Does social capital matter for European regional growth?

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Abstract

This article analyzes the role of different elements of social capital in economic growth for a sample of 85 European regions during the period 1995 - 2008. Much has been said about social capital in the last two decades, but studies for the European regional context are scant, and those analyzing periods after the nineties are nonexistent. The improvements in data availability allow us to consider the traditionally disregarded Central and Eastern European regions. This is especially interesting, since they are all transition economies that recently joined to the European Union and show remarkably low levels of social capital. Additionally, we follow the Bayesian paradigm, which not only allows us to make direct inference on the parameters to be estimated, but also deals with parameter uncertainty, leading to a deeper understanding of the data. Contrary to other contributions for the European context, results suggest, among other findings, that trust and social norms might have the major implications for regional growth, whereas the role of active participation in groups not seem to be so well defined.

Keywords: social capital, economic growth, European regions, Bayesian inference

JEL classification: C15, R10, Z13

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1. Introduction

The study of the implications of social capital on economic growth has received major attention over the last two decades. Definitions of social capital are manifold,[1] and that becomes a handicap for scholars to easily bring the concept from theory to empirical applications. However, Putnam (1993) proposed a definition that quickly became one of the most accepted. Following Putnam, social capital would be defined as "features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions". Triggered by Putnam's (1993) findings, which suggested that differences in social capital are important for explaining regional growth patterns in Italy, scholars began to consider social capital as a potential growth driver in other geographical contexts.

Today, contributions are substantial at country level, including Knack and Keefer (1997), Whiteley (2000), Zak and Knack (2001), Dearmon and Grier (2009), or Doh and McNeely (2011), to name few. However, at regional level, which was actually the spirit of the pioneering Putnam's study, contributions are still scant, specially for the European regional context. Considering regions in Europe rather than countries is not a trivial affair, since one third of the European budget is devoted to regional policies. In this geographical context and in the particular field of social capital and growth, we only find Schneider et al. (2000) and Beugelsdijk and Van Schaik (2005), both of which focused on periods on the late nineties. However, their results not only contradict the predictions of social capital theory, but also other studies at both the country and the regional level. This wide collection of results found across the different studies has made social capital to become increasingly considered by the economic growth literature, including recent books for undergraduate students such as that by Acemoglu (2008).

Meanwhile, in the framework of economic growth, the remarkable limitations showed by the commonly used parametric frequentist analysis in order to set robust arguments on this matter have led scholars such as Henderson et al. (2011) to move to alternative non-parametric methodologies. Special attention has been paid to Bayesian methods, as the recent studies by Durlauf et al. (2012), Crespo-Cuaresma et al. (2011, 2012) and Moral-Benito (2012) well corroborate. One of the most powerful advantages of Bayesian statistics is that it avoids any preliminary assumption on the parameters to be estimated, providing a mathematical framework to deal with complex problems with many possible and interacting sources of uncertainty. However, despite Bayesian statistics is becoming increasingly popular in economics, studies have mainly relied on Bayesian Model Averaging (BMA), a powerful instrument for model and

[1]See Adler and Kwon (2002) for a complete discussion on the different definitions of social capital.

variable selection, while studies using Bayesian methods in order to do *inference* are virtually nonexistent.

This study evaluates the role of different dimensions of social capital on the economic growth of 85 European regions for the period 1995 - 2008. The contribution to the previous literature is twofold. To start with, in front of the classical frequestist analysis it applies Bayesian inference methodologies. Inference in classical statistics heavily relies on the accomplishment of many assumptions that not always are easy to be accomplished, specially when dealing with small samples as the ones in common use in growth studies. Bayesian inference might provide a better framework to deal with these inconveniences. In this work, the conditional posterior densities of the variables under study are simulated by using Markov Chain Monte Carlo (MCMC) methods. In the specific context of social capital and growth its application is, *per se*, innovative. It might shed some light on the true implications of social capital on growth, a topic still partially blurred despite the remarkable effort done in relatively recent times.

The other contribution is the selected sample. Not only it is the largest in this particular setting, but also includes regions from Central and Eastern Europe countries which joined the European Union in the 2004 and 2007 enlargements. Previous evidence for Europe is exclusively confined to samples of Western regions. Considering regions from the new members is interesting in the sense that most of them are transition countries with highly eroded social capital levels by the communist experience. Nowadays, they hold relatively lower social capital levels than the Western Europe regions (Fidrmuc and Gërxhani, 2008).

Therefore, if social capital is positively linked to growth, policy implications for these countries might be specially useful. Additionally, there is no previous evidence for the selected period, which is particularly relevant for two reasons: i) it was a period of unprecedented growth for most of the European regions; and ii) it was a period of deep changes in the European Union, including fifteen new accessions (years 1995, 2004 and 2007), the creation of the Eurozone (1999), and advances in integration at different levels (Amsterdam, Nice and Lisbon Treaties). Consequently, evaluating the implications of social capital in this space-time scenario is not a trivial question.

The reminder of the paper is structured as follows. Section 2 provides some insights on the theoretical links between social capital and growth. Section 3 gives details on the Bayesian approach followed and Section 4 is devoted to present the model to be estimated. Section 5 provides information on the sample and the variables used while Section 6 displays the results. Finally, Section 7 concludes.

2. The links between social capital and economic growth

Theory points out that social capital has positive implications for economic growth. However, the links are complex and heterogeneous, and some authors such as Torsvik (2000) claimed for a major clarification of the channels through which social capital affects growth. Today, virtually all scholars agree that the effects of social capital manifest themselves through a reduction in transaction costs. Economic transactions in those economies with lower stock of social capital are usually characterized by strong regulations and bureaucratic procurements that impose costs and reduce their efficiency (Whiteley, 2000). In that sense, social capital can be a substitute for contracts in poorer economies, as well as it may facilitate complex transactions in the richer ones (Fukuyama, 1995). Therefore, it improves efficiency and helps to save transaction costs, and that positively impacts on aggregate economic output (Putnam, 1993). This may occur due to an increase in the information flows, groups, flexibility and coordinated actions (Durlauf and Fafchamps, 2005), as well as the reduction of the information asymmetries between the agents in negotiations (Dearmon and Grier, 2009).

Social capital also affects other variables, which at the same time are positively linked to economic development—i.e they would be considered as indirect channels. They comprise, among others, physical capital investment (Knack and Keefer, 1997; Dearmon and Grier, 2011), human capital (Dearmon and Grier, 2011), technological innovation (Akçomak and Ter Weel, 2009; Miguélez et al., 2011), or financial development (Guiso et al., 2004). These effects, tend to be self-reinforcing and cumulative. That might involve regions in virtuos circles of low–or–high social capital scenarios (Putnam, 1993).

The above assertions may cast some doubts on the true causal relationship between social capital and growth. Nevertheless, social capital exhibits a strong heritable component, and its stock is remarkably stable along time. Therefore, causality running from economic growth to social capital is not plausible (Uslaner, 2002, 2008). This has been well corroborated by Bergh and Bjørnskov (2011a,b) and Fairbrother and Martin (2013), who advocate for links from social capital to welfare, income equality and economic development, but not for the inverse causal relationship. Bjørnskov (2012) provides additional evidence and concluded that the effects from social capital to economic growth are channeled through schooling and better governance, and not inversely.[2] Therefore, the above arguments strongly support previous theoretical considerations on this issue.

[2]These studies test the exogeneity of trust, which is, certainly, an specific dimension of social capital. The suited scenario would be that all the social capital elements have been tested, but evidence on that point is yet to come. However, the results for trust are encouraging, and they lead us to expect similar results for other social capital indicators, given that they all share the same nature—i.e they are social features.

3. A brief outline of the Bayesian methods

As commented on in the Introduction, in this contribution we follow the Bayesian paradigm in order to do inference on the estimated parameters. Bayesian statistics is founded on the fundamental premise that all uncertainties should be represented and measured by probabilities. First of all, the information provided by the data is introduced through the *likelihood function*, which depends on the selected probabilistic model, and connects the data and the unknown parameters. This is also the usual procedure in classical statistics but, in addition, Bayesian statistics allows to incorporate the prior knowledge of the researcher about the unknown parameters into the inferential process. This information needs to be expressed in probabilistic terms in the so-called *prior distribution*. Both sources of information are combined by using the Bayes theorem in order to obtain the *posterior distribution*, which provides all the relevant information on the parameters of interest.

More concisely, the posterior distribution of the parameters $\boldsymbol{\theta}$, given the observed data $\boldsymbol{y}$ is obtained as:

$$\pi(\boldsymbol{\theta} \mid \boldsymbol{y}) = \frac{f(\boldsymbol{y} \mid \boldsymbol{\theta})\pi(\boldsymbol{\theta})}{m(\boldsymbol{y})}, \tag{1}$$

where $\pi(\boldsymbol{\theta})$ is a probability distribution containing the prior information about the parameters; $f(\boldsymbol{y} \mid \boldsymbol{\theta})$ represents the likelihood function and $m(\boldsymbol{y})$ is the prior predictive distribution, this is:

$$m(\boldsymbol{y}) = \int_{\Theta} f(\boldsymbol{y} \mid \boldsymbol{\theta})\pi(\boldsymbol{\theta})d\boldsymbol{\theta}$$

with Θ being the parametric space.

From the Bayesian point of view, complex problems with many possible and interacting sources of uncertainty become problems of mathematical manipulation, and so are well defined. The idea of problem of mathematical manipulation refers to that there is no longer a necessity for *ad hoc* tests such as heterogeneity or normality, making the analysis simpler. Moreover, the results, provided by the posterior distribution, are much easier to be interpreted than the usual p-values and confidence intervals provided by the classical approaches.

The main challenge of Bayesian statistics is the computation of posterior distributions, which cannot always be obtained analytically. In fact, for many years, the computation of posterior distributions has been one of the main obstacles for not using Bayesian statistics. Yet nowadays this task has been simplified by the increasing capacity of computers, together with the development of simulation methodologies based on Monte Carlo sampling and Markov Chain Monte Carlo (MCMC) (see Green, 2001, for example). These useful simulation procedures result in an approximate sample of the posterior distribution from which inference can be directly done. For example, posterior means and medians, credible regions or quantiles can be easily calculated (Gammerman and Lopes, 2006). MCMC methods can be implemented by many statistical packages. In this study we use the package WinBUGS (Spiegelhalter et al., 2003).

Another important issue within the Bayesian framework is the assignment of prior distributions, which capture the knowledge of the researcher before conducting the analysis. In fact, one of the main arguments of classical statisticians against the Bayesian approach is that the use of prior information might introduce some bias into the analysis. However, this is not entirely true, since an *Objective Bayesian* approach can be adopted. Objective Bayesian statisticians argue that using the appropriate objective prior results in the same conclusions as classical analysis, while still enjoying the advantages of the Bayesian framework (Berger, 2006). In this study we use Bayesian Hierarchical models, which are a powerful tool for constructing models for complex scenarios (see, for example Banerjee et al., 2004; Zhao et al., 2006). As a prior distribution, an objective approach is used, assuming no prior knowledge on the parameters of interest.

4. The growth model

The number of theories and models employed in the task of explaining economic growth is so high that some scholars such as Brock and Durlauf (2001) refer to it as "theory openendedness". Recent studies by Crespo-Cuaresma et al. (2011, 2012), focused on the European regions, advocate for using Bayesian techniques, including large sets of variables as potential growth drivers. Unfortunately, despite the flourishing interest that social capital has generated in the last two decades, a measure of social capital was not included. Therefore, since our sample is conformed by a set of European regions, our strategy is to consider a model that includes those robust variables found by Crespo-Cuaresma et al. (2012), [3] together with other variables considered by Henderson et al. (2011) as basic growth determinants.[4] Additionally, we include different social capital indicators, explained in detail in Section 5.2. In order to control for other potential sources of variability, we introduce country fixed effects and also spatial effects by using a Simultaneous Autorregressive (SAR) model (see Oliveira and Song, 2008, for a description of a Bayesian aproach to SAR models). Both country fixed effects

[3]These are: i) the initial level of income; ii) the share of working population with tertiary education; iii) regions with capital cities; and iv) regions from Central and Eastern Europe countries.

[4]Henderson et al. (2011) consider and evaluate different growth theories. However, the Solow's variables, namely, the initial level of income; the population growth; investment and human capital, are used as the basic framework of growth determinants. To that basic framework, other variables are added but Solow's variables remain fixed.

and spatial effects have been proved to be relevant in the European context (see Basile, 2008; Crespo Cuaresma and Feldkircher, 2012, for instance). In doing so, a contiguity matrix **W** is introduced, considering neighboring regions those with shared borders.

The model can be expressed as:

$$GGRPPC_i = \alpha + \boldsymbol{\beta}\mathbf{x}_i + \gamma SC_i + \delta_{COUNTRY_i} + \phi v_i^{-1}\boldsymbol{W}_i\boldsymbol{GGRPPC} + \varepsilon_i \quad \text{for } i = 1, \ldots, 85 \tag{2}$$

where the subindex i denotes regions. The other components of the model are:

- The response variable $GGRPPC$ is the average growth of Gross Regional Product (GRP) per capita in the period 1995 - 2008.
- α is the intercept.
- $\boldsymbol{x}_i$ is a 7×1 vector including control variables with $\boldsymbol{\beta}$ being the vector of regression coefficients. The list of control variables included is detailed below.
- SC is a social capital indicator (from the ones described in the next section) and $\boldsymbol{\gamma}$ is the associated regression coefficient.
- In the fixed effects part, $COUNTRY_i$ is the corresponding country for region i, and δ is a 21×1 vector including the regression coefficients for each country (Germany is considered as the reference category).
- In the SAR part of the model, $\boldsymbol{W}$ is a neighboring 85×85 matrix where $W_{ij} = 1$ if regions i and j are neighbors and 0 otherwise ($\boldsymbol{W}_i$ refers to row i in $\boldsymbol{W}$). v_i is the number of neighbors of region i hence, the product $v_i^{-1}\boldsymbol{W}_i\boldsymbol{GGRPPC}$ is the mean growth for the neighbors of region i. Finally ϕ measures the strength of this relationship.
- The disturbances are measured by a white noise error: $\varepsilon_i \sim \mathcal{N}(0, \sigma^2)$.

Finally, following Oliveira and Song (2008), the model for the response variable can be written as:

$$\boldsymbol{G}GRPPC \sim \mathcal{N}_p(\alpha + \boldsymbol{\beta}\mathbf{x}_i + \gamma SC_i + \delta_{COUNTRY_i}, \boldsymbol{\Sigma}) \tag{3}$$

with

$$\boldsymbol{\Sigma} = (I_n - \phi\boldsymbol{v}^{-1}\boldsymbol{W})^{-1}\sigma^2\boldsymbol{I}_p(I_n - \phi\boldsymbol{v}^{-1}\boldsymbol{W}) \tag{4}$$

where $\boldsymbol{v}^{-1}$ is a row vector ($1 \times p$) containing the inverse of the number of neighbors fore each region.

The control variables included in $\boldsymbol{x}_i$ for each region i are: i) $GRPPC_0$, the income per capita at the beginning of the period; ii) $GPOP$, the growth of population; iii) $POPDENS$, the population density; iv) $GFCF$, the gross fixed capital formation (share of GRP); v) HK, the share of people in the working age with tertiary studies; vi) $CAPITAL$, which equals one for regions with capital cities and zero otherwise; and vii) CEE, which equals one for regions from Central and Eastern Europe countries (those that have joined the European Union in the 2004 and 2007 enlargements) and zero otherwise.

The social capital indicator, SC, varies among three different elements, namely, $TRUST$, $ACTIVE$ and $NORMS$, whose nature and construction will be explained in detail in Section 5.2. In order to capture the effects of all three indicators as clearly as possible—i.e. avoiding partial correlations, three models are estimated, each of them considering a different indicator. From now on, the three models will be referred to as "Model 1", "Model 2" and "Model 3", considering $TRUST$, $ACTIVE$ and $NORMS$, respectively. Table 2 provides further information both on the units of measure and the statistical sources of the variables, and Table 3 provides some descriptive statistics.

5. Sample and data on social capital

5.1. The sample

We consider 85 regions at NUTS[5] 1 level for the period 1995 - 2008.[6] While most studies focused on European growth and convergence are conducted at NUTS 2 level (more disaggregated), our choice is heavily affected by social capital data limitations. Despite our relatively high level of aggregation considerably reduces the number of observations, it has some particular advantages in our specific context. On the one hand, due to the nature of social features, it would be plausible to expect gradual changes across space instead of great differences among the smaller territorial units that NUTS 2 actually represent. On the other hand, some authors such as Boldrin and Canova (2001) and Basile (2008) criticize the use of NUTS 2 for growth and convergence analysis, arguing that some NUTS 2 are artificially separated from their hinterland. Previous evidence for Europe considering the role of social capital, such as Beugelsdijk and Van Schaik (2005), is also reported at NUTS 1 level. The regions considered are listed in Table 1.

[5]NUTS stands for Nomenclature of Territorial Units for Statistics. See http://epp.eurostat.ec.europa.eu

[6]The change in measurement methods of national accounts in Central and Eastern Europe countries after the end of the Communist era, makes the period for which comparable data are available, relatively short.

5.2. Social capital variables

The multifaceted nature of social capital has led scholars to use different indicators as proxies for social capital. In many occasions, authors combine their self-chosen elements, an strategy that makes it difficult for policymakers to extract useful insights from these studies (Knack, 2002). Bjørnskov (2006) focuses on Putnam's definition of social capital, and his analysis reveals that three different elements, namely, *trust*, *networks* (proxied by participation in groups) and *social norms* can be inferred from it. They are actually different facets of social capital and, therefore, they cannot be mixed in a single indicator, since each component might have different implications for growth. The indices of social capital in our analysis are based on Bjørnskov (2006), although we acknowledge that other formal approaches might be also possible. The data for its construction are provided by the European Value Survey (EVS), for which four waves are available (years 1981, 1990, 1999 and 2008). However, we only consider the waves corresponding to 1999 and 2008.[7] In order to compute regional indicators the individual responses provided in the surveys are aggregated. Subsequently, the regional measures for 1999 and 2008 are merged in a single indicator.

As commented on in the preceding Subsection 5.1, we were constrained by limitations with data on social capital. One obstacle is that the level of disaggregation of the data is not homogeneous for the whole sample. [8] Another problem is that when data at the smallest level of disaggregation is available (NUTS 2), the number of individual surveys conducted at that level is too small (lower than 20 surveys in some areas) to become a representative sample of the area under study. These two constraints, i.e. both the availability and the reliability of the sample, make it more appropriate to confine the analysis at NUTS 1 level.

5.2.1. Trust

The number of studies considering this indicator is quite large, including Knack and Keefer (1997), Zak and Knack (2001), Schneider et al. (2000), Beugelsdijk and Van Schaik (2005), and Dearmon and Grier (2009), to name some of the most relevant. To measure the stock of interpersonal trust, virtually all the previous literature has considered the following question: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" Two possible answers are considered, namely; i) "most people

[7]Data in the wave for 1981 are provided only at country level and for the year 1990 only a small sample of regions are considered (see Beugelsdijk and Van Schaik, 2005). Note that our period of analysis is 1995 - 2008 and therefore, data from 1999 and 2008 would capture regional social capital for our period of reference.

[8]For example, the wave for the year 1999 does not supply data at NUTS 2 level for France, Germany and the United Kingdom, being NUTS 1 the smallest geographical areas for which data are available for these countries.

can be trusted"; and ii) "can't be too careful". The indicator $TRUST$ is constructed by taking the percentage of people who responded "most people can be trusted".

Figure 1a depicts the scores for the 85 regions in the sample. The regions with the highest levels of trust are those located in the Netherlands and the North of Europe, specially in Denmark and the Scandinavian countries, as well as Scotland in the UK and some German regions. The Spanish regions, the Southern regions of the UK and the Northern parts of Italy also show relatively high levels. The lowest levels are for some regions of France,[9] the South of Italy, the Greek regions, as well as the regions corresponding to those Eastern European countries, recently joined to the European Union. Focusing on the last regions, the picture widely supports the findings by Paldam and Svendsen (2002) and Fidrmuc and Gërxhani (2008), who concluded that the communist experience heavily affected the levels of trust. Some within country differences are especially relevant, as for instance those shown by the North and the South of Italy, which would corroborate Putnam's (1993) findings.

5.2.2. Active participation

Another indicator in this context is that measuring associational life (see Knack and Keefer, 1997; Knack, 2003; Beugelsdijk and Van Schaik, 2005). It is constructed by considering active participation (measured by voluntary or unpaid work)[10] within fifteen associations of different nature. The question to quantify active participation is: "Do you work unpaid for...?" The associations considered are: a) welfare organization; b) religious organization; c) cultural activities; d) trade unions and political parties; e) local community action; f) development/human rights; g) environment, ecology; h) professional associations; i) youth work; j) sports/recreation; k) women groups; l) peace movement; m) voluntary health; and n) other groups. The answers are: i) "mentioned"; and ii) "not mentioned". The indicator $ACTIVE$ is constructed by considering the percentage of respondents who "mentioned" doing unpaid work.[11]

Figure 1b shows the scores for active participation. The highest rates of people doing unpaid work within associations are those in regions located in the Netherlands, Denmark, the Scandinavian countries and the UK, although some regions from Central Germany, Aus-

[9] Note that the French regions hold one of the lowest social capital levels in Western Europe. Despite being surprising, the pictures are consistent with previous findings using other databases and country level data. See Algan and Cahuc (2007) for an excellent discussion on the French case.

[10] Knack and Keefer (1997) measure associational life by considering simple membership—i.e passive membership, whereas Knack (2003) and Beugelsdijk and Van Schaik (2005) consider both passive and active membership. The last seems to be more appropriate, since it is closer to Putnam's idea that people learn to trust and share norms when they actually participate in organizations (Bjørnskov, 2006).

[11] There are alternative ways of constructing this indicator. For instance, Beugelsdijk and Van Schaik (2005) considered the average number of associations for which each respondent does unpaid work. However, we consider that differences between both ways of calculating the indicator are not specially relevant.

trian regions, as well as the Northern Italian and the Greek regions also hold rates of active participation above the mean. Some Central Europe countries such as the Czech Republic and Slovakia, hold relatively high levels of this indicator, whereas some Spanish and Polish regions show the lowest rates.

5.2.3. Social norms

Finally, we consider social norms. The index is based on the responses about to what extent a variety of actions are justified. The question is: "Do you justify...?" and the actions considered are: a) claiming state benefits to which one is not entitled; b) cheating on tax; c) accepting a bribe; and d) avoiding fare in public transport. The answers range from 1 ("never justified") to 10 ("always justified"). The action d) (avoiding fare in public transport) is not available in the survey corresponding to 1999. Despite this minor inconvenient, we averaged the results with the wave of 2008, which includes the four questions. However, merging the two indices is by no means problematic.[12] We averaged the answers for the four questions in order to construct the indicator for social norms *NORMS*, which lies in the interval [1-10]. The closer the values are to 10, the worse social norms are.[13]

The scores, shown in Figure 1c, are interesting.[14] In general terms, in those areas where trust is poor, social norms score worse and vice versa. Therefore, most of the UK regions, Denmark, the Dutch regions and some regions in Northern Germany hold the best scores. The Scandinavian countries and, perhaps surprisingly considering the previous literature, both the Southern and the Northern regions of Italy also hold relatively good scores. By the contrary, the regions from Eastern European countries score generally quite poor on this aspect of social capital. The French and Greek regions, together with the region of Madrid in Spain, Estonia and the Romanian area of Macroregiunea doi show the worst levels.

6. Results

Following the Bayesian paradigm, inference could be made directly from the posterior densities of the estimated parameters. As commented on in Section 3, simulations from the posterior distribution of the parameters are conducted by using the software WinBUGS (see

[12]To ensure that this strategy was not biasing the indicator, we also constructed the index considering only the three common questions in both surveys. The correlation between both indicators is above 0.99.

[13]Following Bjørnskov (2006), this strategy is preferable to simply take the percentage of respondents who answer "never justified" or "always justified", since the conception of "never" and "always" differ across cultures and languages .

[14]Note that Figure 1c should be inversely interpreted. Darker colours correspond to worse punctuation in social norms.

Spiegelhalter et al., 2003). Convergence of the simulated values from the posterior distribution is ensured by running three chains, with $3,000,000$ iterations each, and using a burning period of $500,000$. Then, convergence is checked both graphically (making sure that chains mixed well) and the Rhat statistic (Brooks and Gelman, 1998), which indicates convergence if it is close to 1. Results are provided in terms of probability, what means that we know the probability of a parameter of being, for instance, greater than zero (or any other value of interest). In particular, we present a summary of the realizations of the posterior distribution for the parameters of the model. This summary includes a plot of the empirical posterior density, the mean, the standard deviation, the median and a 95% *credible interval*, [15] which are central intervals containing a particular share of the probability (95% in our case) under the posterior distribution.

6.1. Results for the social capital indicators

This section focuses on the results for the three social capital indicators—i.e. $TRUST$, $ACTIVE$ and $NORMS$, included separately in Equation 2 (Models 1, 2 and 3 respectively).

Focusing on the interpersonal trust indicator ($TRUST$) (Model 1), results are provided in Table 4, while Figure 2 represents their graphical counterpart. The posterior density for $TRUST$ in Figure 2 shows that the largest amount of the probability mass (81.5%, see the last column in Table 4) is on the positive side. Therefore, our results suggest that the population parameter for $TRUST$ is positive with a probability of 81.5%. Table 4 also reports 95% credible interval, bounded by the two tails of the distribution (quantiles 2.5% and 97.5%). While our results do not provide an irrefutable proof about a hypothetical positive effect of $TRUST$ on growth, the support is substantial and would be aligned with previous findings at country level using classical inference, such as those by La Porta et al. (1997), Knack and Keefer (1997), Zak and Knack (2001) and Dearmon and Grier (2009), among other salient contributions. However, previous results for $TRUST$ in the European regional context are more mixed. Beugelsdijk and Van Schaik (2005) found non-significant effects for the period 1950 - 1998, and, more surprisingly, Schneider et al. (2000) found a negative and highly significant relationship for the period 1980 - 1996. Although the results are not directly comparable due to different sample, periods, and variables chosen, some of the likely reasons behind these disparities in the results are discussed at the end of this section.

Regarding the active participation indicator ($ACTIVE$) (Model 2), Table 5 provides the

[15] From the Bayesian perspective, parameter estimation can be performed via credibility (or credible) intervals. Contrary to classical confidence intervals, Bayesian credible intervals contain the *true* but unknown value of the parameter with a given (by the analyst) probability. When using MCMC, these credible intervals can be easily calculated from the resulting MCMC chains.

analytical results while Figure 2 provides the results graphically. The reader might notice that the distribution is more centered at 0 than the one corresponding to $TRUST$. In particular, the 66.2% of the probability mass is on the right side. Despite it is more likely that the population parameter for $ACTIVE$ will be positive rather than negative, the support to such a positive effect is substantially lower than the one reported for $TRUST$, casting some doubts on the true direction of the effects of $ACTIVE$. This comparatively more blurred result is, however, in consonance with previous findings relying on classic statistical analysis.

Knack and Keefer (1997) and Knack (2003) suggested that a condensed indicator of groups, constructed by considering multiple kinds of associations may lead to a non-significant impact on growth. This might be because there are two kind of groups, the ones promoting cooperation for general welfare (e.g. welfare organizations or cultural groups), and others arranged for rent-seeking, which constitute lobbies (e.g. political parties and professional organizations).[16] For a direct comparison with the previous literature using the $ACTIVE$ indicator in the European regional context, we focus on Beugelsdijk and Van Schaik (2005), who found a significant positive effect.[17] In the light of our results, however, very little can be inferred about the implications of $ACTIVE$.[18]

Finally, we focus on the indicator of social norms $(NORMS)$ (Model 3). The 95% credible interval provided by Table 6 and the density plot in Figure 2 show that the largest amount of the posterior probability density is on the left of 0. The probability of this indicator of being positive is really low (16.3%), and consequently the population parameter for $NORMS$ is negative with the 83.7% of probability. This result is not surprising since, by construction, the higher the score in social norms is, the worse social norms are. Therefore, results suggest that civic attitudes towards actions like the ones considered in the construction of this indicator (see Section 5.2) are probably relevant for growth. This result is in line with Knack and Keefer (1997), which, to our knowledge, is the only one in the context of growth considering an indicator of civic norms of the same nature that the one used in this study.[19]

[16]This categorical separation corresponds to *Putnam Groups* [Putnam (1993)] and *Olson Groups* [Olson (1982)], respectively. Knack (2003) and Beugelsdijk and Van Schaik (2005) evaluate both categories separately, and they find non-significant links to growth.

[17]They also include an indicator for passive membership and it is also significant. However, authors suggest that the effect is higher when considering active involvement.

[18]Note that in the Bayesian framework, a probability of 50% of being positive—or negative, means that nothing can be inferred about the direction of the effect of the population parameter of interest. We consider that a threshold of 75% or higher provides *substantial* information on the likely directional effect. This is our own consideration, but we acknowledge that this imposed threshold might be too high—or low, for other scholars. Therefore, the results are opened to other subjective interpretations.

[19]As commented on in Section 5.2, the construction of the $NORMS$ indicator is based on Bjørnskov (2006). He evaluates its impact on governance and life satisfaction and encourages scholars to asses the indicator in other contexts such as growth, since implications might differ upon context.

After the separate analysis of the three indicators, our results are in concordance with most of the previous literature using classical inferential methods, specially with those studies at country level. Our findings suggest that a positive effect of $TRUST$ and a negative effect of $NORMS$ is the most likely scenario. In some way, both indicators are two sides of the same coin and hence, we would expect that where social norms score worse, people trust less each other and vice versa (Knack and Keefer, 1997). However, the probability of $ACTIVE$ of being positive is considerably lower, casting some doubts on its effects. These results are in conflict with previous findings for the European regions. While previous literature casts some doubts on the implications of social capital on European regional growth, our results suggest that the positive effects of social capital on growth found in other contexts (mainly cross-country studies), also hold in European regions, specially for $TRUST$ and $NORMS$.

One likely explanation for this discrepancy is the heterogeneity in the sample. Beugelsdijk et al. (2004) compared the robustness of the cross-country results for the salient contributions by Knack and Keefer (1997) and Zak and Knack (2001). Their analysis, based on different robustness proofs, suggests that Zak and Knack's (2001) findings are far more robust because they introduce heterogeneity in the sample by considering 12 countries with lower levels of social capital. In the European regional context, the two previous contributions [Schneider et al. (2000) and Beugelsdijk and Van Schaik (2005)] are based on samples including relatively homogenous regions, mainly from Western Europe countries. However, we include regions from Nordic countries, which have traditionally held higher levels of social capital (see Figure 1) but especially post-communist regions from Central and Eastern Europe countries. As indicated throughout the study, the last are relatively low-social capital countries compared to their Western European peers and therefore, their inclusion introduces substantial heterogeneity in the sample. Additionally, the inclusion of these regions is also of interest because, as Paldam and Svendsen (2002) pointed out, despite the transition from the communist system to the market economy has made these countries grow faster than the European average,[20] the relatively low social capital levels in these countries has become a major obstacle for the convergence process.

Another reason that may be explaining the disparities in the results is related to the selected period. Opposite to Schneider et al. (2000) and Beugelsdijk and Van Schaik (2005), who focus on late nineties periods, we consider the last decade, characterized for being a period of unprecedented growth for most European regions. It has also been a period of deep changes in the European Union, due to the 2004 and 2007 enlargements. Within this plural and mul-

[20] According to the Neoclassical growth theory, the poorer regions should growth faster than the richer ones. Therefore, it is expected that the poorer regions *converge* to the richer. An excellent discussion on the Neoclassical model and the convergence hypothesis is provided in Mankiw et al. (1992) and Barro and Sala-i Martin (1992).

ticultural framework, social capital has been particularly relevant for promoting growth and convergence. In the benchmark of the European regions, even the poorest regions are richer than some of the countries included in cross-country studies. It means that in our sample there are not underdeveloped regions. The implications of this argument are interesting, since the role of social capital seems to be more important for those economies that have reached certain level of development. In this line, North (1990) pointed out that the returns of opportunism, cheating and shirking increase in advanced societies, since transactions are more complex as well. This argument has been theoretically supported by Putnam (1993), Fukuyama (1995) and Beugelsdijk and Van Schaik (2005). Recently, Peiró-Palomino and Tortosa-Ausina (2012) provide quantitative evidence on this argument. Consequently, following these arguments and our own results, the support for considering a positive role of social capital on the European regional growth is reasonable.

6.2. Results for the control variables

Although the main objective of this contribution is to focus on social capital, the estimations also yield results for the control variables included in the model. The results for the three models estimated are provided in Tables 4, 5 and 6, respectively. Figure 3 displays the results graphically. For each control variable, three results are provided, one for every model estimated (Models 1, 2 and 3). In general, results across models do not differ substantially, with the exception of those for CEE, which show the largest differences. In the following discussion, results will be mainly compared to those by Crespo-Cuaresma et al. (2012), since it is the most recent study for the European regional context. Additionally, they focus on a period similar to ours, although we extend the analysis with three additional years (2006, 2007 and 2008).

The $Intercept$ is positive with probabilities 75%, 64% and 71% for Models 1, 2 and 3, respectively. It would mean that, without considering the effect of the rest of the variables included in the model, the European regions have experienced positive economic growth during the period selected—although the results should be taken carefully in the light of the probabilities in Models 2 and 3. Regarding $GRPPC_0$, the mean is negative in Model 1 and positive in Models 2 and 3. The probability of having a positive sign is ranged in the interval 44% - 60%. These probabilities suggest that the effect is not really clear. Whereas one would theoretically expect a negative sign, which would imply convergence, a positive sign is not surprising in the European context, since global regional convergence has proved to be weak (Bartkowska and Riedl, 2012), and it rather obeys to different convergence clubs. However, the results by Crespo-Cuaresma et al. (2012) suggest regional convergence. The variable measuring the population growth $GPOP$ is centered on the negative side for the three models and the probability of being positive is in the vicinity of the 5%. This provides reasonable support on the negative effect of this variable, a result in concordance with the Neoclassical theory (see Mankiw et al., 1992, for example). The results for the population density $POPDENS$, show only a 10% probability of being positive (result for Model 2). This means that major agglomerations of people will probably be detrimental for growth.

The population parameter for gross fixed capital formation $GFCF$ is positive with probabilities around the 60%. This probability casts some doubts on its effect. This variable is positive in virtually all cross-country studies but, however, the implications of this kind of investment would be more linked to growth in economies in the earliest stages of development. The European regions however, despite showing remarkable differences both between and within countries, have reached relatively high levels of development. This ambiguity in the result is in line with Crespo-Cuaresma et al. (2012), whose Bayesian Model Averaging (BMA) analysis determined not to include $GFCF$ in the model. However, the indicator of human capital HK, measured as the percentage of workers with tertiary education, is positive with a probability over 93% in the three models. The result heavily supports the consideration of this variable as *robust* by Crespo-Cuaresma et al. (2012). In addition, it supports the argument that the European regional growth during the last decade might has been influenced by investment in knowledge, more than physical investment. When considering tertiary education, cross-regional differences are large, and they seem to corroborate that the differential growth patterns for the European regions may be related to the specialization in activities with high value added, intensives in skilled labor.

The results for the dummy variable $CAPITAL$ show that the probability of this variable of being positive is very high and similar across models (93% in Model 2 and 97% in Models 1 and 3). It implies that being a region with a capital city is positive for growth. Capital cities are poles of economic activity and it is not surprising that these regions grow above the others. Again the result supports Crespo-Cuaresma et al.'s (2012) findings for the European context. The results for CEE—i.e. a dummy indicating if a country joined the European Union in the 2004 or 2007 enlargements, are interesting. This parameter seems to be strongly correlated with the social capital parameters, since the posterior distribution shows remarkable changes depending on the model—i.e the indicator of social capital included. The probability of being positive for the three models is respectively, 47%, 65% and 32%.

The first interesting detail, is that the probability of being positive in Model 2 is larger than in Models 1 and 3, providing some insights on the narrow links between $TRUST$ (Model 1) and $NORMS$ (Model 3). Most intriguing is the fact that the probability of CEE of being positive is surprisingly low. Crespo-Cuaresma et al. (2012) considered being a Central Eastern Europe country as a robust positive determinant of growth. However, our results strongly corroborate the argument that, despite these regions should grow faster because they are relatively poorer, their relatively low social capital endowments may be strongly conditioning this process. This may help in explaining the relatively blurred impact found for CEE.

Finally, the posterior distribution for the spatial effects, ϕ, shows that these effects might have a negative influence with probabilities ranged in the interval 81% - 87%, depending on the model. That would lead to conclude that the growth of a region is negatively influenced by the growth of its neighbors. However, spatial effects in SAR models are highly sensible to the model specification and the nature of the distance matrix $\mathbf{W}$ (see Crespo-Cuaresma et al., 2012; Crespo Cuaresma and Feldkircher, 2012), and this negative result might obey to our specific model and matrix $\mathbf{W}$ selected.[21] Another likely reason is that the beneficial effects of the neighbors take place at more disaggregated level (NUTS 2). Note that countries such as Denmark, Finland or Slovakia are constituted by a single region and, perhaps, these positive influences not only disappear, but may also adopt negative forms.

7. Concluding remarks

The interest towards social capital as a factor conditioning economic growth processes has increased remarkably in the last two decades. Yet most of the previous literature in this context is focused on cross-country studies, whereas the contributions considering cross-regional samples are relatively scant, specially for the European context and for recent time periods. This study has contributed to the literature by assessing the role of different elements of social capital in a sample of 85 European regions for the period 1995 - 2008.

In doing so, it has relied on Bayesian methodologies, which have allowed to evaluate with some precision the probabilities of the different social capital indicators to have a positive impact on regional growth. Our results give substantial support to the arguments held by the social capital theory, and most of the findings in cross-country studies. The results suggest that higher levels of trust and better social norms may lead to more intense economic growth with probabilities over the 81% and 84%, respectively. However, little evidence is provided supporting the hypothesis that higher level of active participation in groups positively affects growth.

The enlarged European Union will face an scenario characterized by disparities, both economic and cultural. The political implications of our results have a remarkable long run out-

[21] Testing for alternative model specifications and the consistency of the results using other spatial matrices would be an interesting exercise, but it is out of the scope of this study.

look. They might be useful for the current socioeconomic context, but especially for the future challenges that are still yet to come. Special attention should be paid to Central Eastern regions. Contributions considering these regions are still scant, but some authors and our own results suggest that these regions show lower social capital levels, probably eroded by the long communist experience (see Rose, 2000; Paldam and Svendsen, 2002; Fidrmuc and Gërxhani, 2008). People in these regions show more tendency towards individual rent-seeking in front of greater cooperation and behaviors oriented to public wellbeing. Therefore, for these regions, the social change is an essential part for the social cohesion and the development process towards their Western peers.

The generation of social capital is not immediate, but, unfortunately, social change needs in some cases several decades to take place. Yet policymakers should take into consideration that economic growth is linked to education and knowledge diffusion which, at the same time, need from favorable social conditions—i.e healthy levels of trust and social norms. In this sense, the improvement of the institutional quality might be one of the fronts to start from, especially after the cases of corruption recently appeared in some European countries. Europe is changing and, in the relatively advanced European regions, perhaps, the role played by society in the near future will be more relevant than ever before.

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Table 1: Sample of regions

Country	ID*	Region	NUTS code
Austria	1	Ostösterreich	AT1
	2	Südösterreich	AT2
	3	Westösterreich	AT3
Belgium	4	Région de Bruxelles-Capitale	B1
	5	Vlaanderen	B2
	6	Wallonie	B3
Czech Republic	7	Czech Republic	CZ0
Germany	8	Baden-Württemberg	DE1
	9	Bayern	DE2
	10	Berlin	DE3
	11	Bradenburg	DE4
	12	Bremen	DE5
	13	Hamburg	DE6
	14	Hessen	DE7
	15	Mecklenburg-Vorpommern	DE8
	16	Niedersachsen	DE9
	17	Nordrhein-Westfalen	DEA
	18	Rheinland-Pfalz	DEB
	19	Saarland	DEC
	20	Sachsen	DED
	21	Sachsen-Anhalt	DEE
	22	Schleswig-Holstein	DEF
	23	Thüringen	DEG
Denmark	24	Denmark	DK0
Estonia	25	Estonia	EE0
Spain	26	Noroeste	ES1
	27	Noreste	ES2
	28	Comunidad de Madrid	ES3
	29	Centro	ES4
	30	Este	ES5
	31	Sur	ES6
	32	Islas Canarias	ES7
Finland	33	Manner-Suomi	FI1
France	34	Île de France	FR1
	35	Bassin Parisien	FR2
	36	Nord - Pas-de-Calais	FR3
	37	Est	FR4
	38	Ouest	FR5
	39	Sud-Ouest	FR6
	40	Centre-Est	FR7
	41	Méditerraneé	FR8
Greece	42	Voreia Ellada	GR1
	43	Kentriki Ellada	GR2
	44	Attiki	GR3
	45	Nissia Aigaiou, Kriti	GR4
Hungary	46	Közép-Magyarország	HU1
	47	Dunántúl	HU2
	48	Észak és Alföld	HU3
Italy	49	Nord-Ovest	ITC
	50	Nord-Est	ITD
	51	Centro	ITE
	52	Mezzogiorno	ITF
	53	Isole	ITG
Lithuania	54	Lietuva	LT0
Latvia	55	Latvija	LV0
Netherlands	56	Noord-Nederland	NL1
	57	Oost-Nederland	NL2
	58	West-Nederland	NL3
	59	Zuid-Nederland	NL4
Poland	60	Region Centralnyd	PL1
	61	Region Poludniowy	PL2
	62	Region Wschodni	PL3
	63	Region Pólnocno-Zachodni	PL4
	64	Region Poludniowo-Zachodni	PL5
	65	Region Pólnocny	PL6
Portugal	66	Continente	PT1
Romania	67	Macroregiunea unu	RO1
	68	Macroregiunea doi	RO2
	69	Macroregiunea trei	RO3
	70	Macroregiunea patru	RO4
Sweden	71	Östra Sverige	SE1
	72	Södra Sverige	SE2
	73	Norra Sverige	SE3
Slovakia	74	Slovensko	SK0
United Kingdom	75	North East England	UKC
	76	North West	UKD
	77	Yorkshire and the Humber	UKE
	78	East Midlands	UKF
	79	West Midlands	UKG
	80	East of England	UKH
	81	London	UKI
	82	South East	UKJ
	83	South West	UKK
	84	Wales	UKL
	85	Scotland	UKM

Table 2: Variables and statistical sources

Variable	Description	Source
GGRPPC	Average growth of real GRP per capita. Base year (€) 1999	Eurostat
$GRPPC_0$	GRP per capita (in logs) in 1995 or first year available. Base year (€) 1999	Eurostat
GPOP	Growth of population (fixed coefficient = 0.05 added)*	Eurostat
POPDENS	Inhabitants per km^2	Eurostat
GFCF	Gross fixed capital formation (share of GRP)	Eurostat
HK	Share of highly educated people (ISCED 5 and 6) in the working age	Eurostat
CAPITAL	1 = region with capital city; 0 = otherwise	-
CEE	1 = the country joined the E.U. in 2004 or 2007; 0 = otherwise	-
TRUST	Share of respondents who trust each other	EVS (1999 and 2008)
ACTIVE	Share of respondents who actively participate in associations	EVS (1999 and 2008)
NORMS	Compound indicator of social norms. Scaled in the interval [1-10]	EVS (1999 and 2008)

* We follow Mankiw et al. (1992) for this consideration. The fixed coefficient 0.05 represents technical advance and depreciation.

Table 3: Descriptive statistics

Variable	Obs.	Mean	s.d.	Min.	1st quartile	Median	3rd quartile	Max.
GGRPPC	85	0.056	0.037	0.006	0.032	0.045	0.060	0.174
$GRPPC_0$	85	9.341	0.898	7.067	9.126	9.645	9.934	10.683
GPOP	85	0.052	0.005	0.040	0.049	0.053	0.055	0.071
POPDENS	85	480.489	1,037.753	24.825	89.126	171.318	391.836	6,203.832
GFCF	85	0.209	0.042	0.116	0.184	0.198	0.230	0.326
HK	85	0.233	0.075	0.086	0.171	0.237	0.275	0.436
TRUST	85	0.338	0.153	0.124	0.235	0.326	0.388	0.850
ACTIVE	85	0.029	0.020	0.000	0.016	0.025	0.039	0.135
NORMS	85	2.145	0.376	1.089	1.902	2.144	2.383	2.900

Table 4: Summary for regressors in Model 1 ($TRUST$)

	Dependent variable: $GGRPPC$					
Variable	Mean	s.d.	2.5%	50%	97.5%	$\mathrm{P}(\beta > 0 \mid \boldsymbol{y})$
$Intercept$	0.0368	0.0551	-0.0713	0.0363	0.1457	0.7495
$GRPPC_0$	-0.0008	0.0058	-0.0126	-0.0007	0.0111	0.4361
$GPOP$	-0.4615	0.2893	-1.0320	-0.4667	0.0911	0.0569
$POPDENS$	-0.0000	0.0000	-0.0000	-0.0000	0.0000	0.0729
$GFCF$	0.0070	0.0319	-0.0544	0.0067	0.0736	0.5838
HK	0.0461	0.0270	-0.0078	0.0459	0.0976	0.9521
$CAPITAL$	0.0060	0.0033	-0.0005	0.0060	0.0124	0.9651
CEE	-0.1276	0.9398	-2.1338	-0.0621	1.6856	0.4701
$TRUST$	0.0111	0.0129	-0.0127	0.0110	0.0360	0.8154
ϕ	-0.0835	0.0759	-0.2371	-0.0835	0.0674	0.1317

Individual country fixed effects are included but not reported.
n=85

Table 5: Summary for regressors in Model 2 ($ACTIVE$)

	Dependent variable: $GGRPPC$					
Variable	Mean	s.d.	2.5%	50%	97.5%	$\mathrm{P}(\beta > 0 \mid \boldsymbol{y})$
$Intercept$	0.0200	0.0515	-0.0849	0.0198	0.1162	0.6387
$GRPPC_0$	0.0013	0.0052	-0.0086	0.0013	0.0115	0.5868
$GPOP$	-0.4916	0.2984	-1.1029	-0.4876	0.0663	0.0449
$POPDENS$	-0.0000	0.0000	-0.0000	-0.0000	0.0000	0.1058
$GFCF$	0.0117	0.0317	-0.0482	0.0132	0.0724	0.6457
HK	0.0431	0.0289	-0.0115	0.0426	0.1028	0.9421
$CAPITAL$	0.0053	0.0036	-0.0016	0.0054	0.0122	0.9271
CEE	0.2165	1.2580	-2.4070	0.3901	2.4560	0.6467
$ACTIVE$	0.0552	0.1420	-0.2218	0.0564	0.3269	0.6617
ϕ	-0.0774	0.0765	-0.2280	-0.0768	0.0766	0.1547

Individual country fixed effects are included but not reported.
n=85

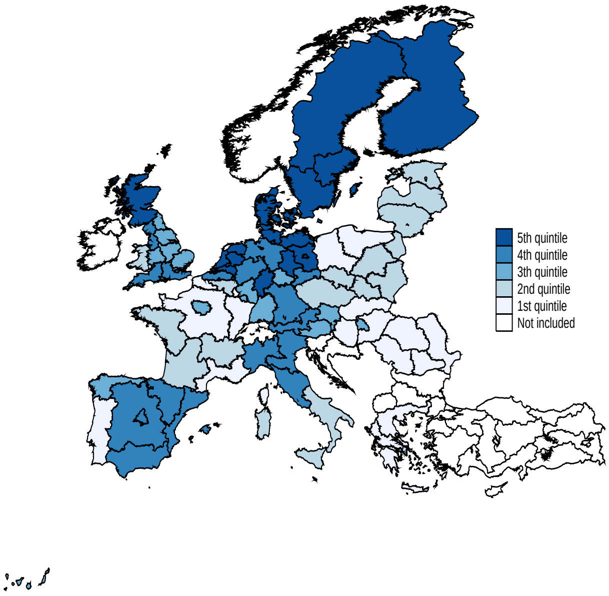
Table 6: Summary for regressors in Model 3 ($NORMS$)

	Dependent variable: $GGRPPC$					
Variable	Mean	s.d.	2.5%	50%	97.5%	$\mathrm{P}(\beta > 0 \mid \boldsymbol{y})$
$Intercept$	0.0268	0.0516	-0.0832	0.0277	0.1236	0.7086
$GRPPC_0$	0.0013	0.0052	-0.0089	0.0014	0.0120	0.6028
$GPOP$	-0.4500	0.2878	-1.0070	-0.4585	0.0969	0.0559
$POPDENS$	-0.0000	0.0000	-0.0000	-0.0000	0.0000	0.0479
$GFCF$	0.0076	0.0310	-0.0527	0.0077	0.0672	0.6008
HK	0.0452	0.0284	-0.0108	0.0461	0.0974	0.9331
$CAPITAL$	0.0060	0.0035	-0.0006	0.0060	0.0127	0.9681
CEE	-0.5663	1.0734	-2.5830	-0.6129	1.4779	0.3174
$NORMS$	-0.0044	0.0050	-0.0144	-0.0043	0.0056	0.1637
ϕ	-0.0637	0.0773	-0.2180	-0.0653	0.0849	0.2066

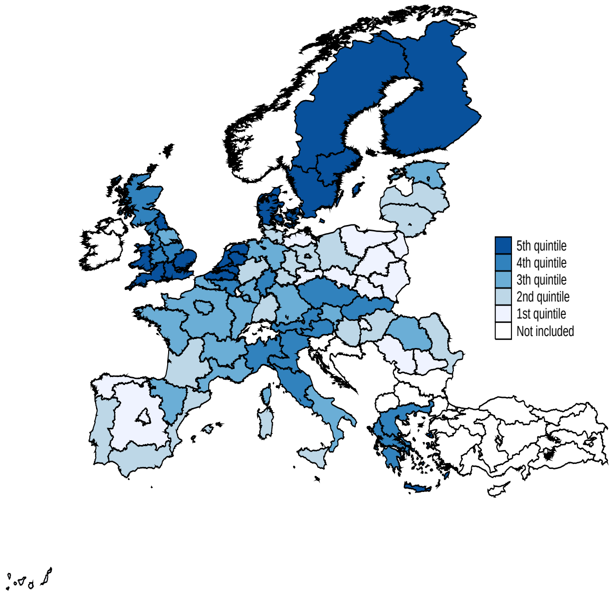
Individual country fixed effects are included but not reported.
$n = 85$

Figure 1: Social capital indicators

(a) Trust



(b) Active participation



(c) Social norms

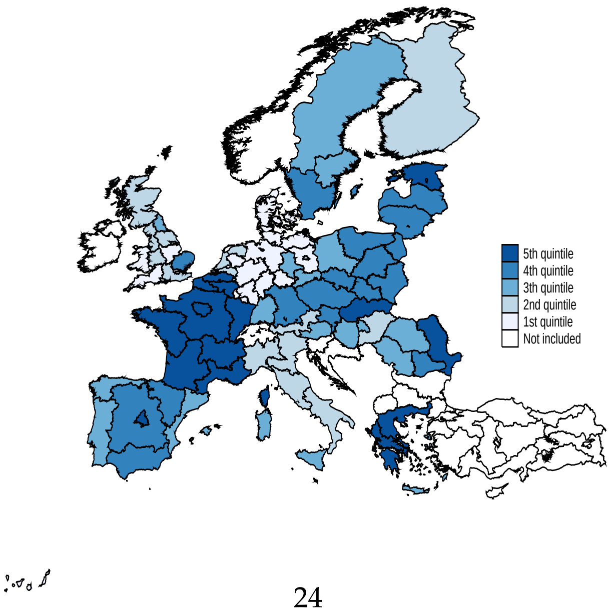
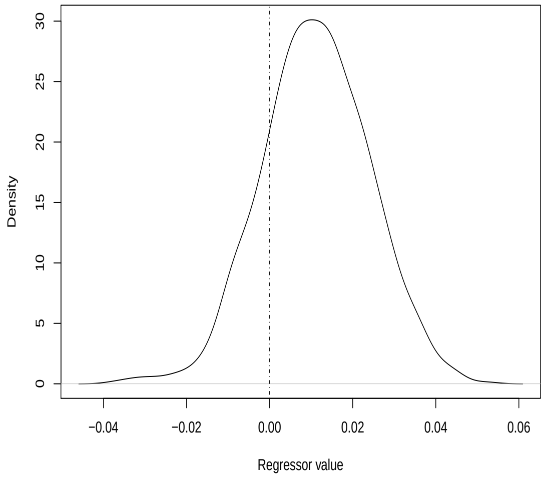
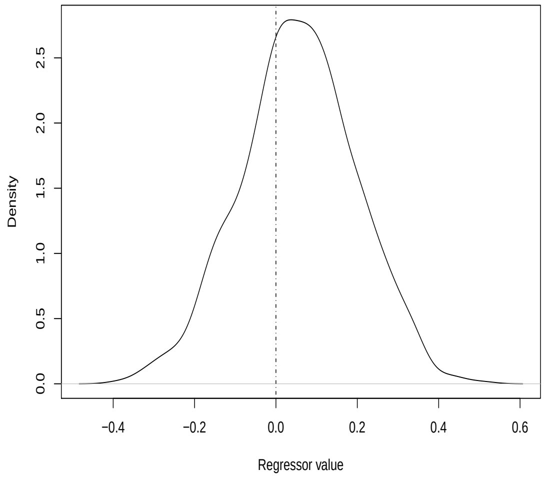


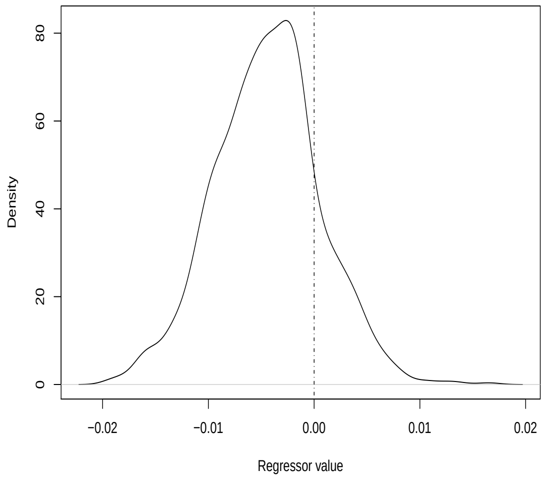
Figure 2: Posterior densities for the social capital indicators



(a) *TRUST*

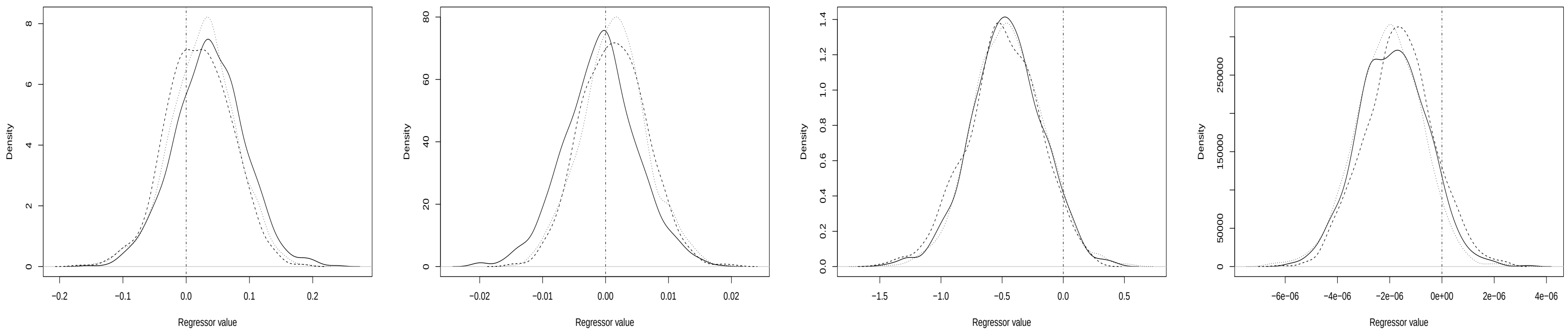


(b) *ACTIVE*

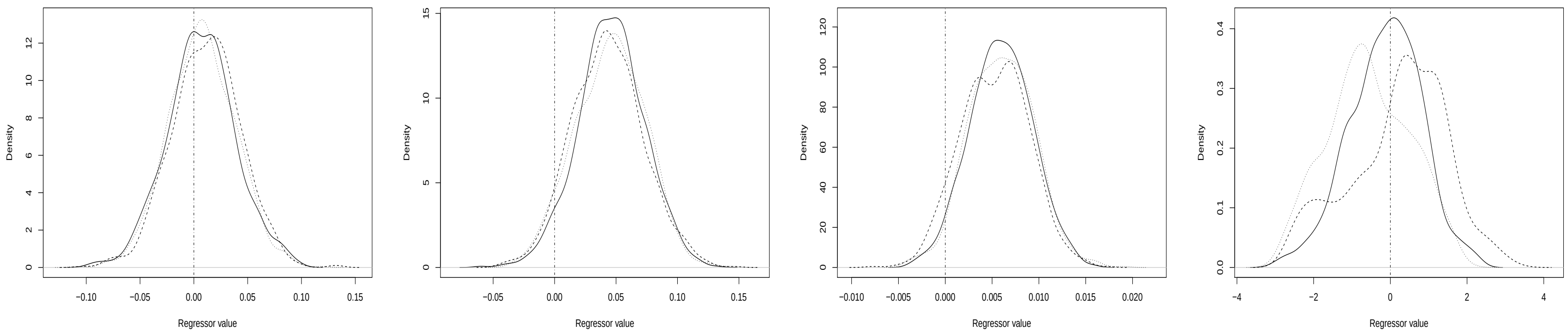


(c) *NORMS*

Figure 3: Posterior densities for the control variables



(a) $INTERCEPT$ **(b)** $GRPPC_0$ **(c)** $GPOP$ **(d)** $POPDENS$



(e) $GFCF$ **(f)** HK **(g)** $CAPITAL$ **(h)** CEE

Notes: Superimposed in the figures are the posterior density functions for the control variables for the Models 1, 2 and 3. The solid, dashed and doted lines correspond to Model 1 ($TRUST$), Model 2 ($ASSOC$) and Model 3 ($NORMS$), respectively.