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Jesús Peiró Palomino
Anabel Forte Deltell
Emili Tortosa-Ausina

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Jesús Peiró Palomino[1]
Anabel Forte Deltell[1]
Emili Tortosa-Ausina[2]

[1] *UNIVERSITY JAUME I*
[2] *THE VALENCIAN INSTITUTE OF ECONOMIC RESEARCH (IVIE)*

Abstract

This working paper analyzes the role of different elements of social capital in economic growth for a sample of 85 European regions during the period 1995-2008. Despite the remarkable progress that social capital and European regional economic growth literatures have experienced over the last two decades, initiatives combining the two are few, and entirely yet to come for the post-1990s period. Recent improvements in data availability allow this gap in the literature to be closed, since they enable the researcher to consider the traditionally disregarded Central and Eastern European regions. This is particularly interesting, since they are all transition economies that recently joined the European Union, with relatively low levels of social capital. On the methodological side, we follow the Bayesian paradigm, which enables us to make direct inferences on the parameters to be estimated and deal with parameter uncertainty, leading to a deeper understanding of the relationships being investigated. Contrary to other contributions for the European context, results suggest, among other findings, that trust and social norms might have some implications for regional growth, whereas the role of active participation in groups remains unclear.

Key words

Bayesian inference, economic growth, European regions, social capital.

Resumen

Este documento de trabajo analiza el papel de los diferentes elementos del capital social en el crecimiento económico para una muestra de 85 regiones europeas durante el periodo 1995-2008. A pesar de los notables avances que la literatura sobre capital social y sobre el crecimiento económico de las regiones europeas ha experimentado en las últimas dos décadas, hay pocos trabajos que combinen ambos análisis y no existe ninguno sobre el periodo posterior a los 90. Las recientes mejoras en la disponibilidad de datos posibilitan cerrar esta brecha de la literatura, puesto que permiten al investigador considerar las regiones de Europa central y oriental, tradicionalmente ignoradas. Esto es particularmente interesante, ya que son economías en transición que se han incorporado recientemente a la UE y con niveles de capital social relativamente bajos. Por lo que a la metodología se refiere, utilizamos un enfoque bayesiano, que nos permite realizar inferencias directamente sobre los parámetros a estimar, y lidiar con su incertidumbre, facilitando una comprensión más profunda de las relaciones investigadas. Contrariamente a otras contribuciones para el contexto europeo, los resultados sugieren, entre otras conclusiones, que las normas sociales y de confianza influyen en el crecimiento regional, mientras que el papel de la participación activa en grupos permanece incierto.

Palabras clave

Inferencia bayesiana, crecimiento económico, regiones europeas, capital social.

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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 and this is a handicap for scholars to easily bring the concept from theory to empirical applications. However, Putnam (1993) proposed a definition that quickly became widely accepted, namely, the "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 disparities in institutional and economic performance in Italy, scholars began to consider social capital as a potential driver for economic development in other geographical contexts. We may even consider that the wide array of relevant theories and results arising from different studies has contributed to the increasing attention paid to social capital in the economic growth literature, which also includes relevant textbooks such as Acemoglu (2008).

Today, the number of contributions at the country level has increased remarkably, with relevant publications including Knack and Keefer (1997), Whiteley (2000), Zak and Knack (2001), Dearmon and Grier (2009), or Doh and McNeely (2011). However, at the regional level, which was actually the tenor of Putnam's pioneering study, contributions are still scant. The case of the European regional context is not an exception, and considering regions in Europe rather than countries is not trivial, since one third of the European budget is devoted to regional policies. More specifically, the European Union (EU) has specific policies (known as the Regional Policy of the EU or Cohesion Policy) addressed to both improve the economic well-being of its regions (i.e. to promote growth) and to reduce the magnitude of regional disparities (i.e. to promote convergence). There has been a corresponding growth in the literature analyzing how growth and convergence patterns in the EU have evolved over the last three decades, and especially since the 1980s, when some of the Cohesion countries (Greece, Ireland, Portugal and Spain) had just joined the former European Economic Community. Relevant examples of this literature include, but are not restricted to, Sala-i-Martin (1996), Quah (1996), López-Bazo et al. (1999), Neven and Gouymte (1995), Canaleta et al. (2002), Rodríguez-Pose and Fratesi (2004), and Ezcurra et al. (2007), among many others, which deal with different aspects of European regional growth and convergence.

In this specific geographic and institutional setting, if we constrain the focus of the analysis to the impact of social capital on regional economic growth, the number of contributions shrinks dramatically. Significant examples include Schneider et al. (2000) and Beugelsdijk and Van Schaik (2005), both of which confine their analysis to the late nineties. However, their results using the common proxies for social capital—i.e. trust and density of associations—not only partly contradict what social capital theories predict, namely that social capital positively affects growth, but also those results found by other studies at both the country and regional level. In particular Schneider et al. (2000) found that trust was negatively related to growth, whereas Beugelsdijk and Van Schaik (2005) found non-significant effects from trust to growth but reported a positive effect from associations to growth.

Meanwhile, from a methodological point of view, some of the limitations revealed by the most commonly used parametric (frequentist) analyses in order to set robust arguments in economic growth models have led scholars such as, for instance, Henderson et al. (2011) to use alternative non-parametric methodologies. One particular branch of the economic growth literature has been paying detailed attention to Bayesian methods, popularized by Fernández et al. (2000). The reasons why Bayesian methods have been considered in a variety of studies are partly related to the fact that there is no need to make preliminary assumptions on the parameters to be estimated, providing a mathematical framework to deal with complex problems with many possible and interacting sources of uncertainty. In the particular field of economic growth, the available studies (see, for instance, Durlauf et al. 2012; Crespo-Cuaresma et al. 2011, 2012; Moral-Benito 2012) have confined their choices to Bayesian Model Averaging (BMA), a powerful instrument for variable and model selection; however contributions in the field of growth using Bayesian methods to make inference are virtually nonexistent.

However, this debate on models, methods, etc. has not been transferred to the literature on the impact of social capital on regional European growth, which is especially relevant taking into account that the existing studies partly contradict well-established theories on the impact of social capital on growth. In this context, our study evaluates the role of different dimensions of social capital on the economic growth of 85 European regions for the 1995-2008 period. With respect to the existing literature, the contribution is twofold. First, as opposed to previous approaches in this literature, most of which were frequentist, we consider Bayesian (inference) methodologies. In classical statistics, inference relies heavily on the fulfillment of many assumptions which are often violated, especially when dealing with small samples as is

common in economic growth studies. Bayesian analyses, which in our particular study will be based on the use of conditional posterior densities of the variables under study simulated by Markov Chain Monte Carlo (MCMC) methods, might provide a better framework to deal with these drawbacks. Bayesian methods have never been used in the specific context of social capital and economic growth, and their consideration may shed some light on the implications of social capital for growth, the links between which have not been entirely uncovered despite the remarkable research initiatives of the last few years.

A second contribution is related to the selected sample, which not only is larger than previous studies, but also includes regions from Central and Eastern Europe countries that joined the EU in the 2004 and 2007 enlargements. Previous evidence on the links between social capital and regional growth in Europe is exclusively confined to Western region samples. The interest in considering the new members, basically Eastern European regions, lies in the fact that most of them are transition countries with highly eroded social capital levels and, nowadays, they have relatively low social capital levels compared to their Western counterparts (Fidrmuc and Gerxhani 2008). Although several studies (see, for instance, Ezcurra et al. 2007; Crespo-Cuaresma et al. 2012) have focused on growth and convergence processes in the Eastern European regions, social capital issues have not yet been addressed. In addition, apart from the large size of the sample, including regions from both Eastern and Western Europe, this study encompasses a period for which there is no previous evidence on the links between social capital and growth. This period (1995-2008) is particularly relevant for two reasons: (i) it was a period of unprecedented growth for most European regions; (ii) it witnessed profound changes in the EU, including the enlargement to include 15 new members (corresponding to the 1995, 2004 and 2007 enlargements), the creation of the Eurozone (1999), and advances in integration at different levels (corresponding to the Amsterdam, Nice and Lisbon treaties).

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

2. On the Links between Social Capital and Economic Growth

THE theory states that social capital has positive implications for the performance of organizations as well as stimulating economic growth at the society level. The concept of *social capital* firstly appeared in Hanifan (1916), who found that social attitudes such as cooperation and participation were essential for rural schools in the state of Virginia to function well. Following a long parenthesis, sociological studies such as Arrow (1972) and Sen (1977) argued that the existence of social capital in society plays a major role in systems operations and that societies need some norms and rules of conduct to be viable. However, studies formally evaluating the implications of social capital on institutional and economic performance from a macroeconomic perspective did not appear until the nineties; of particular note were the contributions from Putnam (1993) and Knack and Keefer (1997).

The links between social capital and economic development are complex and heterogeneous, and some authors such as Torsvik (2000) call for a major clarification of the channels through which social capital affects growth. Despite the difficultly of this task, virtually all scholars agree that the effects of social capital are seen in reduced transaction costs. Putnam's (1993) definition of social capital suggests that it facilitates coordination and cooperation for mutual benefit, whereas Whiteley (2000) concludes that social capital helps in solving problems of collective action and in reducing the incentives for opportunism and egoism. Aligned with these arguments are those by Knack and Keefer (1997), who argue that social capital reduces the cost of monitoring possible free-riding behavior.

Therefore, economic transactions in economies with a 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 legal contracts in poorer economies, as well as facilitating complex transactions in the richer ones (Fukuyama 1995). In a broad sense, therefore, it improves efficiency, which in turn positively impacts on aggregate economic output (Putnam 1993). This may occur as a result of an increase in information flows, groups, flexibility and coordinated actions (Durlauf and Fafchamps 2005), as well as the reduction of information asymmetries between agents in negotiations (Dearmon and Grier 2009). The above effects also led to an increase in productivity levels, as recently suggested by Dettori et al. (2012) for a sample of European regions.

Following the above arguments, social capital might be understood as an informal legal framework. Ahlerup et al. (2009), using an indicator of trust as a proxy for social capital, concluded that the major effects of social capital take place in societies with weak formal institutional frameworks. When transactions cannot be formally guaranteed, the informal framework provided by social capital might become essential, although in areas with more a reliable institutional framework, the influence of social capital is more limited. However, there is no broad consensus on this point and other authors such as Beugelsdijk and Van Schaik (2005) have suggested that social capital is relevant even where the institutional framework is strong.

Other variables might be affected by social capital, which at the same time are positively linked to economic development —i.e., they would be considered as indirect channels. Among them, Knack and Keefer (1997) and Dearmon and Grier (2011) found a positive relationship between social capital and physical capital investment. Social capital is also transmitted through better education, as found by Dearmon and Grier (2011), Bjørnskov (2009) or Bjørnskov and Méon (2013). At the same time, social capital stimulates technological innovation and facilitates knowledge diffusion (Akçomak and Ter Weel 2009; Miguélez et al. 2011) as well as being positively related to agents' participation in the credit market (Guiso et al. 2004). Finally, Guiso et al. (2009) found that trust—the most common form of social capital—is essential for trade, especially for complex products; Bjørnskov (2012) also found significant links between social capital and better governance. These effects tend to be self-reinforcing and cumulative. That might involve regions in virtuous 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, recent contributions such as Uslaner (2008), Algan and Cahuc (2010) and Nunn and Wantchekon (2011) suggest that social capital exhibits a strong heritable component, and its stock is remarkably stable over time. Therefore, causality running from economic growth to social capital is not plausible. This has been well corroborated by Bergh and Bjørnskov (2011a, 2011b) and Fairbrother and Martin (2013), who find links from social capital to welfare, income equality and economic development, but not for the inverse causal relationship. Bjørnskov (2012) provides additional evidence and concludes that the effects from social capital to economic growth are channeled through schooling and better governance, and not inversely[1]. Therefore, the above arguments strongly support previous theoretical considerations on this issue.

[1] These studies test the exogeneity of trust, which undoubtedly is a specific dimension of social capital. Ideally, all the social capital elements would have been tested, but evidence on that point is yet to come.

3. Sample and Data on Social Capital

3.1. The sample

We consider 85 regions at NUTS[2] level 1 for the period 1995-2008[3]. While most studies on European growth and convergence are conducted at NUTS level 2 (more disaggregated), our choice is heavily affected by social capital data limitations, which will be commented on in detail in section 3.2. Although our relatively high level of aggregation considerably reduces the number of observations, some authors such as Boldrin and Canova (2001) and Basile (2008) criticize the use of NUTS level 2 for growth and convergence analysis, arguing that some NUTS level 2 are artificially separated from their hinterland. In addition, previous evidence for Europe considering the role of social capital, such as Beugelsdijk and Van Schaik (2005), is also reported at NUTS level 1. The regions considered are listed in table 1 and graphically displayed in map 1.

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

However, the results for trust are encouraging, and they lead us to expect similar results for other social capital indicators, given that they are all of a similar nature —i.e., they are social features.

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

[3] The change in the methods used to measure 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.

TABLE 1 *(cont.):* **Sample of regions**

Country	ID*	Region	NUTS code
	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

TABLE 1 *(cont.):* **Sample of regions**

Country	ID*	Region	NUTS code
	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

* ID numbers are linked to the regions plot in map 1.

MAP 1: **European regions (NUTS level 1)**

3.2. Social capital variables

The multifaceted nature of social capital has led scholars to use different indicators as proxies for social capital. Although the most accepted proxies are social trust and associational life, authors frequently combine them with elements they choose themselves, a 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 combined together 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 also be 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[4]. 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 subsection 3.1, 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[5]. Another problem is that when data at the smallest level of disaggregation is available (NUTS level 2), the number of individual surveys conducted at that level is too small (lower than 20 surveys in some areas) to be considered a representative sample of the area under study. These two constraints, i.e., the availability and the reliability of the sample, make it more appropriate to confine the analysis to NUTS level 1.

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[4] 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.

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

3.2.1. Trust

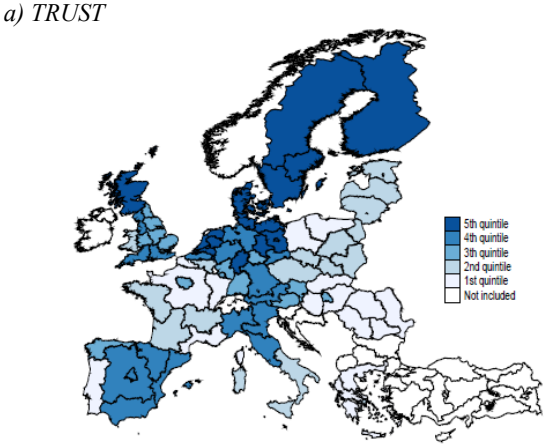
The number of studies considering this indicator is substantial; some of the most relevant are Knack and Keefer (1997), Zak and Knack (2001), Schneider et al. (2000), Beugelsdijk and Van Schaik (2005) and Dearmon and Grier (2009). To measure the stock of interpersonal trust, virtually all the previous 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 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".

Panel (a) of map 2 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, especially 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[6], the south of Italy, the Greek regions, and the regions corresponding to the recent EU entrants from the Eastern European countries. Focusing on these latter regions, the picture widely supports the findings by Paldam and Svendsen (2001) and Fidrmuc and Gerxhani (2008), who concluded that the communist experience heavily affected levels of trust. Some within-country differences are especially relevant, as for instance those between the north and the south of Italy, which would corroborate Putnam's (1993) findings.

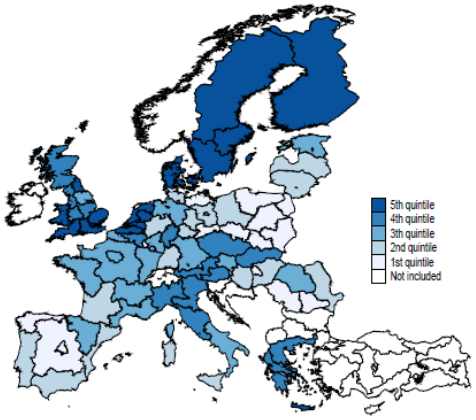
[6] Note that the French regions have one of the lowest social capital levels in Western Europe. Although this result is surprising, the pictures are consistent with previous findings using other databases and country level data. See Algan and Cahuc (2007) for an excellent discussion on the French case.

MAP 2: **Social capital indicators**

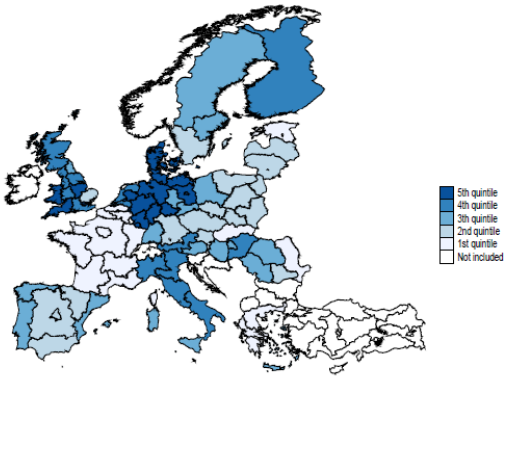
a) TRUST



b) ACTIVE



c) NORMS



3.2.2. Active participation

Another indicator in this context is the one measuring networks, commonly proxied by 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)[7] within fifteen different associations. The question to quantify active

[7] 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 latter 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).

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[8].

Panel (b) of map 2 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, Austria, northern Italy and Greece also have rates of active participation above the mean. Some Central European countries such as the Czech Republic and Slovakia present relatively high active participation levels, whereas some Spanish and Polish regions show the lowest rates.

3.2.3. Social norms

Finally, we consider social norms. The index is based on the responses about the extent to which a variety of actions are justified. The question asked was, "Do you consider that the following actions are justified...?": a) claiming state benefits to which one is not entitled; b) cheating on tax; c) accepting a bribe; and d) avoiding fares in public transport. The answers range from 1 ("never justified") to 10 ("always justified"). Action d) (avoiding fares in public transport) is not available in the survey corresponding to 1999. Despite this minor inconvenience, we averaged the results with the 2008 wave, which includes the four questions; merging the two indices is by no means problematic[9]. We averaged the answers to the four questions in order to construct the indicator for social norms *(NORMS)*, which

[8] 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 the two ways of calculating the indicator are not especially relevant.

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

lies in the interval [1-10]. The closer the values are to 10, the worse the social norms[10]. In order to ease interpretation—contrary to the other two indicators, higher values of this indicator correspond to worse scores—we carried out a linear transformation of the scores. After this transformation, the higher the value, the better the score in social norms.

The scores, shown in panel (c) of map 2, reveal some interesting patterns. In general terms, in areas where trust is poor, social norm scores are poorer and vice versa. Therefore, most of the UK regions, Denmark, the Dutch regions and some regions in northern Germany present the best scores. The Scandinavian countries and, perhaps surprisingly considering the previous literature, both the southern and the northern regions of Italy also have relatively good scores. In contrast, the regions from Eastern European countries score generally quite poorly in 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 present the worst levels.

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 open-endedness". Recent studies by Crespo-Cuaresma etal. (2011), Crespo-Cuaresma et al. (2012) on the European regions advocate 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 made up of a set of European regions, our strategy is to consider a model that includes those robust variables found by Crespo-Cuaresma et al. (2012)[11], together with other variables considered by Henderson et al. (2011) as basic

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

[11] 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, although the latter is not included in our model because we also consider fixed effects and therefore they might be also capturing this feature.

growth determinants[12]. Additionally, we include the social capital indicators explained in detail in section 3.2. 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 approach to SAR models). Both country fixed effects and spatial effects have been proved to be relevant in the European context (see Basile, 2008; Crespo-Cuaresma et al. 2012, for instance). In doing so, a contiguity matrix W is introduced, considering neighboring regions as those with shared borders.

The model can be expressed as:

$$GGRPPC_i = \alpha + \boldsymbol{\beta}\mathbf{x}_i + \gamma SC_i + \delta_{COUNTRY_i} + \varphi v_i^{-1}\mathbf{W}_i\mathbf{GGRPPC} + \varepsilon_i \quad for \quad i = 1,\ldots,85 \qquad (1)$$

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.

— $\mathbf{x}_i$ 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 preceding section) and $\boldsymbol{\gamma}$ is the associated regression coefficient.

— In the fixed effects part, $COUNTRY_i$ is the corresponding country for region *i*, and $\boldsymbol{\delta}$ 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, **W** is a neighboring 85 × 85 matrix where $W_{ij} = 1$ if regions *i* and *j* are neighbors and 0 otherwise ($\mathbf{W}_i$ refers to row *i* in **W**); v_i is the number of neighbors of region *i* hence, the product $v_i^{-1}\mathbf{W}_i\mathbf{GGRPPC}$ is the mean growth for the neighbors of region *i*. Finally φ measures the strength of this relationship.

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

— The disturbances are measured by a white noise error: $\varepsilon_i \sim N(0,\sigma^2)$.

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

$$GGRPPC \sim N_p(\alpha + \boldsymbol{\beta}\mathbf{x}_i + \gamma SC_i + \delta_{COUNTRY_i}, \boldsymbol{\Sigma}) \quad (2)$$

with

$$\boldsymbol{\Sigma} = (I_n - \phi\mathbf{v}^{-1}\mathbf{W})^{-1}\sigma^2\mathbf{I}_p(I_n - \phi\mathbf{v}^{-1}\mathbf{W}) \quad (3)$$

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

The control variables included in $\mathbf{x}_i$ 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 of working age with tertiary studies; and vi) *CAPITAL*, which equals one for regions with capital cities and zero otherwise.

The social capital indicator, *SC*, varies among three different elements, namely, *TRUST*, *ACTIVE* and *NORMS*, whose nature and construction are explained in detail in section 3.2. 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. *Model 4* considers the three indicators simultaneously. 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.

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	—
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	7.855	0.376	7.100	7.617	7.856	8.098	8.911

* This variable has been rescaled to ease interpretation. Higher values correspond to better scores.

5. A Brief Outline of the Bayesian Methods

AS commented on in the Introduction, in this contribution we follow the Bayesian paradigm in order to make inferences 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 the researcher's prior knowledge about the unknown parameters to be incorporated into the inferential process. This information needs

to be expressed in probabilistic terms in what is known as *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 $\mathbf{y}$ is obtained as:

$$\pi(\boldsymbol{\theta} \mid \mathbf{y}) = \frac{f(\mathbf{y} \mid \boldsymbol{\theta})\pi(\boldsymbol{\theta})}{m(\mathbf{y})} \tag{4}$$

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

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

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 the problem of mathematical manipulation is 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 interpret 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 to 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 made. 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 WinBUGS package (Spiegelhalter et al. 2003).

Another important issue within the Bayesian framework is the assignment of prior distributions, which capture the researcher's knowledge prior to 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. In particular we consider independent prior distribution for each of the parameters:

— $\pi(\alpha) = (0,10)$

— $\pi(\beta) = \prod_{i=1}^{7}(0,10)$

— $\pi(\delta) = \prod_{i=1}^{20}(0,10)$

— $\pi(\phi) = U(l_n^{-1}, l_1^{-1})$ where l_n and l_1 are the maximum and minimum eigen values of W as recommended in Oliveira and Song (2008) to ensure the non-singularity of the final covariance matrix $\Sigma = (I_n - \phi v^{-1}W)^{-1}\sigma^2 I_p (I_n - \phi v^{-1}W)$.

— $\pi(\sigma) = U(0,1.5)$.

6. Results

FOLLOWING the Bayesian paradigm, inference can be made directly from the posterior densities of the estimated parameters. 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, which means that we know the probability of a parameter 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*[13], 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 Models 1, 2 and 3 respectively, and simultaneously in Model 4.

Focusing on the interpersonal trust indicator (*TRUST)* (Model 1), results are provided in table 4, while panel (a) of figure 1 represents the graphical counterpart. The posterior density for *TRUST* in panel (a) shows that the largest amount of the probability mass (80.2%, see the last column in table 4) is on the positive side. Therefore, our results seem to be indicating that the population parameter for *TRUST* is positive with a probability of 80.2%. Table 4 also reports a 95% credible interval, bounded by the two tails of the distribution (quantiles 2.5% and 97.5%). While our results do not provide irrefutable proof of the hypothetical positive effect of *TRUST* on growth, the support is substantial and aligns 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 variations in the samples, periods, and variables chosen, some of the likely reasons underlying these disparities in the results are discussed at the end of this section.

[13] 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.

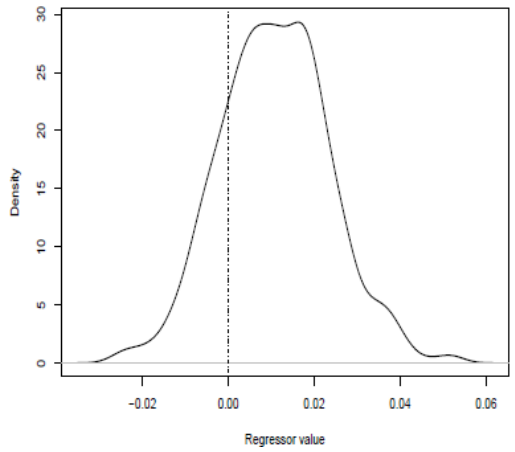
TABLE 4: **Summary for regressors in Model 1 *(TRUST)***

Variable	Dependent variable: *GGRPPC*					
	Mean	**s.d.**	**2.5%**	**50%**	**97.5%**	**P (β > 0 | y)**
Intercept	0.0385	0.0581	-0.0735	0.0394	1.0006	0.7465
$GRPPC_0$	-0.0010	0.0062	-0.0140	-0.0008	1.0006	0.4331
GPOP	-0.4472	0.2879	-1.0267	-0.4346	1.0016	0.0489
POPDENS	-0.0000	0.0000	-0.0000	-0.0000	1.0000	0.0729
GFCF	0.0070	0.0323	-0.0587	0.0058	0.9996	0.5818
HK	0.0465	0.0279	-0.0070	0.0465	1.0034	0.9531
CAPITAL	0.0057	0.0032	-0.0006	0.0057	1.0005	0.9571
TRUST	0.0108	0.0127	-0.0131	0.0107	1.0006	0.8024
φ	-0.0889	0.0748	-0.2385	-0.0886	1.0009	0.1158

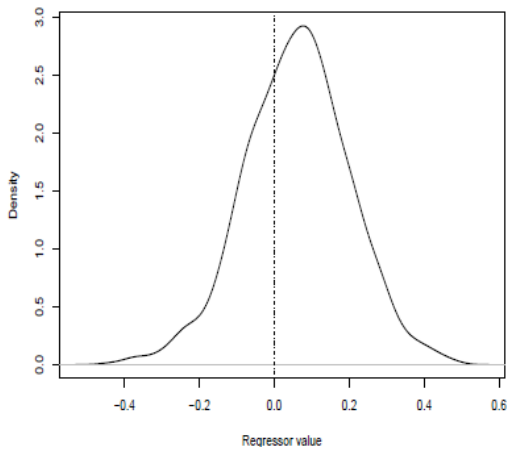
Note: Individual country fixed effects are included but not reported. $n = 85$.

FIGURE 1: **Posterior densities for the social capital indicators**

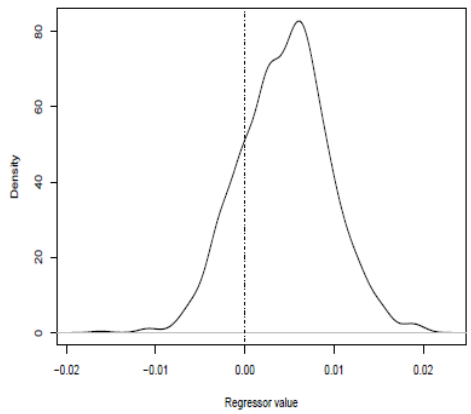
A) TRUST



B) ACTIVE



C) NORMS



C) TRUST, ACTIVE and NORMS

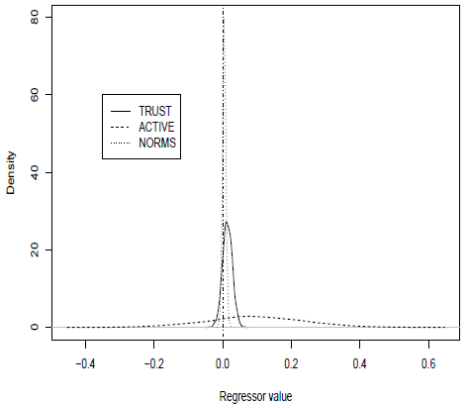


TABLE 5: **Summary for regressors in Model 2 *(ACTIVE)***

Variable	Dependent variable: *GGRPPC*					
	Mean	**s.d.**	**2.5%**	**50%**	**97.5%**	**P (β > 0 | y)**
Intercept	0.0213	0.0521	-0.0842	0.0222	0.1244	0.6766
$GRPPC_0$	0.0011	0.0053	-0.0089	0.0011	0.0116	0.5888
GPOP	-0.4673	0.3089	-1.0699	-0.4652	0.1258	0.0589
POPDENS	-0.0000	0.0000	-0.0000	-0.0000	0.0000	0.1148
GFCF	0.0121	0.0332	-0.0533	0.0118	0.0751	0.6547
HK	0.0422	0.0293	-0.0149	0.0431	0.1009	0.9251
CAPITAL	0.0054	0.0034	-0.0013	0.0053	0.0123	0.9461
ACTIVE	0.0597	0.1401	-0.2347	0.0629	0.3277	0.6766
φ	-0.0785	0.0764	-0.2277	-0.0779	0.0647	0.1507

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

Regarding the active participation indicator *(ACTIVE)* (Model 2), table 5 provides the analytical results while panel (b) of figure 1 illustrates the results graphically. Notice that the distribution is more centered at 0 than for the *TRUST* indicator. In particular, the 67.6% of the probability mass is on the right side. Although the population parameter for *ACTIVE* is more likely to be positive rather than negative, the support for such a positive effect is substantially lower than that 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 kinds of groups, those promoting cooperation for general welfare (e.g. welfare organizations or cultural groups), and others aimed at rent-seeking, which constitute lobbies (e.g. political parties and professional organizations)[14]. For a direct comparison with the previous literature using the *ACTIVE* indicator in the European regional context, we turn to Beugelsdijk and Van Schaik (2005), who

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

found a significant positive effect[15]. In the light of our results, however, little can be inferred about the implications of *ACTIVE*[16].

TABLE 6: **Summary for regressors in Model 3 *(NORMS)***

Variable	Dependent variable: *GGRPPC*					
	Mean	**s.d.**	**2.5%**	**50%**	**97.5%**	**P (β > 0 | y)**
Intercept	-0.0175	0.0674	-0.1456	-0.0184	0.1263	0.3802
$GRPPC_0$	0.0013	0.0055	-0.0099	0.0013	0.0122	0.6028
GPOP	-0.4420	0.2982	-0.9999	-0.4496	0.2064	0.0788
POPDENS	-0.0000	0.0000	-0.0000	-0.0000	0.0000	0.0639
GFCF	0.0076	0.0326	-0.0563	0.0079	0.0759	0.6008
HK	0.0442	0.0282	-0.0107	0.0444	0.0997	0.9471
CAPITAL	0.0061	0.0034	-0.0010	0.0061	0.0126	0.9611
NORMS	0.0045	0.0049	-0.0048	0.0047	0.0141	0.8094
φ	-0.0601	0.0760	-0.1973	-0.0619	0.0946	0.2066

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

Considering the indicator of social norms (*NORMS*) (Model 3), the 95% credible interval provided in table 6 and the density plot in panel (c) of figure 1 show that the largest amount of the posterior probability density is beyond 0. The probability that this indicator will be positive is 80.9%. Therefore, results suggest that civic attitudes towards actions like the ones considered in the construction of this indicator (see section 3.2) are probably relevant for growth. This result is in line with Knack and Keefer (1997), which, to our knowledge, is the only study in the context of growth to consider an indicator of civic norms similar to the one used in this study[17].

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

[16] 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 open to other subjective interpretations.

[17] As commented on in section 3.2, the construction of the *NORMS* indicator is based on Bjørnskov (2006). He evaluates its impact on governance and life satisfaction and encourages scholars to assess the indicator in other contexts such as growth, since implications might differ according to context.

Finally, we estimate Model 4, which considers the three indicators simultaneously. The results, shown in table 7 and in panel (d) of figure 1, remain essentially unaltered, although the probability mass on the right of zero increases for the three indicators up to 83.6%, 75.7%, 81.2% for *TRUST*, *ACTIVE* and *NORMS*, respectively, which reinforce the findings in Models 1, 2 and 3.

table 7: Summary for regressors in Model 4 *(TRUST, ACTIVE, NORMS)*

Variable	Dependent variable: *GGRPPC*					
	Mean	**s.d.**	**2.5%**	**50%**	**97.5%**	**P (β > 0 | y)**
Intercept	0.0027	0.0720	-0.1474	0.0043	0.1448	0.5259
*GRPPC*0	-0.0013	0.0062	-0.0139	-0.0012	0.0104	0.4202
GPOP	-0.4843	0.2979	-1.0696	-0.4884	0.1159	0.0549
POPDENS	-0.0000	0.0000	-0.0000	-0.0000	0.0000	0.0828
GFCF	0.0043	0.0329	-0.0648	0.0047	0.0648	0.5719
HK	0.0482	0.0285	-0.0059	0.0475	0.1062	0.9641
CAPITAL	0.0064	0.0036	-0.0003	0.0064	0.0134	0.9681
TRUST	0.0139	0.0142	-0.0138	0.0136	0.0421	0.8363
ACTIVE	0.0950	0.1449	-0.1890	0.0933	0.3840	0.7575
NORMS	0.0044	0.0052	-0.0059	0.0043	0.0146	0.8124
φ	-0.0644	0.0770	-0.2087	-0.0649	0.0958	0.1906

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

After both the separate and the joint analysis of the three indicators, our results are in concordance with most of the previous studies using classical inferential methods, especially with those at country level. Our findings suggest that a positive effect of *TRUST* and *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 achieve poorer scores, people trust each other less and vice versa (Knack and Keefer 1997). However, the probability of *ACTIVE* 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 raises 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) compare 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 evidence of robustness, 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 homogeneous regions, mainly from Western European countries. However, we include regions from the Nordic countries, which have traditionally held higher levels of social capital (see map 2), and in particular post-communist regions from Central and Eastern European countries. As indicated throughout the study, this latter group comprises relatively low-social capital countries compared to their Western European peers and therefore, their inclusion introduces substantial heterogeneity in the sample.

Another reason that may be explaining the disparities in the results is related to the selected period. In contrast to Schneider et al. (2000) and Beugelsdijk and Van Schaik (2005), who focus on the late nineties, we consider the last decade, characterized by unprecedented growth for most European regions. It was also a period of profound changes in the EU, due to the 2004 and 2007 enlargements. Within this plural and multicultural framework, social capital has been particularly relevant for promoting growth. In the benchmark of the European regions, even the poorest regions are richer than some of the countries included in cross-country studies. This means that there are no underdeveloped regions in our sample. The implications of this argument are interesting, since the role of social capital seems to be more important for those economies that have reached a 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 also more complex. This argument has been theoretically supported by Putnam (1993), Fukuyama (1995) and Beugelsdijk and Van Schaik (2005). Consequently, following these arguments and our own results, the support for considering the positive role of social capital on European regional growth is reasonable.

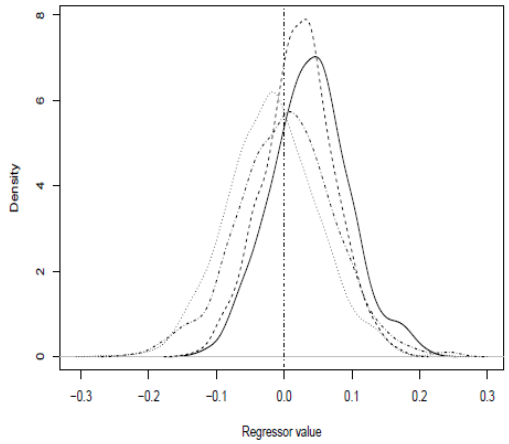
6.2. Results for the control variables

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 four estimated models are provided in tables 4, 5, 6 and 7. Figure 2 displays the results graphically. For each control variable, four results are provided, one for every model estimated. The results across models do not differ substantially, with the exception of the intercept. 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 by three additional years (2006, 2007 and 2008), and employs Bayesian methods.

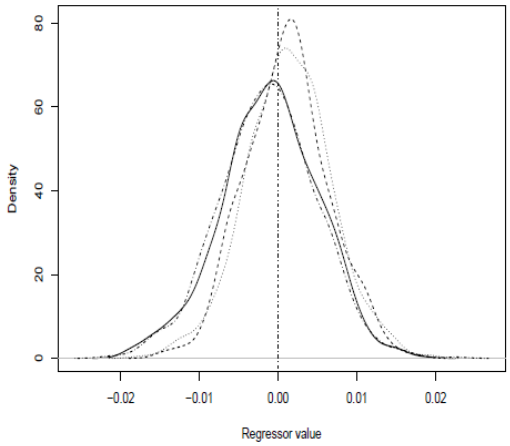
The *Intercept* is positive with probabilities of 75%, 68%, 38% and 52% for Models 1, 2, 3 and 4, respectively. The result changes dramatically when the variable *NORMS* is introduced (Models 3 and 4), indicating a substantial influence of the latter in the model. Regarding *GGRPPC*0, the mean is negative in Models 1 and 4, and positive in Models 2 and 3. The probability of having a positive sign ranges in the interval 42%-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 different convergence clubs. In contrast, 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 four models and the probability of being positive is in the vicinity of 5%. This provides reasonable support for the negative effect of this variable, a result in concordance with the Neoclassical theory (see Mankiw et al., 1992, for example). However, the results for the population density *POPDENS*, show only 11% probability of being positive (result for Model 2).

FIGURE 2: **Posterior densities for the control variables**

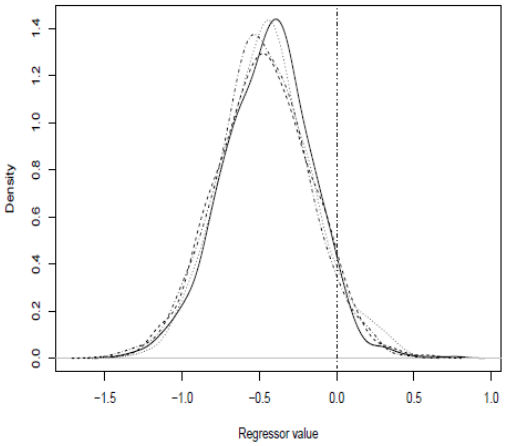
a) Intercept



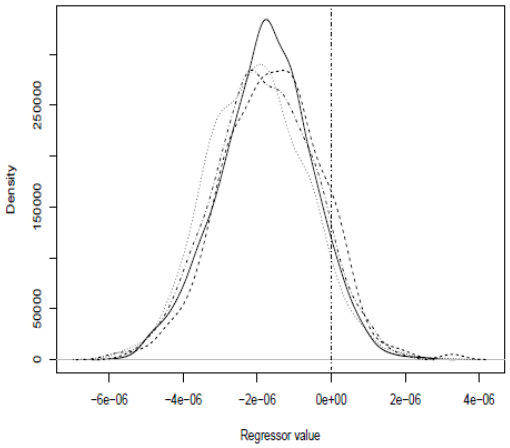
b) $GRPPC_0$



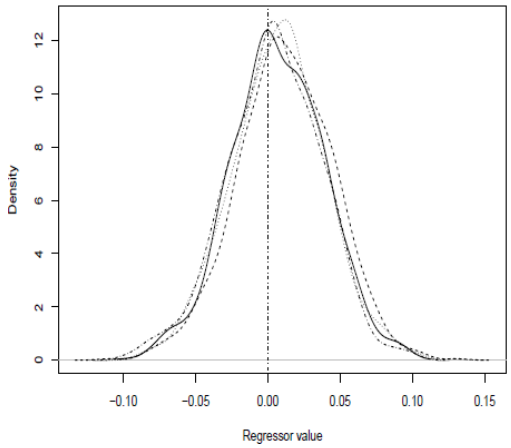
c) GPOP



d) POPDENS



e) GFCF



f) HK

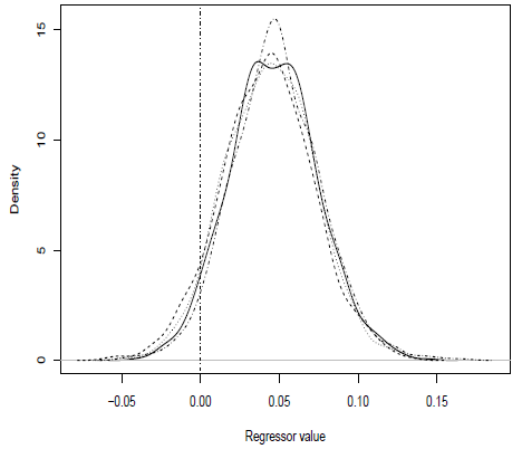
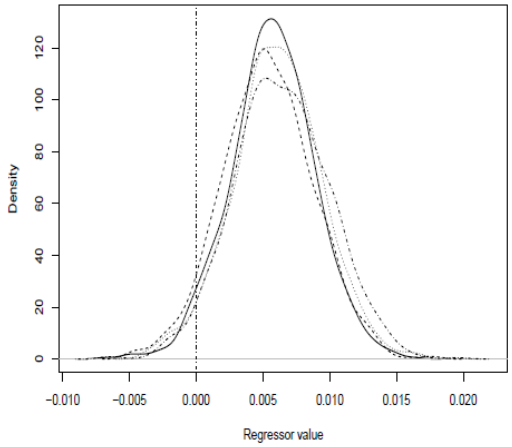


FIGURE 2: **Posterior densities for the control variables**

g) CAPITAL



Note: Superimposed in the figures are the posterior density functions for the control variables for the Models 1, 2, 3 and 4. The solid, dashed, doted and dashed-doted lines correspond to Model 1 (*TRUST*), Model 2 (*ACTIVE*), Model 3 (*NORMS*) and Model 4 (*TRUST, ACTIVE, NORMS*) respectively.

The population parameter for gross fixed capital formation *GFCF* is positive with probabilities around 60%. This probability casts some doubts on its effect. This variable is positive in virtually all cross-country studies; however, the implications of this kind of investment would be more closely 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 92% in the four models (96% in Model 4). The result lends considerable support to Crespo-Cuaresma et al.'s (2012) consideration of this variable as *robust*. In addition, it supports the argument that European regional growth during the last decade might have 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, and intensive in skilled labor.

The results for the dummy variable *CAPITAL* show that the probability of this variable being positive is very high and similar across models (around 95% in all four models). 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.

Finally, the posterior distribution for the spatial effects, φ, shows that these effects might have a positive influence with probabilities ranging in the interval 12%-21%, depending on the model. That would lead us 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 sensitive to the model specification and the nature of the distance matrix W see Crespo-Cuaresma et al. 2012; Crespo-Cuaresma and Feldkircher, 2012), and this negative result might be conditioned by our specific model and the matrix W selected[18]. Another likely reason is that the beneficial effects of neighbors take place at a more disaggregated level (NUTS level 2). Note that countries such as Denmark, Finland or Slovakia constitute a single region and, perhaps, these positive influences not only disappear, but may also adopt negative forms.

7. Concluding Remarks

THE interest in social capital as a factor conditioning economic growth processes has increased remarkably over the last two decades. This has already been documented in relevant contributions including, for instance, Zak and Knack (2001). Despite this growing interest, most of the previous related literature focuses almost exclusively on cross-country studies, whereas those considering cross-regional samples have been relatively scant. Although this might be partially explained by the scarcity of data at the regional level, especially for the social capital variables, in the case of Europe these data do actually exist, and for relatively recent time periods. This study does exactly that, in an at-

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

tempt to contribute to the literature by assessing how different elements of social capital might have affected the growth patterns of a sample of 85 European regions during the 1995-2008 period.

To this end, we have considered a Bayesian framework, due to some of its virtues, which are especially appealing in economic growth studies. Although in this type of studies the Bayesian framework has focused more on model and parameter uncertainty, our interest lies in adding precision to evaluating the probabilities of different social capital indicators to having a positive impact on European regional growth, since it allows a more direct comparison with previous literature on this topic. Our results give substantial support to the arguments held by social capital scientists, and most of the findings in cross-country studies. Among other relevant results, we find that higher levels of trust and better social norms may lead to more intense economic growth with probabilities of over 80%. However, the empirical evidence supporting the hypothesis that higher level of active participation in groups positively affects growth receives much more limited support.

In an enlarged EU that will face a scenario characterized by both economic and cultural disparities, the political implications of our results have a remarkable long run outlook. Specifically, although they might be useful in the current socioeconomic context, their importance is even higher in facing challenges that are yet to come, including the *de facto* integration of Central and Eastern regions in the EU. As indicated above, contributions considering these regions are still scant, but some authors and our own results suggest that they show lower social capital levels, probably eroded by the long communist experience (see Rose 2000; Paldam and Svendsen 2001; Fidrmuc and Gërxhani 2008), in terms of higher tendencies towards individual rent-seeking as opposed to greater cooperation and behavior oriented to public wellbeing. For these regions, therefore, social change plays an essential role in social cohesion and the development process toward their Western peers.

The generation of social capital is not immediate, but, unfortunately, in some cases social change requires 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, demand favorable social conditions—i.e., healthy levels of trust and social norms. In this sense, improvement of institutional quality might be one of the fronts to start from. Europe is changing in many ways and, in the relatively advanced Eu-

ropean regions, the role played by society in the near future might be more relevant than ever before.

References

Acemoglu, D. (2008): *Introduction to Modern Economic Growth*. Priceton; NJ: Princeton University Press.

Ahlerup, P., Olsson, O., and D. Yanagizawa (2009): "Social capital vs institutions in the growth process". *European Journal of Political Economy* 25 (1), 1-14.

Akçomak, I. and B. Ter Weel (2009): "Social capital, innovation and growth: evidence from Europe". *European Economic Review* 53 (5), 544-567.

Algan, Y. and P. Cahuc (2007): *La société de défiance. Comment le modèle social français*. Éditions de la rue d'Ulm.

_____ (2010): "Inherited trust and growth". *American Economic Review* 100 (5), 2060-2092.

Arrow, K.J. (1972): "Gifts and exchanges". *Philosophy & Public Affairs* 1 (4), 343-362.

Bartkowska, M. and A. Riedl (2012): "Regional convergence clubs in Europe: identification and conditioning factors". *Economic Modelling* 29 (1), 22-31.

Basile, R. (2008): "Regional economic growth in Europe: a semiparametric spatial dependence approach". *Papers in Regional Science* 87 (4), 527-544.

Berger, J.O. (2006): "The case for objective Bayesian analysis". *Bayesian Analysis* 1 (3), 385-402.

Bergh, A. and C. Bjørnskov, (2011a): "Historical trust levels predict the current size of the welfare state". *Kyklos* 64 (1), 1-19.

_____ (2011b): "Trust, welfare states and income equality: What causes what". Unpublished paper, University of Aarhus.

Beugelsdijk, S., De Groot, H.L., and A.B. van Schaik, (2004): "Trust and economic growth: a robustness analysis". *Oxford Economic Papers* 56 (1), 118-134.

Beugelsdijk, S. and T. van Schaik, (2005): "Social capital and growth in European regions: an empirical test". *European Journal of Political Economy* 21 (2), 301-324.

Bjørnskov, C. (2006): "The multiple facets of social capital". *European Journal of Political Economy* 22 (1), 22-40.

_____ (2009): "Social trust and the growth of schooling". *Economics of Education Review* 28 (2), 249-257.

_____ (2012): "How does social trust affect economic growth?". *Southern Economic Journal* 78 (4), 1346-1368.

Bjørnskov, C. and P.G. Méon (2013): "Is trust the missing root of institutions, education, and development?". *Public Choice*, forthcoming.

Boldrin, M. and F. Canova (2001): "Inequality and convergence in Europe's regions: reconsidering European regional policies". *Economic Policy* 16 (32), 205-253.

Brock, W.A. and S.N. Durlauf (2001): "What have we learned from a decade of empirical research on growth? Growth empirics and reality". *World Bank Economic Review* 15 (2), 229-272.

Brooks, S. and Gelman, A. (1998): "Alternative methods for monitoring convergence of iterative simulations". *Journal of Computational Graphical Statistics* 7, 434-455.

Canaleta, C.G., Arzoz, P.P., and M.R. Gárate (2002): "Structural change, infrastructure and convergence in the regions of the european union". *European Urban and Regional Studies* 9 (2), 115-135.

Crespo-Cuaresma, J., Doppelhofer, G., and M. Feldkircher (2012): "The determinants of economic growth in european regions". *Regional Studies* 0, 1–24.

Crespo-Cuaresma, J.C., Foster, N., and R. Stehrer (2011): "Determinants of regional economic growth by quantile". *Regional Studies* 45 (6), 809-826.

Dearmon, J. and K. Grier (2009): "Trust and development". *Journal of Economic Behavior & Organization* 71 (2), 210-220.

_____ (2011): "Trust and the accumulation of physical & human capital". *European Journal of Political Economy* 27 (3), 507-519.

Dettori, B., Marrocu, E., and R. Paci (2012): "Total factor productivity, intangible assets and spatial dependence in the European regions". *Regional Studies* 46 (10), 1401-1416.

Doh, S., and C. McNeely (2011): "A multi-dimensional perspective on social capital and economic development: an exploratory analysis". *The Annals of Regional Science* 49 (3), 821-843.

Durlauf, S.N., and M. Fafchamps (2005): "Social capital". In P. Aghion and S.N. Durlauf, eds. *Handbook of Economic Growth.* Vol. 1B, Ch. 26, Amsterdam: North-Holland, 1639-1699

Ezcurra, R., Pascual, P., and M. Rapún (2007): "The dynamics of regional disparities in central and eastern europe during transition". *European Planning Studies* 15 (10), 1397-1421.

Fairbrother, M. and I.W. Martin (2013): "Does inequality erode social trust? Results from multilevel models of US states and counties". *Social Science Research* 42 (2): 347-360.

Fernández, C., Koop, G., and M. Steel (2000): "A Bayesian analysis of multiple-output production frontiers". *Journal of Econometrics* 98 (1), 47-79.

Fidrmuc, J., and K. Gërxhani (2008): "Mind the gap! Social capital, East and West". *Journal of Comparative Economics* 36 (2), 264-286.

Fukuyama, F. (1995): *Trust: The Social Virtues and the Creation of Prosperity*. New York: Free Press.

Gammerman, D. and H. Lopes (2006): *Monte Carlo Markov Chain: Stochastic Simulation for Bayesian Inference*. 2nd edition, Boca Raton, FL: Chapman and Hall/CRC.

Guiso, L., Sapienza, P., and L. Zingales (2004): "The role of social capital in financial development". *American Economic Review* 94 (3), 526-556.

_____ (2009): "Cultural biases in economic exchange?". *The Quarterly Journal of Economics* 124 (3), 1095-1131.

Hanifan, L.J. (1916): "The rural school community center". *Annals of the American Academy of political and Social Science* 67, 130-138.

Henderson, D. J., Papageorgiou, C., and C.F. Parmeter (2011): "Growth empirics without parameters". *Economic Journal* 122 (559), 125-154.

Knack, S. (2002): "Social capital and the quality of government: evidence from the States". *American Journal of Political Science* 46 (4), 772-785.

_____ (2003): Groups, growth and trust: cross-country evidence on the Olson and Putnam hypotheses. *Public Choice*, 117(3-4):341–355.

Knack, S., and P. Keefer (1997): "Does social capital have an economic payoff? A cross country investigation". *Quarterly Journal of Economics* 112 (4): 1251-1288.

La Porta, R., F. López de Silanes, A. Shleifer, and R. Vishny (1997): "Trust in large organizations". *The American Economic Review* 87 (2), 333-338.

López-Bazo, E., E. Vayá, A.J. Mora, and J.S. Nach (1999): "Regional economic dynamics and convergence in the European Union". *Annals of Regional Science* 33 (3), 343-370.

Mankiw, N., D. Romer, and D. Weil (1992): "A contribution to the empirics of economic growth". *Quarterly Journal of Economics* 107 (2), 407-437.

Miguélez, E., R. Moreno, and M. Arts (2011): "Does social capital reinforce technological inputs in the creation of knowledge? Evidence from the Spanish regions". *Regional Studies* 45 (8), 1019-1038.

Neven, D., and C. Gouymte (1995): "Regional convergence in the European Community". *Journal of Common Market Studies* 33 (1), 47-65.

North, D. (1990): *Institutions, Institutional Change, and Economic Performance*. New York: Cambridge Univ Press.

Nunn, N. and L. Wantchekon (2011): "The slave trade and the origins of mistrust in Africa". *American Economic Review* 101 (7), 3221-52.

Oliveira, V.D. and J.J. Song (2008): "Bayesian analysis of simultaneous autoregressive models". *Sankhya: The Indian Journal of Statistics* 70-B (Part 2), 323-350.

Olson, M. (1982): *The Rise and Decline of Nations: Economic growth, Stagflation, and Social Rigidities*. Yale University Press.

Paldam, M. and G.T. Svendsen (2001): Missing social capital and the transition in Eastern Europe. *Journal of Institutional Innovation, Development and Transition* 5, 21-34.

Putnam, R.D. (1993): *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, NJ: Princeton University Press,

Quah, D.T. (1996): "Regional convergence clusters across Europe". *European Economic Review* 40 (3), 951-958.

Rodríguez-Pose, A. and U. Fratesi (2004): "Between development and social policies: the impact of European Structural Funds in Objective 1 regions". *Regional Studies* 38 (1), 97-113.

Sala-i-Martin, X. (1996): "Regional cohesion: evidence and theories of regional growth and convergence". *European Economic Review* 40 (6), 1325-1352.

Schneider, G., T. Plumper, and S. Baumann (2000): "Bringing Putnam to the European regions". *European Urban and Regional Studies* 7 (4), 307-317.

Sen, A.K. (1977): "Rational fools: a critique of the behavioral foundations of economic theory". *Philosophy & Public Affairs* 6 (4), 317-344.

Spiegelhalter, D.J., A. Thomas, N. Best, and D. Lunn (2003): *WinBUGS version (1.4)*. Cambridge, UK: MRC Biostatistics Unit.

Torsvik, G. (2000): "Social capital and economic development". *Rationality and Society* 12 (4), 451.

Uslaner, E. (2008): "Where you stand depends upon where your grandparents sat". *Public Opinion Quarterly* 72 (4): 725-740.

Whiteley, P. (2000): "Economic growth and social capital". *Political Studies* 48 (3), 443-466.

Zak, P.J., and S. Knack (2001): "Trust and growth". *Economic Journal* 111 (470), 295-321.

NOTA SOBRE LOS AUTORES - *ABOUT THE AUTHORS**

ANABEL FORTE DELTELL graduated in mathematics and statistics and holds a PhD in Statistics from the University of Valencia. She currently holds a postdoc position in the Department of Economics at Universiy Jaume I (Castellón, Spain) where she teaches quantitative methods in economics. Her research topics cover several fields of statistics such as spatial analysis, longitudinal (or panel) data analysis, and temporal series, among others, although her main field of research is Bayesian model selection and, in particular, objective Bayesian variable selection. She has published articles in major journals such as *Annals of Statistics, Mathematical and Computer Modelling, or Preventive Veterinary Medicine*, among others, and has participated in many national and international meetings.
Email: forte@uji.es

JESÚS PEIRÓ PALOMINO holds a degree in organization and business administration from University Jaume I and received the award of the Confederación de Empresarios de Castellón in recognition of his academic career. He also holds a master in economic internationalization from University Jaume I and received a PhD scholarship from the Valencian Government Vali+d 2011 program. He is currently finishing his PhD dissertation, focused on the role of social capital in economic development. He has published articles in international journals such as *Spatial Economic Analysis* and *European Journal of Political Economy*, and has participated in many congresses and invited seminars, both national and international.
E-mail: peiroj@uji.es

EMILI TORTOSA-AUSINA graduated in economics from the University of Valencia and holds a PhD in economics from the University Jaume I, where he is currently a lecturer in applied economics. He has also taught at the University of Alicante (1994-1995) and has received scholarships from various institutions (Fundación Caja Madrid, among others). He has held posts as visiting researcher at the Autonomous University of Barcelona, the University of New South Wales (Australia), and the Economics Department of Oregon State University (USA). His specialized fields are banking economics, the analysis of productivity and efficiency, and the application of different techniques to problems in the banking sector. He has published various books in collaboration with others and his articles have appeared in specialized journals. He has participated in many Spanish and international congresses and is main researcher on the Spanish National Research Programme project *Evaluación de*

la eficiencia y la productividad de las organizaciones en un contexto de crisis económica: instituciones financieras y sector publico.
E-mail: tortosa@uji.es

_____

Any comments on the contents of this paper can be addressed to Emili Tortosa-Ausina, Departament d'Economia, Universitat Jaume I, Campus del Riu Sec, 12071 Castelló de la Plana, Spain. Tel.: +34 964387168, fax: +34 964728591, e-mail: tortosa@uji.es.

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Fundación BBVA

Plaza de San Nicolás, 4
48005 Bilbao
España
Tel.: +34 94 487 52 52
Fax: +34 94 424 46 21

Paseo de Recoletos, 10
28001 Madrid
España
Tel.: +34 91 374 54 00
Fax: +34 91 374 85 22

publicaciones@fbbva.es
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