis has been solely performed with individual-level data of the social actions and values, without considering any geographic information of the individuals. This result supports the assertion made in the previous section that inferential models used to explain social capital in Europe necessarily have to consider the multi-level grouping of individuals into regions and country-clusters.

Whereas the figure shows that there is much within-cluster variation in all four country-clusters, there are obviously significant differences between the clusters. The largest differences exist with respect to generalised social capital. The regions of the northern European countries form a particular cluster that is totally distinct from eastern European regions. The western and southern European regions show moderate levels of generalised social capital but exhibit much variation. A similar pattern can be observed for the factor civic social capital. However, when considering communitarian social capital, the situation changes significantly: Eastern European regions have the highest levels of communitarian social capital with a huge within-cluster variation and the other European regions exhibit on average only moderate levels of communitarian social capital.

FIGURE 5 ABOUT HERE

Obviously there are tremendous differences not only with respect to the different dimensions of social capital on an individual level, but also with respect to different aggregates on regional, national and cross-national level. To highlight the extent of geographical variation, boxplots for all 26 countries are displayed in figure 5.

TABLE 3 ABOUT HERE

In figure 5 the three factors are considered separately. Each boxplot represents a country ordered by cross-country cluster and the units of observation are the regional average values for each factor in all the 316 regions. The comparison between the cross-country clusters and the countries on the one hand and that between the different factors within one country on the other hand reveal the large differences with respect to the level of social capital and its variation.¹¹ To

¹¹Since some countries, like cyprus, consist only of very few or even only one factor, the variation of these countries

facilitate the interpretation of the information captured in figure 5, consider table 3 which provides some examples for the different levels of regional clustering.

As mentioned in the introduction, the geographic variation of the social capital factors suggests that a simplified two- or four-dimensional cartography is not appropriate to describe the social capacities in Europe. Instead, table 3 provides illustrative examples for different dimensions of social capital in Europe. To describe the geographical dimension, at least three different level seem to be appropriate. First, there are some cross-national regions with very similar levels of a particular social capital factor that allow to group them into a cross-national cluster or regimes. Examples for this are the Eastern European countries for civicism and the Northern European countries for general and communitarian social capital. In all three cases the within-cluster variation (the horizontal difference between the region with the lowest value for the respective factor and that with the highest value) is relatively low. Compare for instance the closeness with respect to civic social capital of the Eastern European regions: the difference between the region with the lowest value (-0.65 Udena in Lithuania) and the region with the highest value in this cluster (0.04 Durrës in Albania) is only 0.69 - much smaller than the variation of the same factor in the other regions. The same is true for the northern European regions with respect to the other two factors.¹²

Secondly, some countries show such small within-country variation that they could be considered as consistent entity in a particular social capital dimension, but not in other dimensions. A good example for this is Belgium: while the within-country variation of factor 1 and factor 3 is very small there is much variation with respect to factor 2.¹³

Thirdly, there are some countries with such a high level of within-country variation on specific factors that a regional perspective on its social capacities appears more appropriate than considering the country as a single social entity. Examples are Italy for all three factors, Sweden on factor 1 and Bulgaria on factor 2 and 3.¹⁴

FIGURES 6 to 8 ABOUT HERE

The maps displayed in figure 6 to 8 illustrate the differences in Europe more clearly. Similarly

is very small.

¹²The difference between the lowest value region of factor 2 in Northern Europe (Skåne County in Sweden with 0.33) and the highest (Midtjylland in Denmark with 0.81) is only 0.48. With respect to factor 3 the difference in the northern regions sums up to only 0.55 (Finnish Ostrobothnia with -0.37 compared to Danish Nordjylland with 0.18).

¹³The difference between the lowest and the highest value on factor 1 sums up to 0.31 while it is 0.67 on factor 2 and 0.28 on factor 3.

¹⁴Differences in Italy: 0.78 on factor 1, 1.19 on factor 2 and 0.74 on factor 3; Sweden: 0.69 on factor 1; Bulgaria: 0.79 on factor 2 and 1.23 on factor 3.

to results provided in other studies about trust or social capital we observe a north-south and a west-east divide in Europe. However, this is only the case for civic and general social capital, but not for communitarian social capital. Additionally, the regional perspective allows to identify within-country variations and cross-country clusters. For instance, consider figure 7: without knowing which regions belongs to which country it would be hard to distinguish Sweden from Norway or the central-eastern European countries Poland, Czech Republic, Slovakia and Hungary based on the average level of general social capital. At this place it is worth mentioning again that the substantial geographic differences of the social capacities in Europe presented in these figures are the result of an empirical clustering based solely on individual-level data. Thus, the differences can be interpreted as the result of inherent traits of the regions, countries and cross-national clusters that need to be considered and understood when European policies should be implemented successfully.

A First Step to Explain the Social Divide in Europe

While the main focus of this paper is to introduce a truly empirical approach to measure the social capacities in Europe and thus provide descriptive results on the divide in social values, actions and attitudes, this section undertakes a first step in explaining the observed differences by providing inferential hierarchical multi-level models on the ESS-data.

TABLE 4 ABOUT HERE

Table 4 summarises the results of the three models separated by social capital dimension. These models build on the studies (Van Oorschot and Arts, 2005) and (Van Oorschot et al., 2006) that try to explain different social capital dimensions by individual, national and cross-national characteristics. In particular, the same individual covariates are included: age, gender, education, employment status, religion and political stance. As mentioned in the methodology section of this study, the models presented here are multi-level models that allow for different intercepts and slopes of the individuals who belong to different groups (i.e. regions and cross-country clusters). As a consequence, these models capture the hierarchical grouping of the individuals and thus provide unbiased estimates for the effect of the individual-level determinants of social capital. Additionally and in contrast to earlier contributions, the models assess the quantitative effect of regional characteristics (measured by regional GDP and the percentage of the regional population without paid work) and the cross-national regime (indicated by dummy variables).¹⁵

¹⁵Note that, to increase readability, only the significant results are displayed in table 4.

Some of the individual characteristics effect all social capital dimensions similarly. For example, unemployed or sick individuals tend to have lower values on social capital, while the membership in the Protestant church can be associated with higher levels of social capital. In contrast, many of the individual characteristics affect the three social capital dimensions differently, which makes it possible to describe the factors more precisely in relation to the demographic variables. Recall that factor 1 clusters those variables that can be associated with civic participation, while factor 2 mainly reflects trust in the society and factor 3 is related to the local community or traditions.

Against this background, most of the individual covariates have an intuitive effect on the different social capital dimensions. Higher civic social capital is positively correlated with age, higher education, student status and membership in a Protestant church. In contrast, people who do not actively take part in the society (i.e. retired, sick or people responsible for housework) or those with a rather conservative political stance have on average a lower level of civic social capital.

Similarly, generalised social capital is positively associated with education and student status and, different to factor 1, also by a rather right political stance. In contrast, communitarian social capital is driven positively by religion and a more conservative world view, while education is not important. This result is in accordance with the interpretation of communitarian social capital as those values that are more oriented on traditions and rather independent of education.

Interestingly, the cross-country dummies are not significant for factor 3, while they are highly significant for the other two factors. This result confirms the descriptive observations made earlier about the social topography of Europe. In addition, note that the regional covariates are also only partially important in the models.

5. Classification Techniques in Social Capital Research

This section complements the previous investigation with a non-parametric approach. This shall serve as an example of the application of non-parametric statistics not only to social capital research, but likewise to many other fields in empirical social science. More and more, non-parametric statistical techniques from data science and machine learning are starting to find application in social science. In most cases, classification techniques are tested as an alternative approach to frequentest statistical estimations. One of the most commonly considered classification techniques are Classification and Regression Trees (CART). While CART is an umbrella term for two types of decision trees, the distinction between classification trees and regression trees is made

on the basis of the nature of the predicted outcome. Classification trees predict an outcome, which can be put in a specific class, e.g., male/female or survived/died, while regression trees consider numbers with a real meaning as an outcome, such as house prices or number of children.

About CARTs

For this example, we present a single binary target feature, called the classification and several input features with discrete domains. Each element of the domain of the classification is called a class. In a classification tree each internal (non-leaf) node is labeled with an input feature. The arcs of each node marked with an input feature are either labeled with one of the possible values of the target feature or otherwise the arc leads to a subordinate decision node on a different input feature. Each leaf of the tree is labeled with a class or a probability distribution over the classes. At each subordinate node only a subsample of the original population is considered, the population had been divided in two groups according to the splitting criterion of the last input feature.

The Titanic dataset, a digital copy of the registration notebook of passengers of the Titanic, has been a very popular open-source training dataset in the data science community. As illustrated in figure 9, it has been used for the application of CARTs predicting the probability of survival.

FIGURE 9 ABOUT HERE

The goal of a CART is to create a model that predicts the value of the target feature based on several input variables. As a rule for the decision which input feature to consider for the next splitting decision tree algorithm typically consults a measure of data purity of the target feature. If a continuous input feature is chosen, the cut-off value for the feature is likewise determined by the data purity measure. One of the most commonly measures of data purity is the Gini impurity index. Simply put, the Gini impurity ranges from 0 to 0.5. For a binary target feature, a Gini of 0.5 indicates that by picking an observation from the original sample at random could in 50 percent of the cases result in one ore the other outcome. A Gini of 0 implies that a population only contains one type of outcome, the data are perfectly pure. Figure 2, illustrates this example with a binary target feature (triangles or circles) on a two-dimensional discrete parameter space x and y . The two-node decision tree shows a truncation of the sample in x and y dimension with four resulting subsamples of perfect data purity.

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FIGURE 10 ABOUT HERE

Classifying Generalized Trust

The target feature in our example is generalized trust. The feature is constructed in a binary fashion summing all individuals with reported values from 0 to 5 under 0 and all individuals who reported a value of six and higher under 1. The initial sample of 36,365 individuals has a distribution of 52 percent with low and and 48 percent with high levels of generalized trust. The feature set is chosen accordingly to the characteristics in the previous multilevel model. Macro-level features are not taken into consideration. Figure 11 illustrates the results of the classification algorithm.

FIGURE 11 ABOUT HERE

The first splitting feature is education (the arrow to the left always leads to a subsample for which the splitting criterion is true). The original sample is split in two subsamples, those with an educational attainment below ISCED 5 (67.9 percent) and those with a higher level of education (32.1 percent). For the ladder subsample the next splitting criterion is whether the individual belongs to a non-protestant religion. After selecting all individuals, who are of Protestant religion and have a high level of education, the first terminal node is reached. No other feature could yield better data purity when applied as a splitting criterion. This first terminal node also has the lowest Gini and the highest proportion of individuals with high levels of trust (75 percent). On the other hand, following the ISECD 5 splitting criterion to the very left of the three, one begins a branch of the decision tree that ultimately leads to the node with the lowest share of

individuals with high trust values (second node from the left in the sixth row). This subsample contains individuals, who 1) have an educational attainment below higher tertiary education ($<$ ISCED 5), 2) are no Protestants, 3) state a specific religion, 4) have at maximum higher secondary education ($<$ ISCED 3), and 5) and are older than 21 years. Of the remaining 11.7 percent of the original sample (4,255), 71 percent (3,021 individuals) reported trust levels of 5 and lower.

Even though the presented case is just an example of how classification algorithms can be applied to social capital research, it confirms the findings of the parametric multilevel model. Education and religion, most pronouncedly protestantism, are strongly related to levels of generalized trust. However, unlike the previous model, the classification approach reveals that employment and political opinions are of little additional significance.

6. Policy Implications and Conclusion

What can be learned from the descriptive and inferential results presented in this study? First, social capital provides a theoretical framework to capture the differences in social capacity in Europe. This concept has been of interest to sociologists, political scientists and economists for the last decades and was used to explain many different socio-economic phenomena. However, it has often been defined somehow arbitrarily and was therefore prone to the severe criticism that the concept is not able to explain anything if it builds on such a weak definition that it can be used to explain everything. As an empirical answer on this critique and in continuing studies that went into this direction, we provide a solely data-driven approach to measure social capital with European Social Survey data.

Secondly, this approach allows to empirically cluster all variables about social norms, values, attitudes and participation in the ESS into three distinct categories. The resulting categories show strong conceptual similarities which allow to label the groups as *civic*, *generalised* and *communitarian social capital*. This empirical result supports the arguments of those scholars who are in favor of the multidimensional character of social capital. Moreover, the empirical and conceptual proximity of the variables clustered in each factor shows that there are important relations between the different indicators of social capital that should not be ignored. Otherwise it could happen that one inadvertently captures only one specific dimension of social capital if the chosen questions are too closely related to one aspect of the overall concept.

Thirdly, the empirical classification of social capital clearly captures the regional disparities in Europe with respect to social capacity. Even if we control for numerous individual and regional

covariates, the spatial clusters in Europe play an important role in explaining the individual level of social capital in all its dimensions. Furthermore, the regional averages of the three social capital factors are highly volatile and clustered not only on national, but also on regional and cross-national level.

Why are these results important? The results suggest that the spatial pattern of social capital is more complex than described in earlier studies. If one wants to map the social cartography of Europe, it is not enough to stick to a simplified two- or four-dimensional classification of countries into larger groups or welfare regimes. Instead, it is important to appreciate the regional and border-crossing structure of social values, norms and actions. This is even more essential in the face of major disputes in the European Union against the background of debates about refugees and financial crisis. If policies with a potential influence on all European societies should be successful, they need to take a regional perspective on the social capacities of the population in the different countries. Social norms and values differ substantially not only between countries, but also within them. Center-periphery structures are pronounced not only between old and new member states of the European Union, but also within countries like Sweden. This regional spatial structure has been considered in other areas like European environmental policy (Lenschow, 2002), regional economic cohesion (Clarysse and Muldur, 2001) or innovation policy (Tödtling and Trippel, 2005) and it needs to be considered also with respect to social capacity in Europe.

This article provides an overview of the social topography in Europe and sketches possible determinants that might be important to explain the European social landscape. However, it is only one step in this direction. Further research aiming to explain the social differences in Europe could employ spatial econometric models to investigate the cross-regional social interdependencies. Additionally, more qualitative research could delve deeper into case studies on particular regions in order to explain why some regions exhibit a particularly important socio-geographic clustering and others do not. Since this study is concentrated on the ESS and took the survey questions as they are, it could also be of interest to compare different surveys in Europe on the same research question. Moreover, from a methodological point of view, it could be worthwhile to compare different statistical clustering methods and further examine the benefit of applying hierarchical linear models for social capital research.

References

- Ackermann, K., Freitag, M., 2015. Social Capital in der Vergleichenden Politikwissenschaft. In: Handbuch Vergleichende Sozialwissenschaft. Springer, Wiesbaden.
- Adler, P. S., Kwon, S.-W., 2002. Social capital: Prospects for a new concept. *Academy of management review* 27 (1), 17–40.
- Algan, Y., Cahuc, P., 2010. Inherited trust and growth. *The American Economic Review*, 2060–2092.
- Beugelsdijk, S., Van Schaik, T., 2005. Social capital and growth in European regions: an empirical test. *European Journal of Political Economy* 21 (2), 301–324.
URL <http://www.sciencedirect.com/science/article/pii/S0176268004000886>
- Bourdieu, P., 1986. Forms of Capital. In: *Handbook of Theory and Research for the Sociology of Education*. Greenwood Press, pp. 241–260.
- Bowles, S., 1999. "Social capital" and community governance. *Focus* 20 (3), 6–10.
- Brehm, J., Rahn, W., 1997. Individual-level evidence for the causes and consequences of social capital. *American journal of political science*, 999–1023.
- Buxton, R., 2008. Statistics: Multilevel Modeling. Tech. rep., Mathematics Learning Support Centre.
URL www.statstutor.ac.uk/resources/uploaded/multilevelmodelling.pdf
- Clarysse, B., Muldur, U., 2001. Regional cohesion in Europe? An analysis of how EU public RTD support influences the techno-economic regional landscape. *Research Policy* 30 (2), 275–296.
URL <http://www.sciencedirect.com/science/article/pii/S0048733399001134>
- Coleman, J. S., 1988. Social capital in the creation of human capital. *American journal of sociology*, S95–S120.
- Dakhli, M., De Clercq, D., 2004. Human capital, social capital, and innovation: a multi-country study. *Entrepreneurship & regional development* 16 (2), 107–128.
URL <http://www.tandfonline.com/doi/abs/10.1080/08985620410001677835>
- Dasgupta, P., Serageldin, I., 2001. Social capital: a multifaceted perspective. *World Bank Publications*.

- Durlauf, S. N., 1999. The case "against" social capital. *Focus* 20 (3), 1–5.
- Edwards, M., Onyx, J., Maxwell, H., Darcy, S., Bullen, P., Sherker, S., 2015. A Conceptual Model of Social Impact as Active Citizenship. *VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations* 26 (4), 1529–1549.
- Ellison, N. B., Vitak, J., Gray, R., Lampe, C., 2014. Cultivating social resources on social network sites: Facebook relationship maintenance behaviors and their role in social capital processes. *Journal of Computer-Mediated Communication* 19 (4), 855–870.
- Esping-Andersen, G., 1990. The three political economies of the welfare state. *International journal of sociology* 20 (3), 92–123.
- Fine, B., 2001. *Social capital versus social theory*. Routledge.
- Franzen, A., Pointner, S., 2007. *Sozialkapital: Konzeptualisierungen und Messungen*. Sozialkapital. Grundlagen und Anwendungen, 66–89.
- Freitag, M., Bauer, P. C., 2013. Testing for measurement equivalence in surveys dimensions of social trust across cultural contexts. *Public Opinion Quarterly* 77 (S1), 24–44.
- Freitag, M., Kirchner, A., 2011. Social Capital and Unemployment: A Macro-Quantitative Analysis of the European Regions. *Political studies* 59 (2), 389–410.
- Freitag, M., Traunmüller, R., 2008. Sozialkapitalwelten in Deutschland. *Zeitschrift für vergleichende Politikwissenschaft* 2 (2), 221–256.
- Gesthuizen, M., Van der Meer, T., Scheepers, P., 2009. Ethnic diversity and social capital in Europe: tests of Putnam's thesis in European countries. *Scandinavian Political Studies* 32 (2), 121–142.
- Gil de Zúñiga, H., Jung, N., Valenzuela, S., 2012. Social media use for news and individuals' social capital, civic engagement and political participation. *Journal of Computer-Mediated Communication* 17 (3), 319–336.
- Glaeser, E. L., Laibson, D. I., Scheinkman, J. A., Soutter, C. L., 2000. Measuring trust. *Quarterly Journal of Economics*, 811–846.
- James, G., Witten, D., Hastie, T., Tibshirani, R., 2013. *An introduction to statistical learning*. Vol. 6. Springer.

- Kaasa, A., Parts, E., 2008. Individual-level determinants of social capital in Europe differences between country groups. *Acta sociologica* 51 (2), 145–168.
- Knack, S., Keefer, P., 1997. Does social capital have an economic payoff? A cross-country investigation. *The Quarterly journal of economics*, 1251–1288.
- La Due Lake, R., Huckfeldt, R., 1998. Social capital, social networks, and political participation. *Political Psychology* 19 (3), 567–584.
- Lenschow, A., 2002. Environmental policy integration: Greening sectoral policies in Europe. Routledge.
- Lin, N., 1999. Building a network theory of social capital. *Connections* 22 (1), 28–51.
- Mandarano, L., Meenar, M., Steins, C., 2010. Building social capital in the digital age of civic engagement. *Journal of Planning Literature* 25 (2), 123–135.
- Onyx, J., Bullen, P., 2000. Measuring social capital in five communities. *The journal of applied behavioral science* 36 (1), 23–42.
- Paldam, M., 2000. Social capital: one or many? Definition and measurement. *Journal of economic surveys* 14 (5), 629–653.
- Paldam, M., Svendsen, G. T., 2000. Missing social capital and the transition in Eastern Europe. Tech. rep., Department of Economics, Faculty of Business Administration, Aarhus School of Business.
- Parts, E., 2013. The dynamics and determinants of social capital in the European Union and neighbouring countries. *Discussions on Estonian economic policy: Theory and practice of economic policy in the European Union* (1).
- Pichler, F., Wallace, C., 2007. Patterns of formal and informal social capital in Europe. *European sociological review* 23 (4), 423–435.
- Putnam, R. D., 1995. Bowling alone: America’s declining social capital. *Journal of democracy* 6 (1), 65–78.
- Putnam, R. D., Leonardi, R., Nanetti, R. Y., 1993. Making democracy work: Civic traditions in modern Italy. Princeton university press.

- Russell, D. W., 2002. In search of underlying dimensions: The use (and abuse) of factor analysis in Personality and Social Psychology Bulletin. *Personality and social psychology bulletin* 28 (12), 1629–1646.
- Schneider, J. A., 2009. Organizational social capital and nonprofits. *Nonprofit and Voluntary Sector Quarterly* 38 (4), 643–662.
- Sobel, J., 2002. Can we trust social capital? *Journal of economic literature*, 139–154.
- Tödtling, F., Trippel, M., 2005. One size fits all?: Towards a differentiated regional innovation policy approach. *Research policy* 34 (8), 1203–1219.
URL <http://www.sciencedirect.com/science/article/pii/S0048733305001137>
- Uslaner, E. M., Brown, M., 2005. Inequality, trust, and civic engagement. *American politics research* 33 (6), 868–894.
- Valenzuela, S., Park, N., Kee, K. F., 2009. Is there social capital in a social network site?: Facebook use and college students’ life satisfaction, trust, and participation¹. *Journal of Computer-Mediated Communication* 14 (4), 875–901.
- van Deth, J. W., Zmerli, S., 2010. Introduction: civiness, equality, and democracy—a “dark side” of social capital? *American Behavioral Scientist* 53 (5), 631–639.
- Van Oorschot, W., Arts, W., 2005. The social capital of European welfare states: The crowding out hypothesis revisited. *Journal of European social policy* 15 (1), 5–26.
- Van Oorschot, W., Arts, W., Gelissen, J., 2006. Social capital in Europe measurement and social and regional distribution of a multifaceted phenomenon. *Acta sociologica* 49 (2), 149–167.
- Williams, D., 2006. On and off the Net: Scales for social capital in an online era. *Journal of Computer-Mediated Communication* 11 (2), 593–628.
- Woltman, H., Feldstain, A., MacKay, J. C., Rocchi, M., 2012. An introduction to hierarchical linear modeling. *Tutorials in Quantitative Methods for Psychology* 8 (1), 52–69.
URL <http://mail.tqmp.org/RegularArticles/vol108-1/p052/p052.pdf>

7. Appendix

Figures

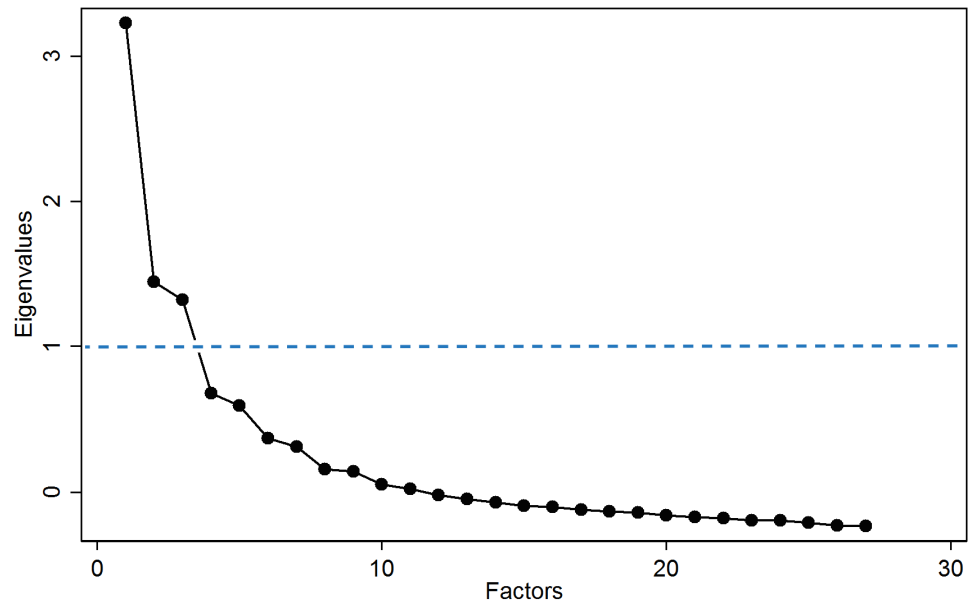


Figure 1: *Screeplot of the Factor Eigenvalues*: the factor analysis leads to three distinct factors with an eigenvalue higher than 1 that capture together all the variation of the social capital indicating variables.

Source: European Social Survey 6, 7 and own calculations

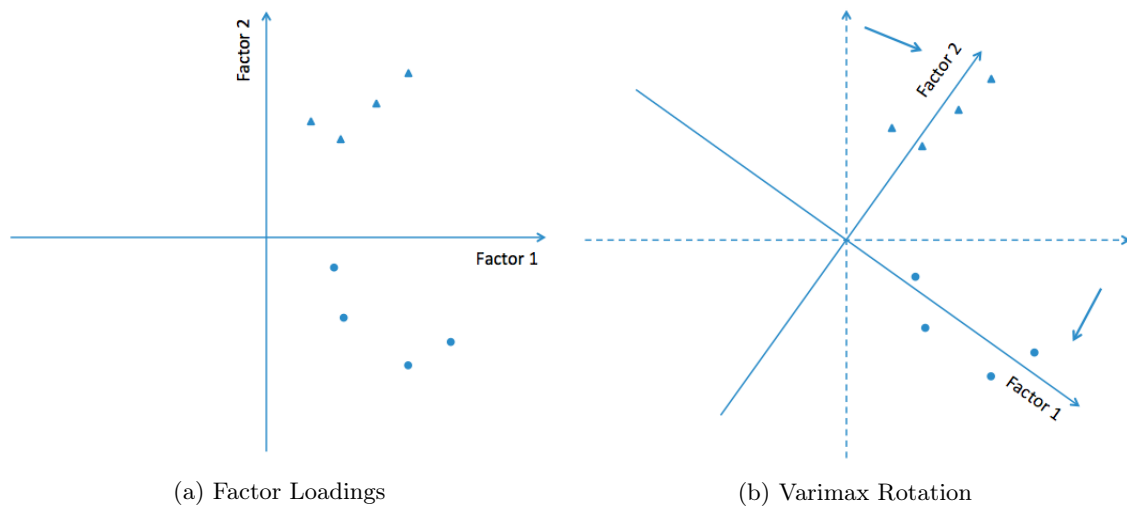


Figure 2: *Factor Analysis Explained*: the factors are rotated in the n-dimensional space until the variance of the squared factor loadings is maximised. Due to this procedure, moderate loadings can be more clearly assigned to a specific factor.

Source: (Russell, 2002)

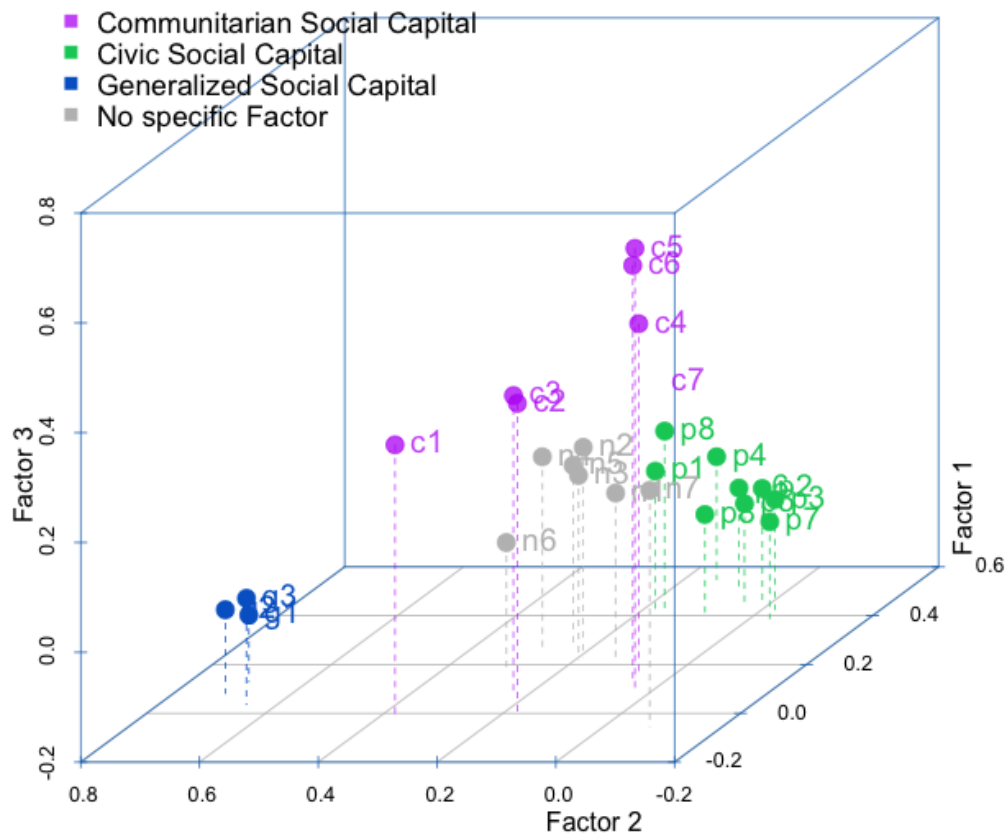


Figure 3: *Factor Loadings in the Model derived by the Factor Analysis*: the factor analysis reveals that the variables that measure social capital can be assigned into three distinct categories: *civic*, *generalised* and *communitarian social capital*.

Source: European Social Survey 6, 7 and own calculations

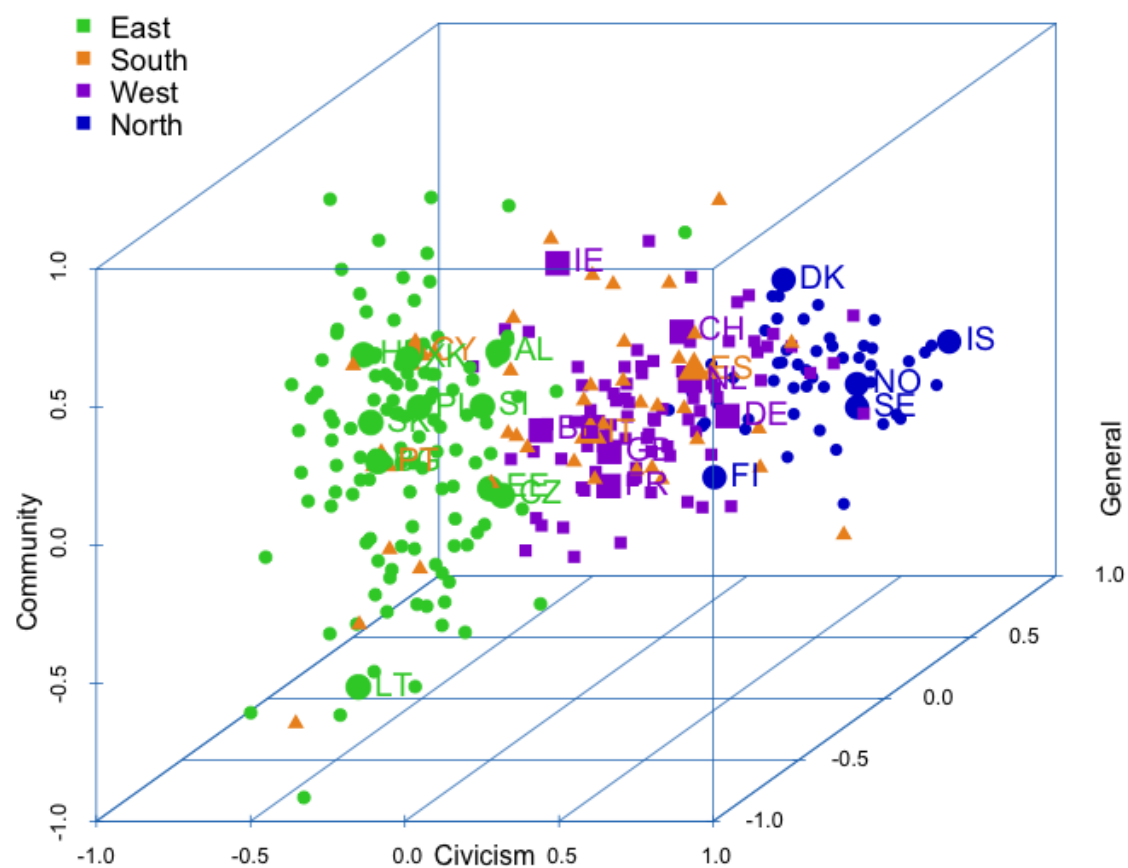


Figure 4: *The Different Social Capital Regimes in Europe*: there are significant differences between the European regions with respect to civic, generalised and communitarian social capital. There is also much variation within the country clusters, in particular for communitarian social capital in Eastern Europe.

Source: European Social Survey 6, 7 and own calculations

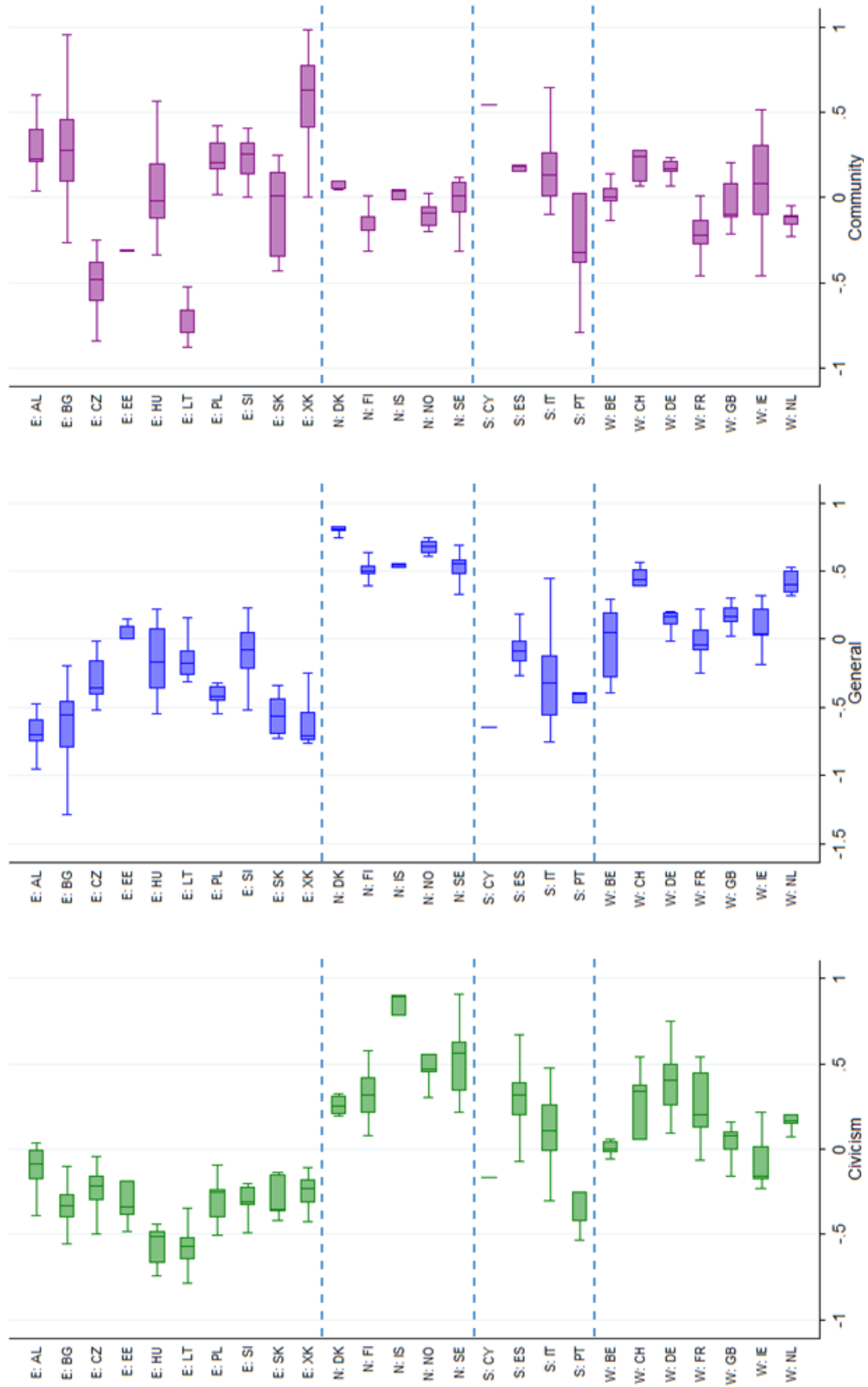
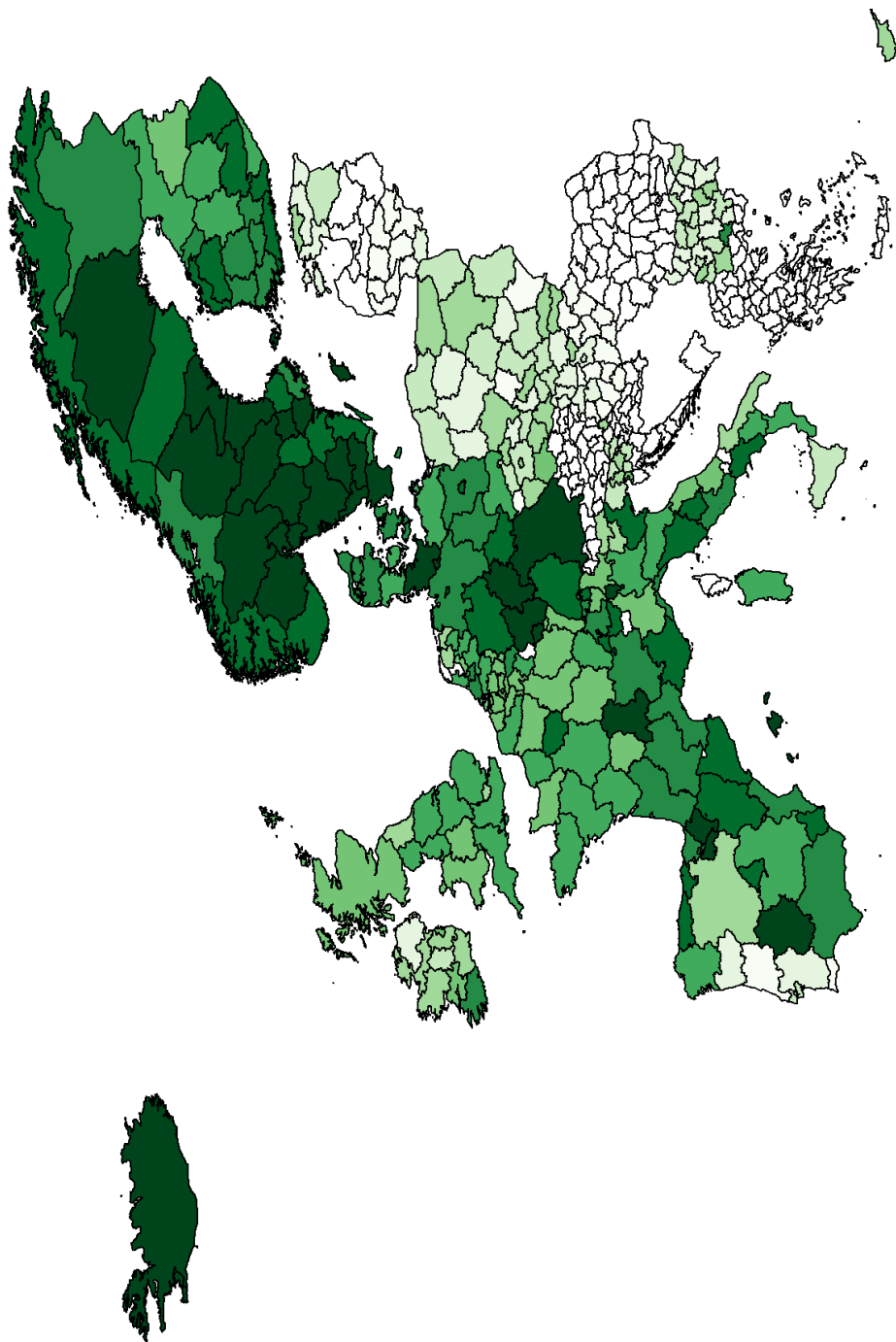


Figure 5: *The Variance of the three social capital dimensions in Europe: the regional average of the social capital factors vary substantially in Europe; not only between countries, but also within some countries.*

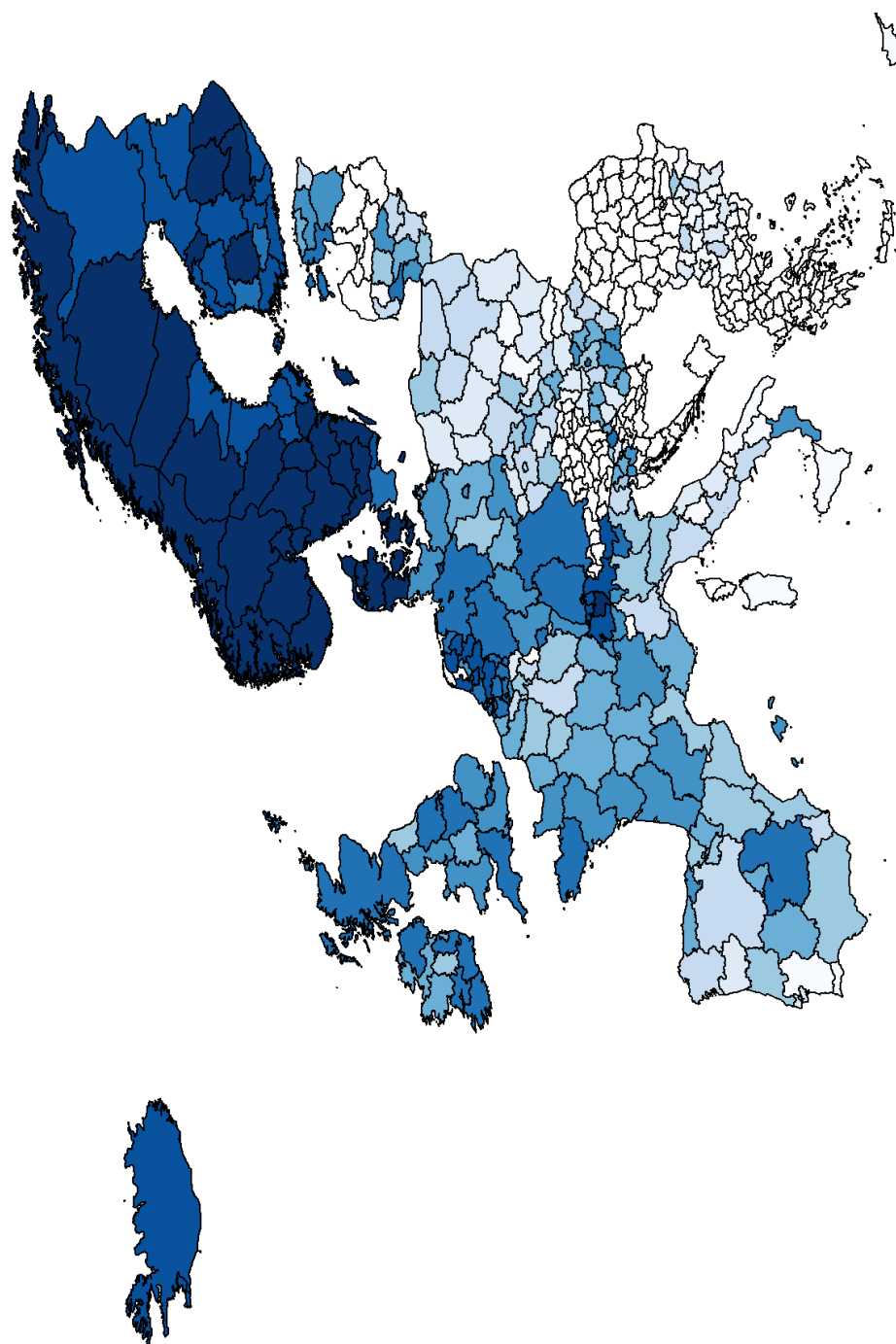
Source: European Social Survey 6, 7 and own calculations



Civicism, Regional Averages - ESS 6 & 7 (own calculations)

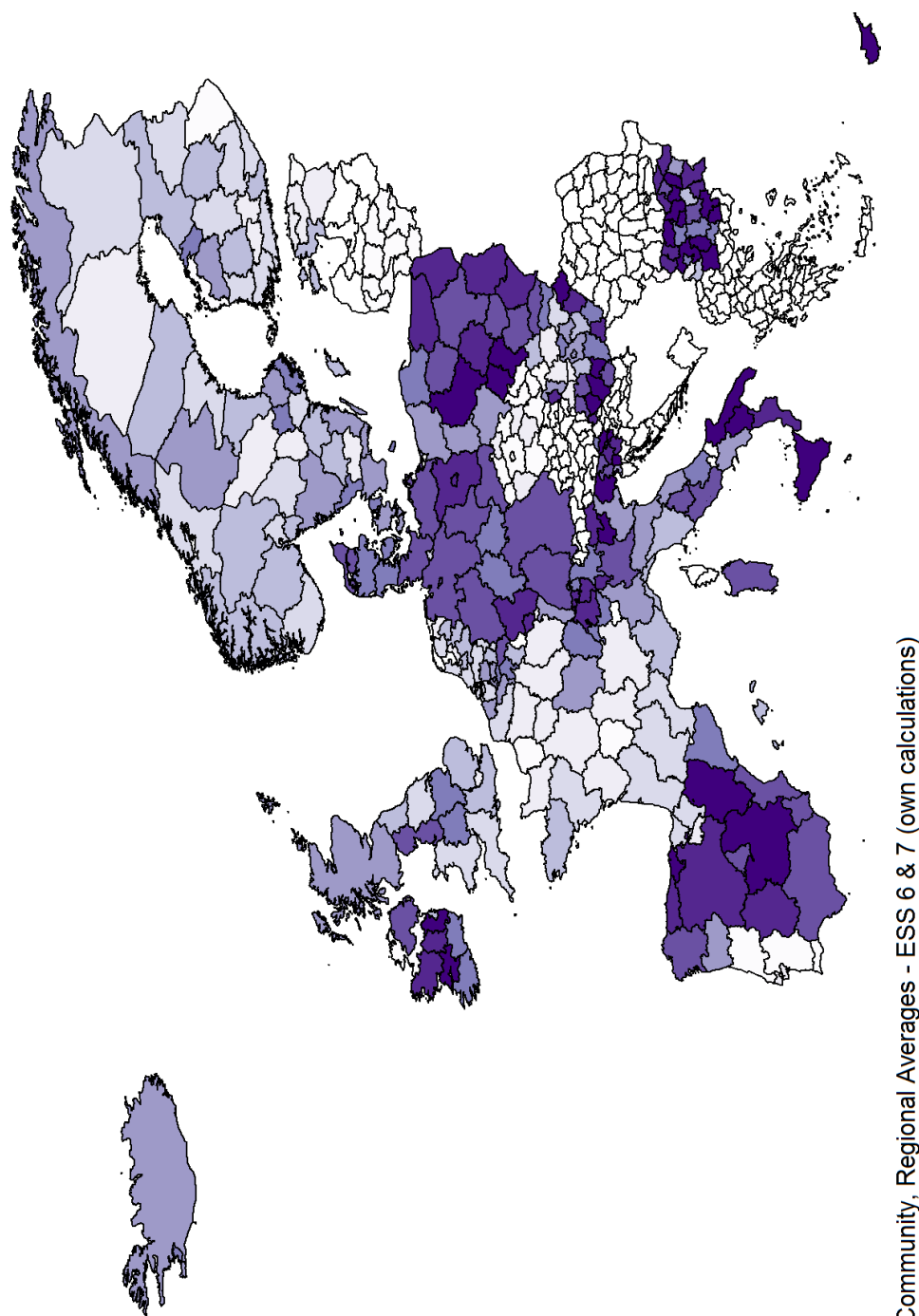
Figure 6: *Civic social capital in Europe*: There are major regional differences with respect to civicism in many European countries, while the Eastern European regions show very low values of that social capital dimension.

Source: European Social Survey 6, 7 and own calculations



General, Regional Averages - ESS 6 & 7 (own calculations)

Figure 7: *Generalised social capital in Europe*: A north-south and east-west-divide is prevalent.
Source: European Social Survey 6, 7 and own calculations



Community, Regional Averages - ESS 6 & 7 (own calculations)

Figure 8: *Communitarian / traditional social capital in Europe: Eastern European countries and regions with a majority of Catholics show higher values of communitarian social capital*

Source: European Social Survey 6, 7 and own calculations

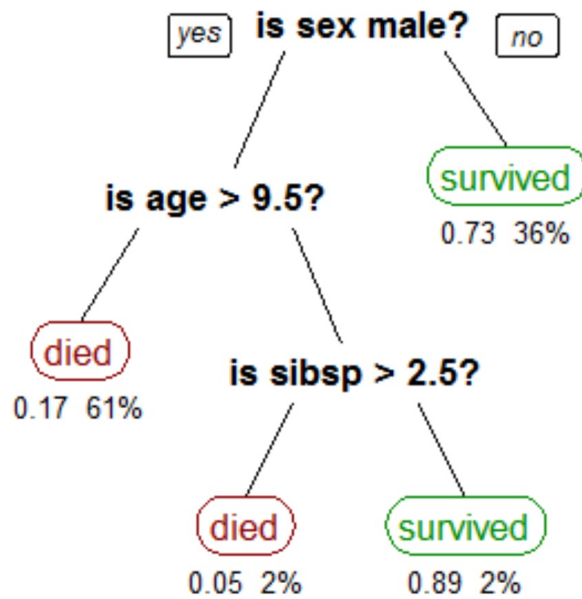


Figure 9: *Chances of survival on the Titanic*: A tree showing survival of passengers on the Titanic (sibsp is the number of spouses or siblings aboard). The figures under the leaves show the probability of outcome and the percentage of observations in the leaf.

Source: Wikipedia - CARTs

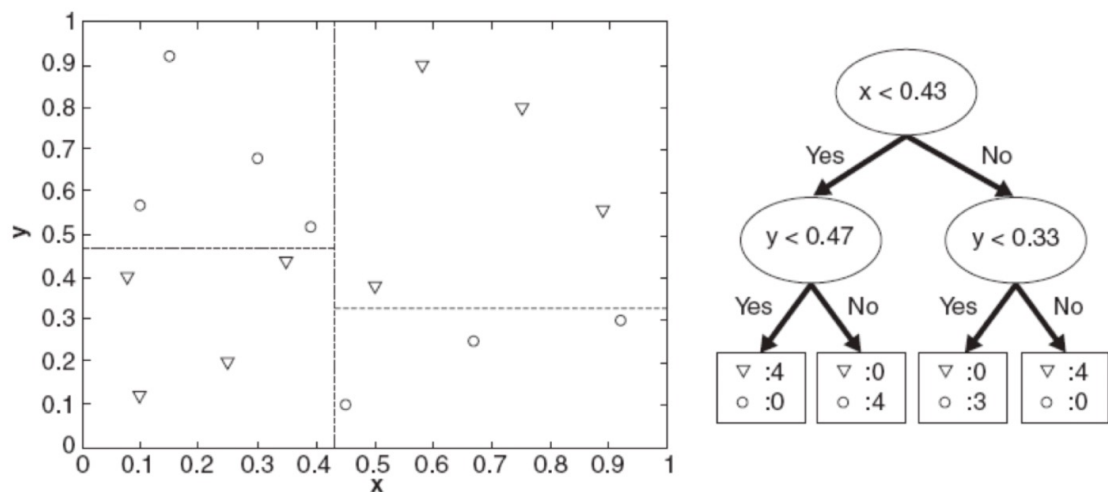


Figure 10: *A classification tree with two input features*: While the original sample contained 15 observations of which seven were circles and 8 triangles, the final for subsamples solemnly contain one or the other outcome.

Source: James et al. (2013)

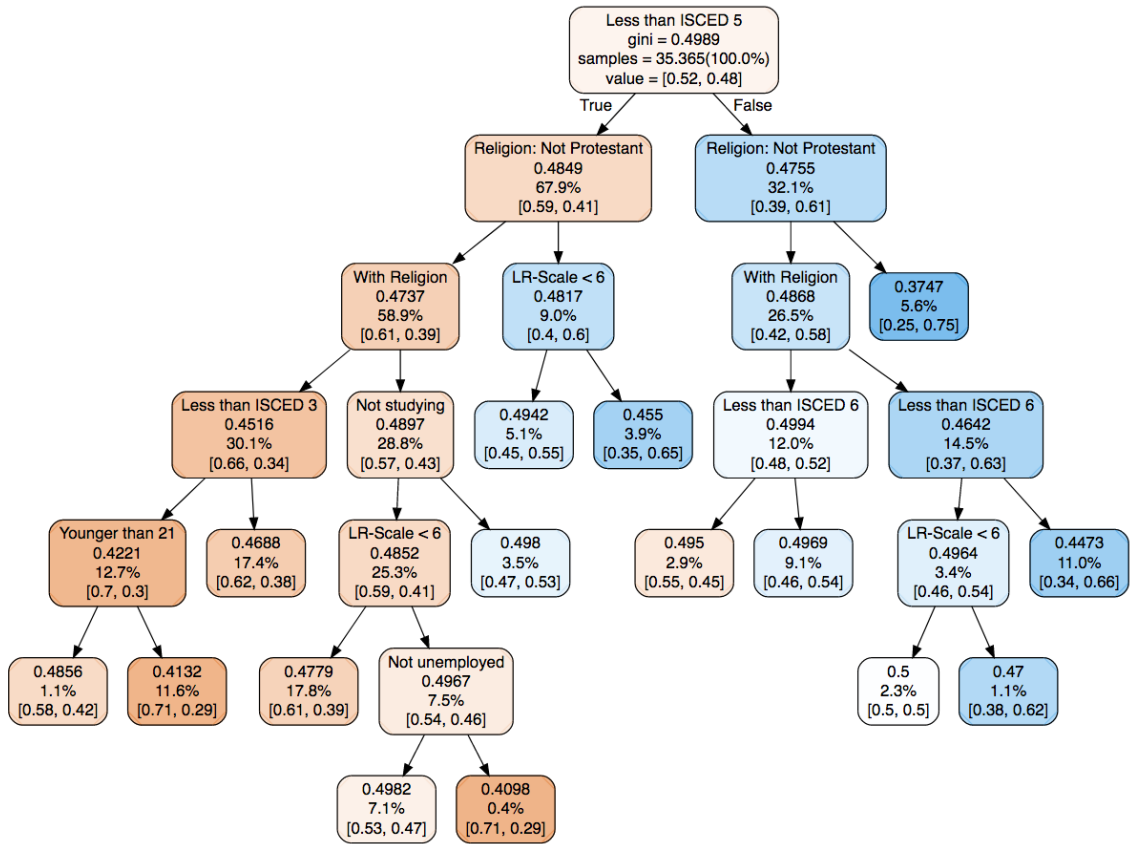


Figure 11: *The binary target feature is generalized trust*: The first line in each node indicates the next splitting criterion, while the second line reports the Gini index, and the last line the distribution of binary generalized trust.

Source: ESS7 and own calculations

Table 1: *Social capital indicating questions in ESS 6 and 7:*

ESS-Code	Description	Abbr.
polintr	How interested in politics in general	p 1
contplt	Ever contacted a politician or government official in the last 12 months	p 2
wrkprty	Worked for a political party or action group in the last 12 months	p 3
wrkorg	Worked in another organization or association in the last 12 months	p 4
wkvlorg	Involved in work for voluntary or charitable organizations in the last 12 months	p 5
badge	Worn or displayed campaign badge/sticker in the last 12 months	p 6
sgnptit	Signed a petition in the last 12 months	p 7
pbldmn	Taken part in lawful public demonstration in last 12 months	p 8
bctprd	Boycotted a certain product in the last 12 months	p 9
ppltrst	Generally speaking most people can be trusted, or you can't be too careful	g 1
pplfair	Most people would try to take advantage of you, or try to be fair	g 2
pplhlp	Most of the time people try to be helpful, or mostly looking out for themselves	g 3
pplahlp	Feel people in local area help one another	c 1
flclpla	Feel close to the people in local area	c 2
flapppl	Feel appreciated by people you are close to	c 3
ipudrst	Important to understand different people	c 4
iphlppl	Important to help people and care for others well-being	c 5
iplylfr	Important to be loyal to friends and devote to people close	c 6
imprad	Important to follow traditions and customs	c 7
vote	Voted in last election	n 1
implvdm	How important for you to live in democratically governed country	n 2
sclmeet	How often socially meet with friends, relatives or colleagues	n 3
inprdsc	How many people with whom you can discuss intimate and personal matters	n 4
sclact	How much do you take part in social activities compared to others of same age	n 5
aesfrk	Feeling of safety of walking alone in local areas after dark	n 6
rlgatnd	How often attend religious services apart from special occasions	n 7

Source: European Social Survey 6, 7

Table 2: *Correlation between the SC factors:* While generalised social capital is positively correlated to civicism, the relation to communitarian social capital is negative. the other factors are not significantly related to each other.

	Civicism	General	Community
Civicism	1.000		
General	0.571***	1.000	
Community	-0.025	-0.247***	1.000

*** p < 0.01 Source: European Social Survey 6, 7 and own calculations

Table 3: *Examples for the different dimensions of social capital in Europe:* The social landscape of Europe is complex - there are not only different dimensions of social capital, but these dimensions show specific spatial structures.

	Civicism	General	Community
Regime	East	North	North
(low within-regime variation, high between-regime variation)			
Country	Belgium	Portugal	Spain
(low within-country variation, high between-country variation)			
Region	Sweden	Italy	Bulgaria
(high within-country variation)			
Source: European Social Survey 6, 7 and own calculations			

Table 4: *Multilevel model explaining the three distinct social capital factors*: The disparities in social capital are significant between the macro-regions in Europe, while this effect is different for the three different dimensions of social capital.

Model on Social Capital:	Civicism (1)	General (2)	Community (3)
Gender (ref. = Female)	0.086*** (0.009)	ns	-0.176*** (0.009)
Age	0.020*** (0.002)	-0.009*** (0.002)	ns
Age Squared·1000	-0.001*** (0.000)	0.001*** (0.000)	0.001** (0.000)
Education (0-8)	0.121*** (0.002)	0.067*** (0.002)	ns
<u>Status (ref. = Paid Work)</u>			
Student	0.297*** (0.023)	0.094*** (0.023)	ns
Unemployed	-0.042** (0.018)	-0.180*** (0.017)	-0.100*** (0.018)
Retired	ns	-0.076*** (0.016)	ns
Disabled, Military, etc.	ns	-0.296*** (0.026)	-0.105*** (0.027)
Housework	-0.052*** (0.017)	ns	ns
<u>Religion (ref. = None)</u>			
Roman Catholic	-0.048*** (0.012)	ns	0.298*** (0.013)
Protestant	0.050*** (0.014)	0.058*** (0.014)	0.252*** (0.014)
Other	-0.057*** (0.019)	-0.155*** (0.019)	0.362*** (0.020)
Left-Right-Scale (0 Left -10 Right)	-0.025*** (0.002)	0.014*** (0.002)	0.017*** (0.002)
<u>Regional covariates</u>			
GDP per capita (2012, in EUR)	ns	0.001* (0.000)	ns
Without paid work (2012, in percent)	-0.271* (0.158)	ns	ns
<u>Regime (ref. = West)</u>			
East	-0.440*** (0.044)	-0.319*** (0.053)	ns
North	0.186*** (0.036)	0.386*** (0.043)	ns
South	0.129*** (0.040)	-0.255*** (0.047)	ns
Observations	30,584	30,584	30,584
Number of groups	288	288	288
AIC/Obs	2.245	2.191	2.254
BIC/Obs	2.251	2.196	2.259

Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1

Source: European Social Survey 6, 7 and own calculations