Social capital, space and growth in Europe

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Abstract

Social capital is an incredibly popular research topic in social sciences. Much has been said and many studies have been drafted, and yet the subject still requires refinements in terms of definition, theoretical framework (origin, transmission) and empirical counterparts. For this reason, we provide a (large) review of the existing literature on definition, models of investment/disinvestment, and measurement of social capital, with an eye to applied empirical problems specific of social capital (data source and collection). Then, in order to deal with the multidimensionality of social capital, we propose a Principal component analysis (PCA),deriving new measures of social capital at regional level in Europe, considering their distribution across space and time. Evidence of positive spatial autocorrelation adds to the existence of spatial clusters of values and beliefs within and between countries. Finally, we focuses on the role of social capital, as driver of regional economic growth in advanced economies. Results, in line with Tabellini (2010), underline an important role of specific values and beliefs in determining the fortunes European regions. In order to establish a causal link between economic growth and social capital, we use an IV approach (GMM-TSE and CUE estimators), controlling for the presence of weak instruments. Following LeSage and Pace (2008), we also frame a spatial autoregressive model with autoregressive disturbances and a Spatial Durbin model to explore the spatial dimension, with results confirming a positive role of social capital.

1 Introduction

Much has been said about social capital[1] but still, there is little consensus on the meaning nor on the origin of the term; Arrow (1999) has even suggested to discard the term, while Durlauf (1999) says that *"it is the intellectual equivalent of a stock market bubble."*.

Hanifan (1916), who is credited to be the first to use the term (de Blasio and Sestito, 2011), describes the active support of local communities towards the Virginia system of rural schools as "social capital".

There is a cross-disciplinary interest on this topic: sociologists, political scientists and, eventually, economists have all spended a considerable amount of energy studying this subject.

For sociologists, social capital is the value accruing from being part of a community, and the focus is on networks and social interactions. Indeed, the focus on individual actions alone are not enough whereas the outcome is partially or totally dependent on other agents' actions. Thus, each individual establishes a set of durable relationships and social capital is the result of an investment in a network of useful resources. Over time, the definition of social capital based on network analysis has evolved into three separate and almost mutually exclusive types, according to the type of ties between people: bonding, bridging and linking social capital (Rutten et al., 2010).

As for political science, the seminal work is that of Banfield (1958), an american scholar who spent one year (1955) in *Montegrano*, a small town of Basilicata, comparing the way of living of the town with that of an American one. He argues that the backwardness of the former is the result of a specific set of values discouraging cooperation, an individualistic society promoting only trust towards family members and peers, which he names "amoral familism". Other political scientists, such as Putnam (1993) and Fukuyama (1995), define social capital as a group or community property, affecting the individuals of a city, region or even a country. Focusing on the regional divide in Italy between the North and the South, Putnam (1993) speak of horizontal vs. vertical relationships characterizing Italy in the Middle Ages.

As for economics, since its beginning as a "modern" social science, economist have been deeply interested in moral attitudes, vices and virtues; Adam Smith was a *moral* philosopher, interested in social norms leading to wealth[2]; Weber (1905) underlines the role of specific values and beliefs

[1] As of June 2014, there were more than 200 thousands search results on Ideas and an astonishing 229 millions on Google.

[2] "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their

(attributed to Protestantism, such as the lack of *"coscienziositá"* (i.e. conscientiousness) as the ultimate explanation for the relative economic success of some countries.

After the WWII social norms have been mostly ignored by economists until the 90s (a part for the "institutional" school), a likely result of what Schumpeter used to call "Ricardian vice", i.e. the difficulties to nest complicated socio-economic interactions within mathematical model[3], at least until recently (see Blume et al. 2010), which resulted in discarding the theme Manski (2000); Dixon (1999). Indeed, while definitions of social capital was plagued by vagueness, the neoclassical theory of general competitive equilibrium became dominant and all non-market interactions, such as those related to social capital, were discarded either because not interesting or, most likely, because they were intractable, the only exception being "trust" which can be easily modelled and incorporated in standard models through a probabilistic definition.

The multiplicity of definitions is suggestive of the main problem of social capital, i.e. its definition. The debate reaches a crosspoint with Solow (1995), remarking that *"if social capital is to be more than a buzzword (...) there needs to be an identifiable process of investment that adds to the stock, and possibly a process of 'depreciation' that subtracts from it. The stock of social capital should somehow be measurable, even inexactly"*. In line with the most recent economic literature, Guiso et al. (2011) introduce a specific refinement of the definition, "civic capital". as *"those persistent values and shared beliefs, which allow a group to overcome the free rider problem in the pursuit of socially valuable activities"*.

2 Literature review

2.1 Social capital and economic growth

There are several identified channels through which social capital might affect economic growth. A non definitive list includes: crime (Glaeser et al., 1996; Giordano and Tommasino, 2011; Barone and

regard to their own interest. We address ourselves, not to their *humanity*, but to their *self-love*, and never talk to them of our own necessities, but of their advantages." - Smith 1776, emphasis added)

[3]This tension between values and mathematics reflect curiously on the origin of the nickname "dismal science". Indeed, it accounts for a clash between those believing that slaves should be given a subsistance wage because it was "morally good" (as they were inferior) and the apprentices of that dismal science "which finds the secret of this Universe in supply and demand" Dixon (1999).

Narciso, 2013), corruption (Ichino and Maggi, 2000), thriftiness (Guiso et al., 2006), institutions (Raiser, 1997, 1999), inequality (Alesina and La Ferrara, 2002), productivity de Blasio and Nuzzo (2010); Cingano and Pinotti (2012), ethnicity (Alesina et al., 1999; Alesina and La Ferrara, 2005; Alesina and Angeletos, 2005; Dahlberg et al., 2012), religion (Guiso et al., 2003), and particurarly trust, fertility (Fernandez et al., 2004; Fernandez and Fogli, 2009; Aassve et al., 2012) and migration (Ichino and Maggi, 2000; Giuliano, 2007; Aghion et al., 2010; Luttmer and Singhal, 2011; LeSage and Ha, 2012).

An important role is given to trust, which is considered part of, particularly relevant when transactions involve some unknown counterpart, when the transaction takes place over a period of time rather than being completed on the spot, and when the legal protection is imperfect. Indeed, generalized trust is required to lower transaction costs (Fukuyama, 1995), overriding situations characterized by prisoner's dilemma and allowing transactions otherwise impossible, even in the presence of an advanced legal system, especially if conducted over time. Trust is favored by past experiences, as proved by cash-conditional games (Fehr et al., 2003). Interestingly, it looks like if there is some sort of asymmetry in the accumulation process of trust: is hard to accrue but easy to lose (such as in the case of scandals). However, it is necessary to pay attention to the difference between personalized and generalized trust (Guiso et al., 2008c). Indeed, personalized trust is a belief of trustworthiness regarding only certain people or groups, a concept related to amoral familism, whether generalized trust refers to unknown people, thus to the whole society. It follows that institutions and markets need generalized trust, not personalized trust, which is essential for ensuring the financial development of a community while its lack could result in giving power to Mafia syndicates.

2.2 Determinants of social capital and transmission models

Traditional analysis of cultural transmission is based on evolutionary selection mechanisms, i.e. preferences are inherited from parents. Some interesting information on the genetic/chemical side might arise from neuroeconomics (see Rustichini 2009 for a review) but it is still a developing field.

On the opposite side, there is an active role played by parents in the cultural transmission mechanisms, defined as "socialization process", transmitting personal beliefs and values across generations. Traditional models assume reproduction success as monotonically increasing in economic pay-off, it

follows a natural selection towards “dominant” cultural traits. However, the empirical evidence of heterogeneous distribution of cultural traits in the population, suggests a different story. Indeed, albeit theories and models conjectured that in the US and some Western Europe countries a “melting pot” was under way, the reality proved different. Persistence of heterogeneous distribution of cultural traits, even in second or more generations of immigrants is widely reported. Cavalli-Sforza and Feldman (1981) model a selection mechanism in which there is a socialization process, either from parents (direct) or society (indirect). It follows that the transmission of preferences, beliefs and norms, is the result of genetic evolution and social interactions (also known as *nature/nurture* theory).

The “natural” aspect is the subject of neuroeconomics while the “nurture” regards culture/social economics. The idea behind the cultural transmission mechanism is that parents assess children’s actions and following outcomes, exerting some sort of socialization, i.e. they instill those values they think are worthy. Unfortunately, as pointed out by Bisin and Verdier (2001) parents’ assessment is imperfect, as they use their own preferences to select values and beliefs (and forecasting the outcomes), not children’s ones. This filter is called *imperfect empathy*.

Indeed, Bisin and Verdier (2001), try to understand the conditions inducing heterogeneity in the long run distribution of preferences in the population finding that if direct socialization acts as cultural substitute for indirect socialization, then a long run equilibrium with heterogeneous population is globally stable. An alternative way to frame emergence and persistence of collective beliefs is the model of Benabou and Tirole (2006). The authors investigate why the majority of Europeans believes that luck is the main determinant of income rather than effort while the opposite is true only for most of the Americans, and their impact on governement spending. Indeed, they find a positive correlation between social spending and belief on the role of luck as the result of rational choices, with 2 equilibria: a *"european"* and an *"american"* one, the former being larger in governement spending. To the extent values are created over time, Guiso et al. (2008a) start from Putnam’s conjecture, i.e. the high persistence of social capital across centuries, providing a model explaining values persistence through an overlapping-generations setting and empirical evidence in support of this conjecture.

The importance of social/cultural norms is underlined by Tabellini (2008) who provides a different answer to why people cooperate: instead of reputation, the basic idea builds on the fact that

people internalize specific social norms which, by themselves, sustaining cooperation. Adapting a model previously defined, individuals are randomly matched with others to play a one-shot prisoner's dilemma game, excluding repetitions and so the role of reputation. It follows that cooperation might be sustained also by values, not only reputation. Building on Banfield (1958) and his "amoral familism" concept, he distinguishes between limited and generalized morality, i.e. social norms that apply only to close/strong ties (such as their own kind) vs. norms that apply to all. In this respect, generalized morality sustains cooperation over a larger range of situations. This model also points out a particular role of space: indeed, generalized morality is hurt by local enforcement of cooperation and weaker with more distant transactions. To this extent, good legal institutions, protecting unrelated individuals, breed good values.

A particular note should be dedicated to migration, as a 'carrier' of values and beliefs. Indeed, migration is a promising field in order to understand transmission mechanisms of social capital: migrants bring new values and beliefs in the communities of incumbents. There is evidence that migrants preferences for redistribution are affected by the social preferences of the origin country, showing also persistence across generations (Alesina and Giuliano, 2013). Morevoer, different living arrangements among second generation european migrants in the US are linked to the sexual revolution of the 70s and its different impact across Europe (Giuliano, 2007). LeSage and Ha (2012) consider how migration affects social capital mainly through two channels: either influencing the existing stock of trust and cooperation of natives or by importing migrants' inherited social norms. Indeed, they underline how the relational nature of social capital often leads researchers to consider it as *place-based*, hence, its measurement in terms of associational activity, voting in elections and referenda, decennial census response rate, presence of tax-exempt non-profit organizations. Thus, the role of migration seems reduced. On the other hand, migration may involve members of a society with higher levels of human capital and higher propensity to participate in social and civic organizations. If migrants maintain these attitudes even in the new country, they are likely to affect positively the social capital of their hosting community.

2.3 Measuring social capital and space

Once narrowed down the definition of social capital we have to focus on its empirical counterpart. There are still several problems related to its measurement, as remarked by Fukuyama (2000): *"one*

of the greatest weaknesses of the social capital concept is the absence of consensus on how to measure it". Recently, Righi and Scalise (2013) distinguish between a structural component of social capital (e.g density of civic associations, voter turnout), and a cognitive component, measured by values and beliefs. While the former is quantitative and easily estimated, the latter is more qualitative and complicated to measure. This approach is rich and detailed but requires either a multivariate regression or the use of synthetic indicators (such as principal components or factor analysis).

Measures of social capital can be also classified according to their origin: survey data, experiments and outcome based measures. Surveys attempt to measure directly those values and beliefs. They are available across countries but they usually cover shorter time span (at maximum 30 years) and usually limited spatial representativeness. Experiments impose a specific framework, thus reducing measurement errors; unfortunately they have also internal validity and results cannot be generalized. Outcome based measures have longer time series and spatial representativeness, sometimes even at city level; unfortunately there is a likely problem of endogeneity, as we might measure the outcome, not the source.

To the extent social interactions happen in a specific, physical, space, there is a (unexplored) role of space in social capital. Even though, the traditional utility/profit maximization approach is a-spatial, several authors have recently pointed out to the role of spatial agglomeration in spurring development. Cipolla (1974) stresses the role of cities in the 11th century, while Guiso et al. (2008b) find evidence that the further from the sea or being at the crossroad of Roman roads, the higher the values of social capital. To the extent that the formation of cultural traits will depend on human interactions, the strength of these ties will depend on transaction costs, which are typically increasing with distance. As a consequence, since social relations are spatially sticky, so are norms and values. This requires to handle with care spatial data, being aware of the Modifiable Areal Unit Problem[4] (MAUP) and sample size as first issues.

2.4 A primer on Spatial Statistics and Econometrics

We introduce some basic tools of spatial analysis,known as Exploratory space data analysis (ESDA), starting from the definition of the weighting matrix $W_{i,j}$, where i and j are two regions/cities:

[4] The MAUP refers to the change in the output of any analysis of spatial data resulting from a different aggregation used - see Openshaw and Taylor 1979

$$W_{i,j} = \begin{cases} 1 & if\, i\, and\, j\, are\, contiguous \\ 0 & otherwise \end{cases}$$

There are several definitions of contiguity[5], the most famous being *"queen contiguity"* (two regions are considered *'neighbours'* if they share at least one border or a vertex) and *'rook contiguity'* (only shared borders are considered). The elements of the weighting matrix are usually row standardized, i.e. each element is divided by the row sum, such that each row of the new standardized matrix sums to one. This implies that a spatially lagged variable, $WX = \sum_{j=1}^{n} w_{ij}x_j$, is just a vector of the averages of the neighbouring units, computed at each point.

We might be interested in veryfing the existence of a specific spatial pattern in data. This can be achieved with the so called Global Moran's I, a measure of spatial correlation:

$$I = \frac{\sum_i \sum_j w_{ij}(x_i - \overline{x})(x_j - \overline{x})}{m_2 \sum_i \sum_j w_{ij}} \tag{1}$$

where $w_{ij} = 1$ if region i is *contiguous* to region j; $\overline{x}$ is the average of the target variable, x_i and $m_2 = \sum_i (x_i - \overline{x})^2/n$ is the second moment.

Global Moran's I gives a first measure of the overall degree of linear association between neighbours, indicating whether the observed spatial pattern is clustered, dispersed or random. Positive values of Global Moran's I indicate positive spatial correlation, or clustering, while negative values indicate dispersion. In a second step, it is possible to compute the Local Indicators of Spatial Association (LISA), which allow the decomposition of Global Moran's I at each unit level of observations, and consider its graphic counterpart, the so-called Moran's scatterplot, which cross-plots the values of region i against the values of its neighbors.

This is better understood with the Local Moran's I

$$I_i = \frac{(x_i - \overline{x})}{m_2} \sum_j w_{ij}(x_j - \overline{x}). \tag{2}$$

Under positive spatial association, the mass of points will be concentrated on the 1st and 3rd quadrants, while the opposite holds on the 2nd and 4th.

[5]Other types of weighting matrices, including inverse distance and socio-economic weighting matrices, could be applied. The choice of weighting matrix usually depends on the research question.

It's possible to test the null of Complete Spatial Randomness (CSR), H_0, for the existence of spatial clusters; indeed, we can compute the standardized value of Local Moran's I, z_i, or

$$z_i = \frac{I_i - E(I_i)}{\sqrt{V(I_i)}} \tag{3}$$

and the corresponding p-value for H_0; in particular, if we reject the null, we can state that we are in presence of some underlying spatial process at work. A positive z-score suggests we have more similarities between our features/regions (i.e. all positive or negative values) than we would expect in a spatial random allocation; on the opposite, a negative z-score identifies a situation with dissimilar regions, i.e. we are in the presence of outliers. A cluster map using Local Moran's I can be constructed by selecting only values which are statistically significant at 5 percent. Classification is based according to the sign of Local Moran's I and with respect to the mean. If I_i is positive and values of X for both region i and neighbours are above mean value, this cluster is defined as "High-High" (HH). On the opposite, if region i and its neighbours have values that are below the mean, they belong to a "Low-Low" (LL) cluster. If the value of I_i is negative while the values of X are above (below) the mean while its neighbours are below (above) the mean, they belong to a cluster "High-Low" ("Low-High").

2.4.1 Review of spatial regression models

Introducing space in our standard regression framework points out to a misspecification problem. Indeed, let's consider a simple cross-sectional model where space is missing:

$$Y = \beta' X + u \tag{4}$$

where β is a $K+1$ vector, y is n x 1, X is $(k+1)$ x 1. If, for any reason, the error term is correlated with any covariate, the estimates are biased. The existence of a significant spatial pattern is one of these case. In what follows we list some spatial regression models. Which one will be the most adapted to our case will depend on the context. We can consider a model, with a spatial lag in our dependent variable, Wy, which captures the effect of agglomeration and spatial spillovers, also known as *spatial autoregressive model* or SAR:

$$y = \alpha + X\beta + \lambda Wy + u. \tag{5}$$

Clearly, we cannot simply estimate equation 5 with OLS as our dependent variable is now correlated with the error term, u(Postiglione and Piras, 2012). In another setting we could have spatial autocorrelation in the error term, as in the *Spatial error model* or SEM:

$$\begin{cases} y = X\beta + u \\ u = \rho W u + \nu \end{cases} \tag{6}$$

In this case, standard estimation methods provide consistent, albeit inefficient, estimates, thus the need to use spatial econometric tools to increase precision.

Another possibility, which consider also spatial lag in the covariates, it is the Spatial Durbin Model defined as:

$$y = \alpha + X\beta + \lambda W_1 y + \delta W_2 X + u \tag{7}$$

Another model which encapsule the previous ones, is the *spatial-autoregressive model with spatial autoregressive disturbances* (SARAR), defined as:

$$\begin{cases} y = \lambda W y + X\beta + u \\ u = \rho M u + \epsilon \end{cases} \tag{8}$$

where y is a n x 1 vector of observation, W and M are n x n spatial weighting matrices, X is a n x k matrix of k exogenous regressors. Overall, the model has 4 parameters, $\theta = \left[\lambda, \rho, \beta, \sigma^2\right]$ and SAR and SEM are just particular cases of SARAR (respectively, when $\rho = 0$ or $\lambda = 0$). The innovation term, ϵ, is usually assumed to be normally distributed with a general covariance matrix Ω, $\epsilon \sim N(0, \Omega)$, which could allow for heteroskedasticity. As for the estimation procedure, assuming the simplest case of homoskedasticity, i.e. $\epsilon \sim N(0, \sigma^2)$, with the same weighting matrix, W, in both equations ($W = M$), we can resort to a Generalized Spatial Two Stage Least Square (GS2SLS)[6].

As to what model should be used, we remind of Anselin and Arribas-Bel (2011) who points out that the use of spatial fixed effects could lead to spurious results, while spatial heterogeneity should

[6] GS2SLS is a four-steps procedure: in the first step it runs 2SLS to estimate $\tilde{\delta}$, where $\delta = [\lambda, \beta']'$. Then GMM to estimate $\tilde{\rho}$. In the third and fourth steps these estimates are reused to obtain efficient estimates. As instruments, GS2SLS uses the linearly independent columns of (X_f, WX_f, W^2X_f) for SARAR, (X_f, WX_f) for SEM, where X_f is the matrix of all the excluded exogenous variables.

be properly treated. LeSage and Pace (2009) prove that under two conditions, a linear regression relationship can lead to a Spatial Durbin Model (SDM), a spatial autoregressive model (SAR) or a spatial error model (SEM). The circumstances that have to be verified are: 1) the existence of an omitted explanatory variable; 2) spatially correlated OLS residuals.

The latter requirement can be tested by means of the Global Moran's, with additional tests, namely *LM Lag* and *LM Error* (and their robust counterparts), helping to understand what type of spatial model should be used. Indeed, once determined spatial correlation in the residuals, in case of rejection of the null of *LM Lag* and *LM Lag robust*, a SAR model is suggested while in case of rejection of *LM Error* and *LM Error robust*, a SEM seems more appropriate.

3 A new measure of social capital

To the extent social capital is a multidimensional concept, as suggested by theory, and ignored by most of the empirical literature, there is the need to encapsulate all the available pieces of information into synthetic indicators.

We select nine variables, typically used in empirical studies on social capital, across Europe. Five of these can be referred to the so-called *"structural component"* of civic capital and include voter turnout at parliamentary elections, relational intensity, and "media use" as of Newspapers, Radio and TV (Righi and Scalise, 2013). The remaining variables refer to the so called *"cognitive component"* of civic capital and consider the perception of norms, values and beliefs. Here, in line with the literature on civic capital, we consider variables that should capture the attitude of individuals towards the community, such as the perception of one's control over life, the importance of respect for the others as a value to teach your children, the extent of generalized trust and autonomy. Our data sources include: two issues of the Eurobarometer and its Swiss counterpart, MOSAiCH; the European Election Database (EED) of the Norwegian Social Science Data Services (NSD) for the Parliamentary voter turnouts around 2008; finally, the 4th wave (2008) of the European Value Study (EVS) for the variables referring to norms, values and beliefs[7] . In terms of the territorial units involved, we refer to the *Nomenclature of Territorial Units for Statistics* (NUTS) of Eurostat, and mostly consider NUTS 2 regions, corresponding to Italian *regioni*, french *departments* or Spanish *Comunidades y ciudades autonomas*, with the notable exception of Germany, where data refer to the

[7]For further information please refer to the attached data appendix.

NUTS 1 level, corresponding to the German *lander*. Eventually, our dataset includes 16 countries and 156 regions at the NUTS 2 level (NUTS 1 for Germany[8]).

As a first step, table 1 presents the matrix of correlations between these variables. Some interesting information already emerge from this table. First of all, since these variables are typically associated to social capital, we would expect them to be to a large extent collinear. However, while there is some correlation structure in the data, not all variables are positively or significantly correlated. This seems to be the case even within and between the proposed taxonomy. The correlation analysis seems to suggest that the representation of social capital may be more complex than typically postulated and corroborates the need for a multidimensional approach. Next, with the help of the Principal component analysis (PCA), which should capture the many dimensions of social capital we aim to solve this issue.

The PCA identifies common patterns by drawing orthogonal vectors across the data, known as "principal components" (PCs). These are constructed as optimally weighted linear combinations, after assigning each observation a "score" and each variable a loading factor. Once the first component is identified, the following step is to maximize the residual variation, iterating the process, keeping all components orthogonal to each other. The number of components should be selected to maximize the explained variance of the data. A logical first step in our analysis is to refer to the proposed taxonomy and perform separate PCAs over the two sets of structural and cognitive measures of social capital (see tables 2 and 3). The PCA over the structural and cognitive component variables suggest we should abandon this taxonomy, as variables are not as correlated as the theory would suggest. Indeed, we consider the full set of variables, looking for a synthetic indicator for the whole dataset. Results in table 4 show how the first component for the whole dataset accounts for almost one third of the total variation in the data, with the associated eigenvalue equal to 2.7, and the second component accounts for an extra 16 percent, with eigenvalue equal to 1.4. The third component has an eigenvalue of just one and would increase the explained variation by a mere 11 percent, therefore, following Kaiser (1960) we focus only on the first two. The PCA for the full set of variables shows how the first PC is dominated by control, autonomy, generalized trust, relational intensity and use of newspapers and radio. TV use, voter turnout and respect have little relation with the first component, but dominate the second principal component of the data. To get a

[8]Following the Eurobarometer, we merged 6 Italian regions into 3 new regions: Piemonte and Valle d'Aosta, Abruzzo and Molise, Puglia and Basilicata.

more precise measure of the first principal component, we exclude the set of variables linked to the second principal component and repeat the PCA over the six remaining variables (*refined* dataset). Results in table 4 show how the first principal component now explains on its own 45 percent of the total variance, with an eigenvalue of 2.7. The second component adds an extra 15 percent to the explained variance, but has an eigenvalue of just 0.9. Overall, the contribution of the six variables to the significant first principal component is balanced, with newspapers use and generalized trust being the most relevant. Given that the subset of structural and cognitive measures do not necessarily uniquely represent social capital (as our previous results seem to suggest), in the rest of the analysis we focus on the full set of variables. Specifically, we consider the first component identified by the PCA over the full set of nine variables and, for robustness, also the first principal component obtained by running the PCA over the *refined* set of six variables, exploring the spatial distribution of social capital across European regions.

3.1 The spatial dimension of social capital in Europe

Figure 1 reports the quartile distributions of PCs extracted from the full and refined set. Some interesting evidence is worth mentioning. First, from panel a) it emerges a clear heterogeneity seems to emerge across European regions in terms of the endowment of social capital. While regions in Denmark, Belgium and Austria seem to be the most endowed of social capital, the South of Italy and parts of Portugal, France, Spain and Poland seem to be the least endowed. Panel b) sharpens the evidence obtained, identifying even more clearly the geographical patterns of high or low levels of our civic capital measure. Overall, the geographic heterogeneity of social capital seems to be more complex than the usually presumed North-South dichotomy. Rather, the distribution of social capital seems to vary a lot within each country and in some cases similar values are shared by regions at the border of different countries.

Now we turn to the Exploratory Spatial Data Analysis (ESDA). We report evidence of positive spatial autocorrelation for all the PCs extracted. The first principal components from the full set of variables exhibit a strong degree of spatial autocorrelation with a Global Moran's I of 0.69. A similar degree of spatial correlation emerges for the first PC of the refined set. Running a simulation with 1000 repetitions suggests that result are robust. In figure 1 we can see the results of the LISA: regions coloured in black belong to HH clusters (i.e. regions with high values surrounded by similarly high

values), while grid pattern regions belong to LL clusters (i.e. regions with low values surrounded by neighbours with low values). Clearly, the two components identify different dimensions of social capital and also different clusters. Panel c) shows how HH clusters for the first component typically are located in Switzerland and part of Austria and in the northern European belt identified by Denmark, the northern regions of Germany, the Netherlands and Belgium. LL clusters are (from left to right) in Portugal and Spain, some French regions and the south of Italy. Panel d) confirms the analysis.

4 Social capital and growth: a *within* Europe perspective

As seen before, a wide range of studies emphasizes the role of social capital as driver of economic development. Following the strain of literature that identifies two channels for social capital formation, namely *parents* or *direct socialization* (i.e. transmission of specific values and beliefs) and *socio-economic environment* or *indirect socialization*, Tabellini (2010) estimates the following equation:

$$Y = \alpha + \delta C + \beta Y_0 + \gamma X + e \tag{9}$$

where Y is average per capita GDP over the period 1995-2000, adjusted for purchasing power and expressed as percentage of the EU-15 average; Y_0 is past economic development (approximated by urbanization rate at 1850) while X are controls such as the gross enrolment rate in primary and secondary school in 1960[9] and country dummies (proxy of current political institutions), which should proxy current social interactions.

As for C, culture, Tabellini (2010) extracts the principal components of four variables from two waves of the European Value Study - EVS (1990 and 1999): generalized trust, respect for others, control over life and obedience. In this context, culture is a proxy of social capital. The first PC is named *pc_culture*; the PC from the three *"positive values"* (g. trust, respect and control) is *pc_culture_pos* and the first PC regarding values to be taught to children (respect and obedience), *pc_children*.

To the extent social capital is a multidimensional concept and following *Solow's critique* we

[9] Including a measure of education reduces the risk that social capital might become a proxy of human capital

propose two additional measures of social capital, *pc1* and *pc1_val* which are the results of previous analysis [10].

Results from the OLS estimation (see table 7) are very similar to those found by Tabellini (2010). All the measures of social capital are positive and statistically significant at 5 percent and results are also sizable.

4.1 Addressing endogeneity

OLS results suggest a significant role for social capital in explaining different economic performances at regional level. However results are likely biased by the endogeneity of culture. It follows the need to modify the identification strategy. Tabellini (2010) postulates the following model for social capital accumulation:

$$C = a + dC_0 + bY_0 + cX + u \tag{10}$$

where C_0 is (unobserved) culture of ancestors, while X is a proxy of contemporary interactions. As C_0 cannot be estimated, iterating the argument it is possible to obtain a stochastic process for current culture:

$$C = \lambda_1 + \lambda_2 X_0 + \lambda_3 Y_0 + \lambda_4 X + v \tag{11}$$

where X_0 is the historical counterpart of X i.e. the literacy rate in 1880 (variable *literacy*) and political institutions in the past (*pc_institutions*[11]), measured by constraints on the executive in the countries between 1600-1885. These variables have been chosen by Tabellini as instrumental variables for C , under a rather strong exclusion restriction, i.e. that past social interactions, summarized by X_0, do not affect directly Y, although this is mildly mitigated by controls for education and past economic development/urbanization rate.

[10] Variable *pc1* is the first PC from variables obedience, control, respect and generalized trust of the latest (2008) wave of the EVS, plus the share of blood donations, people using TV/Radio or newspapers as source of info and voter turnout around 2008. Variable *pc1_val* is the first PC for the aforementioned values and beliefs from the latest (2008) EVS and an update of *pc_culture* respectively. Overall, the dataset encompasses 8 western European countries (France, West Germany, the UK, Italy, the Netherlands, Belgium, Spain and Portugal) and 69 regions.

[11] The variable is computed by Tabellini as the principal component of five measures of constraints on the executive at five points in time (1600, 1700, 1750, 1800 and 1850), using the POLITY IV database

In addressing the endogeneity problem we should pay attention to the two fundamental requirements of instrumental variables techniques: 1) exclusion restrictions hold (i.e. instruments are exogenous); 2) the instruments are strongly correlated with the endogenous variable;

Evidence from the reduced form estimates rule against *literacy* as instrumental variable (see reduced form equations in tables 8 and 9. *First stage regressions* report that both instruments have jointly predictive power with respect to the involved measures of social capital, sustaining the identification strategy (i.e. culture is explained by specific channels, X_0).

If the correlation of the instruments with the endogenous variable is weak, the IV estimator is biased in the direction of the ordinary least squares (OLS) estimator and its distribution is non-normal (Bun and de Haan , 2010). Moreover weak instruments is not just a small-sample problem. Unfortunately there is still no consensus on a formal test for the strength of the IVs but only rules of thumb such consider with caution IVs whose first-stage F statistic is below 10. A promising novelty is represented by Stock and Yogo (2002) test based on the Cragg-Donald statistic, g_{min}, the minimum eigenvalue of matrix G_T, the concentration matrix. Instead, Stock and Yogo (2002) use it to test whether G_T is non-singular but still sufficiently small such that IVs are *"weak"*, providing critical values for *k-class estimators* such as IV, LIML and Fuller's modified LIML estimator, under the assumption of homoskedasticity. A robust version of the Cragg-Donald, namely the *Kleibergen-Paap* rk statistic which can be used with the tabulated critical values with a considerable degree of caution. To the extent that there are no specific values for GMM, we know that: 1) under the null of homoskedasticity, we can use the critical values of IV and LIML, as they can be considered specific cases of, respectively, GMM-TSE and GMM-CUE; 2) LIML and GMM-CUE are more robust estimators in case of weak instruments.

In the specific case of interest with a maximum rate of rejection of 10 percent of the Wald test (i.e. the greatest rate of rejection we want to tolerate) the critical values of the Cragg-Donald statistic ranges between 8.68 and 19.93. Results from IV regressions (see table 10) indicate that, apart from the specification with *pc1_val*, all the others do not reject null of exogeneity of instruments at the 5 percent level (so called *Sargan-Hansen* test).

As for the strength of the instruments, the F statistic are all above 10. However, the Cragg-Donald statistic suggests the weakness of all specifications, with the (feeble) exception of *pc_culture_pos*, whose coefficient has increased by almost 50 percent with respect to the OLS specification. A Pagan-

Hall[12] test rejects at the 10 percent the null of homoskedasticity, thus we perform the same analysis using robust standard errors. Similarly, the last specification, which uses as measure of social capital *pc1_val*, rejects the null of exogeneity of the instruments at 5 percent. Again, first stage F statistic is above 10 but, according to the the robust version of the Cragg-Donald statistic, the *Kleibergen-Paap* rk, only *pc_culture_pos* seems to have strong instruments. As a final remark, in the specification with *pc1* the coefficient of the first-stage F is high although both the Cragg-Donald and the Kleibergen-Paap statistics are not. This remarks the importance of not relying only on first stage F statistic as a way to test weak instruments. As for GMM estimates (see table 11), we know that Hansen J, test for the exogeneity of the instruments, is consistent under heteroskedasticity and it follows that apart from *pc1_val* under GMM-TSE, all the others specification do not reject the null of exogeneity of the instruments at 5 percent. As for the strength of the instruments, remembering that the critical values for GMM-CUE are different (and lower), results point to the specification with *pc_culture* (only GMM-CUE) and *pc_culture_pos* (both GMM-TSE and GMM-CUE), with GMM-CUE preferred because of its robustness to weak IV. With respect to the first OLS specification the coefficient of *pc_culture* is almost twofold while *pc_culture_pos* is now 60 percent larger (considering the estimation with GMM-CUE).

4.2 A spatial approach

To the extent social interactions, which are grounded in space, matter, social capital is clearly related to space, requiring specific estimation procedures. Under two conditions suggested by LeSage and Pace (2008), a linear regression relationship can lead to a spatial regression model. The circumstances that have to be verified are: 1) the existence of an omitted explanatory variable; 2) spatially correlated OLS residuals. The analysis in the previous section rules in favour of the first requirement. As for the second, we report the results from the five spatial tests on the residuals of the OLS regressions, assuming a first order queen contiguity weighting matrix, W[13]. Results indicate that only the specification with *pc_culture* and *pc_children* reject the null of no spatial au-

[12]In the case of heteroskedasticity, standard Breusch-Pagan or Cook-Weisberg tests are generally not usable in an IV setting, thus the Pagan-Hall test.

[13]According to first order queen contiguity criterion, two regions are neighbours if they share either a vertex or a border. With 63 regions (and no islands) we have 254 links with an average of 4 links per region, a minimum of 1 link and a maximum of 10 links.

tocorrelation of the residuals and both seems to go in the direction of a SEM model. It follows that both conditions hold for these variables, thus, justifying recourse to a spatial regression framework. We will estimate a *Spatial autoregressive model with spatial autoregressive disturbances* - SARAR), a SEM and a Spatial Durbin Model using a Generalized Spatial Two Stage Least Square (GS2SLS)[14].

Results from the SARAR model (table 12), using a GS2SLS estimator with *standard instruments*, indicate in all cases significant spatial lags of the dependent variable and the error term, with all the measures of social capital significant, although the coefficients are now smaller compared to OLS. As for the SEM, we can observe an increase in the precision of the estimates with respect to OLS, but the coefficient of the spatial lag of the error term is significant only in the second specification, with *pc_culture_pos*.

These first results suggest a scope for a spatial regression approach. However, even in this case the results may be biased by the potential endogeneity of our measures of social capital. We add two groups of instrumental variables to the GS2SLS estimator: the first group includes the same instruments proposed by Tabellini (2010), i.e. *literacy* and *pc_institutions*; in the second group we add their spatial lags, W^qX, with $q = 2$ for the SARAR(1,1), and $q = 1$ for the SEM. We want to investigate whether the inclusion of these instruments might reduce the endogeneity problem. Results for the SARAR(1,1) estimation report positive and significant coefficients of social capital, albeit smaller than in the OLS specification. We have evidence of significant spatial autocorrelation of both the dependent variable and the error term, with the exception of *pc_culture_pos*. As for the strength of the instruments, unfortunately the routines implementing GS2SLS are are still under development and miss some important features such as the first-stage F statistic (which we had to compute manually), let alone the Cragg-Donald or the Kleibergen-Paap statistics. To the extent we want to test the strength of our instruments, we have to rely only the first-stage F statistic. As before it seems that only the specification with *pc_culture_pos* as proxy of social capital has *"good"* properties in terms of strength of the instruments, as we have first-stage F close to 10 with both groups of instruments, slightly larger including the spatial lags of the original IVs. As for the

[14]GS2SLS is a four-steps procedure: in the first step it runs 2SLS to estimate $\tilde{\delta}$, where $\delta = [\lambda, \beta']'$. Then GMM to estimate $\tilde{\rho}$. In the third and fourth steps these estimates are reused to obtain efficient estimates. As instruments, GS2SLS uses the linearly independent columns of (X_f, WX_f, W^2X_f) for SARAR, (X_f, WX_f) for SEM, where X_f is the matrix of all the excluded exogenous variables. In what follows we will call these linearly independent columns the *"standard instruments"* of any GS2SLS regression.

Table 1: Correlations matrix of the involved variables

	Rel. intensity	VoterT	NewsUse	TvUse	RadioUse	Respect	Control	G.Trust	Autonomy
Rel. intensity	1.00								
Voter Turnout	-0.01	1.00							
Newspapers Use	0.41***	0.26***	1.00						
Tv Use	-0.03	0.20***	0.02	1.00					
Radio Use	0.19**	-0.01	0.53***	0.06	1.00				
Respect	0.10	0.20***	0.09	0.13	-0.02	1.00			
Control	0.32***	-0.07	0.27***	-0.14*	0.32***	0.09	1.00		
Gen. trust	0.45***	0.25***	0.45***	-0.01	0.26***	0.19**	0.34***	1.00	
Autonomy	0.19**	0.04	0.39***	-0.02	0.22***	-0.01	0.27***	0.38***	1.00

Pearson correlation, *** p<0.01, ** p<0.05, * p<0.1.

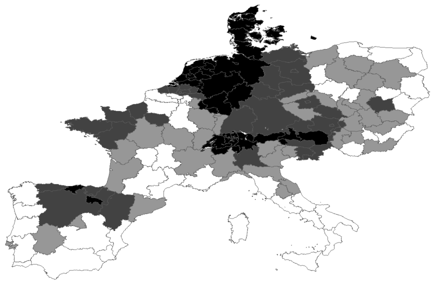
SEM (table 13), the coefficients of the spatial lag of the error term are significant only in the case of *pc_culture_pos* which is also the only one with first stage F statistic above 10. Overall, results point towards the specification with *pc_culture_pos* with a spatial lag of the error term. Finally, results of the Spatial Durbin model (table 17), suggest all the measures of social capital are positive and significant, although only the specification with *pc_children* and *pc1* have significant spatial lags.

5 Conclusions

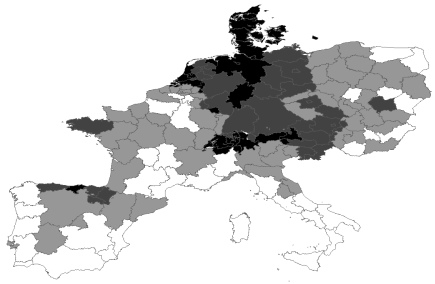
Appendix

Figure 1: Quartile distributions and clusters maps

(a) *Quartiles: Full set of variables*

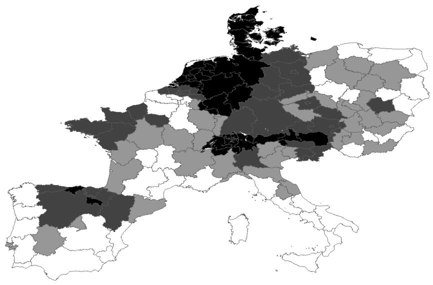


(b) *Quartiles: Refined set*

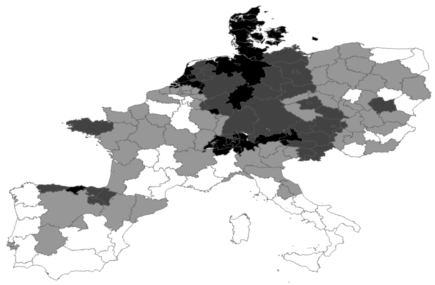


Notes: Darker colours denote higher quartiles

(c) *Clusters: Full set of variables*



(d) *Clusters: Refined set*



Notes: Dark regions = HH clusters; grid pattern = LL clusters

Table 2: PCA of the structural component of civic capital

	Components					Loadings		
	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Variable	Comp.1	Comp.2
						Relational intensity	0.46	0.28
Eigenvalues	1.8	1.2	0.9	0.8	0.3	Voter Turnout	0.22	-0.68
Prop. of variance	0.36	0.24	0.17	0.16	0.07	Newspapers Use	0.66	0.01
Cumulative prop.	0.36	0.60	0.77	0.93	1.00	TV Use	0.09	-0.67
						Radio Use	0.54	0.14

Table 3: PCA cognitive component of civic capital

	Components				Loadings		
	Comp.1	Comp.2	Comp.3	Comp.4	Variable	Comp.1	Comp.2
					Respect	0.23	0.92
Eigenvalues	1.7	1.0	0.7	0.6	Control	0.53	-0.07
Prop. of variance	0.43	0.25	0.18	0.14	G.trust	0.61	0.07
Cumulative prop.	0.43	0.68	0.86	1.00	Autonomy	0.54	-0.39

Table 4: PCA of the full set of variables

Full dataset

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Comp.6	Comp.7	Comp.8	Comp.9
Eigenvalues	2.7	1.4	1.0	0.9	0.8	0.7	0.6	0.5	0.3
Prop. of variance	0.30	0.16	0.11	0.10	0.09	0.09	0.07	0.05	0.03
Cumulative prop.	0.30	0.46	0.58	0.67	0.76	0.85	0.92	0.97	1.00

Full dataset *refined*

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5	Comp.6			
Eigenvalues	2.7	0.9	0.8	0.7	0.5	0.4			
Prop. of variance	0.45	0.15	0.14	0.12	0.08	0.06			
Cumulative prop.	0.45	0.60	0.74	0.86	0.94	1.00			

Table 5: Synthesis of the results

Estimator	Measures of social capital	Coef. of *pc_ culture_ pos*
OLS	all measures	0.71
2SLS	pc_culture_pos	1.04
GMM	pc_culture and pc_culture_pos	1.09 (TSE) / 1.64 (CUE)
SARAR	all measures	0.49
SEM	all measures	0.79
SARAR_IV	pc_culture_pos	0.63 (1) / 0.80 (2)
SEM_IV	pc_culture_pos	0.95 (1) / 0.91 (2)
Spatial Durbin	all measures	0.64

Table 6: Descriptives statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
		Dep. Variable (Y)			
yp9500	63	97.33	30.46	50.17	215.33
		Covariates (X,Y_0)			
school	63	73.52	11.55	51.55	95.48
urb_rate1850	63	11.66	13.64	0	57.43
		Measures of social capital (C)			
pc_culture	63	-1.09	30.12	-56.69	57.22
pc_children	63	-0.49	23.90	-57.62	58.28
pc_culture_pos	63	-2.25	25.00	-49.99	39.47
pc1	63	0	1.54	-3.50	3.35
pc1_val	63	0	1.21	-2.30	4.51
		Instrumental variables (Z)			
pc_institutions	63	0.06	2.00	-2.09	3.58
literacy	63	55.98	25.52	14.6	96.5

Table 7: OLS estimates [with robust s.e.]

VARIABLES			yp9500		
school	0.54	0.79	0.62	0.32	0.50
	(0.53)	(0.52)	(0.54)	(0.58)	(0.55)
	[0.31]*	[0.30]**	[0.37]*	[0.37]	[0.38]
urb_rate1850	0.63	0.70	0.63	0.65	0.51
	(0.21)***	(0.21)***	(0.22)***	(0.23)***	(0.23)**
	[0.18]***	[0.17]***	[0.17]***	[0.21]***	[0.21]**
pc_culture	0.58				
	(0.15)***				
	[0.13]***				
pc_culture_pos		0.71			
		(0.18)***			
		[0.17]***			
pc_children			0.61		
			(0.18)***		
			[0.20]***		
pc1				9.70	
				(3.43)***	
				[3.40]***	
pc1_val					11.9
					(3.66)***
					[3.76]***
Observations	63	63	63	63	63
R-squared	0.62	0.62	0.60	0.57	0.59
Breusch-Pagan chi2	0.00	0.00	0.01	0.00	0.00
Jarque-Bera chi2	0.00	0.00	0.00	0.00	0.00

[Robust] Standard errors in parentheses. *** p<0.01, ** p<0.05,* p<0.1.
Breusch-Pagan tests the null of homoskedasticity. Jarque-Bera tests normality
Country dummies are included.

Table 8: Reduced form and first stage regression estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Reduced form				*First-stage*		
VARIABLES		*yp9500*		pc_culture	pc_culture_pos	pc_children	pc1	pc1_val
school	0.76	0.60	0.56	0.31	-0.14	0.24	0.05**	0.02
	(0.56)	(0.53)	(0.52)	(0.39)	(0.31)	(0.37)	(0.02)	(0.02)
urb_rate1850	0.65***	0.57**	0.51**	0.04	-0.12	0.08	0.01	0.01*
	(0.23)	(0.22)	(0.22)	(0.16)	(0.13)	(0.16)	(0.01)	(0.01)
pc_institutions	9.93**		6.73*	10.2***	10.4***	8.08***	0.038	0.48***
	(3.99)		(3.80)	(2.87)	(2.24)	(2.74)	(0.15)	(0.13)
literacy		0.94***	0.82***	0.51**	0.43***	0.28	0.03***	0.01
		(0.25)	(0.25)	(0.19)	(0.15)	(0.18)	(0.01)	(0.01)
Constant	30.5	-17.6	-1.61	-89.3**	-32.6	-52.4	-6.49***	-2.94*
	(50.4)	(47.6)	(47.5)	(35.8)	(28.0)	(34.2)	(1.89)	(1.64)
Observations	63	63	63	63	63	63	63	63
R-squared	0.56	0.61	0.63	0.79	0.81	0.69	0.77	0.73
F	6.64	8.21	8.06	17.2	20.1	10.5	15.9	12.3

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country dummies included.

Table 9: Reduced form and first stage regression estimates (robust s.e.)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Reduced form				*First-stage*		
VARIABLES		*yp9500*		pc_culture	pc_culture_pos	pc_children	pc1	pc1_val
school	0.76*	0.60*	0.56	0.31	-0.14	0.24	0.048**	0.023
	(0.40)	(0.35)	(0.35)	(0.32)	(0.24)	(0.27)	(0.02)	(0.02)
urb_rate1850	0.65***	0.57**	0.51**	0.04	-0.12	0.08	0.01	0.01
	(0.19)	(0.26)	(0.23)	(0.16)	(0.13)	(0.13)	(0.01)	(0.01)
pc_institutions	9.93**		6.73	10.2***	10.4***	8.08***	0.04	0.48***
	(4.35)		(4.45)	(3.12)	(2.68)	(2.47)	(0.13)	(0.17)
literacy		0.94***	0.82***	0.51***	0.43***	0.28	0.03***	0.01
		(0.24)	(0.24)	(0.16)	(0.10)	(0.17)	(0.01)	(0.01)
Constant	30.5	-17.6	-1.61	-89.3***	-32.6	-52.4**	-6.49***	-2.94*
	(34.4)	(31.6)	(30.7)	(29.8)	(21.3)	(25.9)	(2.21)	(1.54)
Observations	63	63	63	63	63	63	63	63
R-squared	0.56	0.61	0.63	0.79	0.81	0.69	0.77	0.73
F	35.7	31.1	27.7	25.2	28.4	25.4	35.6	24.0

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country dummies included.

Table 10: Two stage least square (2SLS) estimation [with robust s.e.]

	(1)	(2)	(3)	(4)	(5)
VARIABLES			yp9500		
school	0.28	0.76	0.30	-0.90	0.14
	(0.53)	(0.48)	(0.59)	(0.87)	(0.58)
	[0.31]	[0.27]	[0.38]***	[0.66]	[0.38]
urb_rate1850	0.52	0.67	0.44	0.40	0.25
	(0.21)**	(0.20)***	(0.25)*	(0.29)	(0.27)
	[0.19]***	[0.16]***	[0.20]**	[0.25]	[0.31]
pc_culture	1.02				
	(0.26)***				
	[0.27]***				
pc_culture_pos		1.04			
		(0.25)***			
		[0.30]***			
pc_children			1.38		
			(0.40)***		
			[0.43]***		
pc1				30.6	
				(9.91)***	
				[9.34]***	
pc1_val					23.5
					(7.16)***
					[10.7]**
Observations	63	63	63	63	63
Sargan's stat. p-value	0.17	0.08	0.09	0.25	0.02
Hansen J stat. p-value	0.20	0.10	0.10	0.13	0.03
F	17.2	20.1	10.5	15.9	12.3
F [robust s.e.]	25.2	28.4	25.4	35.6	24.0
Cragg-Donald stat.	13.3	19.9	7.24	5.21	8.84
Kleibergen-Paap rk	12.1	22.9	5.48	7.21	8.32

[Robust] Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Sargan (Hansen J) tests the null of exogeneity. Cragg-Donald (Kleibergen-Paap) tests the presence of weak iv with critical values by Stock and Yogo (2002)
Country dummies included.

Table 11: Generalized method of moments (GMM) estimation (with robust standard errors)

	(1) TSE	(2) CUE	(3) TSE	(4) CUE	(5) TSE	(6) CUE	(7) TSE	(8) CUE	(9) TSE	(10) CUE
VARIABLES					yp9500					
school	0.29	0.25	0.82***	0.82**	0.35	0.41	-1.17*	-1.31*	0.11	-0.20
	(0.31)	(0.34)	(0.27)	(0.40)	(0.38)	(0.34)	(0.64)	(0.78)	(0.38)	(0.75)
urb_rate1850	0.54***	0.52**	0.71***	0.65***	0.54***	0.56***	0.31	0.29	0.24	-0.11
	(0.19)	(0.21)	(0.15)	(0.18)	(0.19)	(0.18)	(0.25)	(0.30)	(0.31)	(0.68)
pc_culture	1.02***	1.14***								
	(0.27)	(0.31)								
pc_culture_pos			1.09***	1.64***						
			(0.30)	(0.43)						
pc_children					1.21***	1.17***				
					(0.42)	(0.38)				
pc1							38.3***	40.8***		
							(7.86)	(8.62)		
pc1_val									26.2**	58.7**
									(10.6)	(23.7)
Constant	77.4***	84.2***	38.7**	55.7*	67.1**	62.4**	208***	221***	80.5***	136**
	(25.2)	(28.4)	(18.1)	(28.7)	(29.7)	(26.0)	(51.4)	(59.4)	(30.1)	(57.2)
Observations	63	63	63	63	63	63	63	63	63	63
F	25.2	25.2	28.4	28.4	25.4	25.4	35.6	35.6	24.0	24.0
Hansen J p-value	0.20	0.23	0.10	0.18	0.10	0.14	0.13	0.23	0.03	0.17
Kleibergen-Paap rk	12.1	12.1	22.9	22.9	5.48	5.48	7.21	7.21	8.32	8.32

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Hansen J tests the null of exogeneity. Kleibergen-Paap tests the presence of weak iv with critical values by Stock and Yogo (2002) (For 10 percent max size= 19.93 (GMM-TSE) or 8.68 (GMM-CUE))

Table 12: SARAR(1,1) regression

VARIABLES	yp9500				
school	0.36	0.58*	0.4	-0.08	0.29
	(0.35)	(0.35)	(0.36)	(0.39)	(0.33)
urb_rate1850	0.78***	0.81***	0.77***	0.81***	0.65***
	(0.18)	(0.17)	(0.18)	(0.17)	(0.18)
pc_culture	0.32**				
	(0.14)				
pc_culture_pos		0.49***			
		(0.17)			
pc_children			0.33*		
			(0.17)		
pc1				5.32**	
				(2.54)	
pc1_val					9.30***
					(3.27)
λ	0.74***	0.60***	0.82***	1.08***	0.82***
	(0.21)	(0.22)	(0.19)	(0.15)	(0.16)
ρ	-0.87***	-0.87***	-0.84***	-1.02***	-0.92***
	(0.25)	(0.24)	(0.25)	(0.19)	(0.21)
Observations	63	63	63	63	63

GS2SLS estimator with *standard instruments.* Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Average direct and total impact (ATDI/ATI)

	pc_culture	pc_culture_pos	pc_children	pc1	pc1_val
ATDI	0.41	0.55	0.46	2.01	12.96
ATI	1.25	1.22	1.82	-70.43	51.27
as percentage of average GDP					
ATDI	0.4	0.6	0.5	2.1	13.3
ATI	1.3	1.3	1.9	-72.4	52.7

As a remainder: average GDP growth between 1995-2000: 97.3

Table 13: Spatial error model (SEM)

VARIABLES			yp9500		
school	0.64	0.92**	0.69	0.33	0.6
	(0.45)	(0.4)	(0.48)	(0.53)	(0.47)
urb_rate1850	0.66***	0.75***	0.63***	0.66***	0.51**
	(0.2)	(0.19)	(0.2)	(0.21)	(0.22)
pc_culture	0.61***				
	(0.13)				
pc_culture_pos		0.79***			
		(0.13)			
pc_children			0.62***		
			(0.16)		
pc1				9.83***	
				(3.1)	
pc1_val					13.0***
					(3.34)
ρ	-0.29	-0.48**	-0.12	-0.074	-0.23
	(0.25)	(0.23)	(0.23)	(0.18)	(0.23)
Observations	63	63	63	63	63

GS2SLS estimator with *standard instruments*. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 14: SARAR(1,1) with additional instruments

	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
VARIABLES					yp9500					
school	0.38	0.35	0.63*	0.64*	0.45	0.42	0.07	0.017	0.26	0.09
	(0.38)	(0.39)	(0.36)	(0.37)	(0.41)	(0.38)	(0.45)	(0.42)	(0.35)	(0.38)
urb_rate1850	0.74***	0.72***	0.79***	0.78***	0.71***	0.74***	0.82***	0.81***	0.57***	0.60***
	(0.19)	(0.19)	(0.18)	(0.18)	(0.2)	(0.19)	(0.17)	(0.18)	(0.2)	(0.21)
pc_culture	0.46**	0.54***								
	(0.2)	(0.18)								
pc_culture_pos			0.63***	0.70***						
			(0.24)	(0.21)						
pc_children					0.55**	0.44*				
					(0.27)	(0.24)				
pc1							5.47*	6.28**		
							(3.32)	(2.79)		
pc1_val									13.0**	11.1*
									(5.14)	(6.08)
λ	0.53**	0.47**	0.45*	0.39	0.55**	0.69***	0.88***	0.85***	0.68***	0.97***
	(0.25)	(0.23)	(0.26)	(0.24)	(0.25)	(0.22)	(0.15)	(0.14)	(0.2)	(0.26)
ρ	-0.73**	-0.70**	-0.80***	-0.77***	-0.63**	-0.74***	-0.90***	-0.88***	-0.87***	-0.91***
	(0.29)	(0.3)	(0.26)	(0.26)	(0.3)	(0.28)	(0.2)	(0.21)	(0.23)	(0.22
First-stage F	8.48	7.67	9.78	9.81	5.42	4.71	6.55	6.65	5.31	6.05
Observations	63	63	63	63	63	63	63	63	63	63

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (1) instruments used: *standard instruments* plus *literacy* and *pc_institutions*. (2) instruments used: *standard instruments* plus *literacy*, *pc_institutions*, $W * literacy\_spl$, $W * pc\_institutions$, $W^2 * literacy$ $W^2 * pc\_institutions$.

Table 15: Spatial error model (SEM) with additional instruments

	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
VARIABLES						yp9500				
school	0.39	0.43	0.86**	0.88**	0.48	0.56	0.13	0.18	0.44	0.44
	(0.48)	(0.47)	(0.4)	(0.4)	(0.54)	(0.51)	(0.58)	(0.56)	(0.48)	(0.47)
urb_rate1850	0.59***	0.60***	0.74***	0.74***	0.47*	0.51**	0.63***	0.64***	0.37	0.36
	(0.21)	(0.21)	(0.19)	(0.19)	(0.24)	(0.23)	(0.21)	(0.21)	(0.24)	(0.24)
pc_culture	0.94***	0.89***								
	(0.18)	(0.17)								
pc_culture_pos			0.95***	0.91***						
			(0.17)	(0.16)						
pc_children					1.34***	1.17***				
					(0.29)	(0.26)				
pc1							13.2***	12.4***		
							(4.75)	(4.13)		
pc1_val									19.7***	20.6***
									(5.36)	(4.87)
ρ	-0.33	-0.34	-0.53**	-0.53**	-0.3	-0.29	-0.12	-0.11	-0.43	-0.46*
	(0.29)	(0.29)	(0.24)	(0.23)	(0.3)	(0.29)	(0.19)	(0.19)	(0.27)	(0.27)
First-stage F	8.62	9.95	11.33	10.55	5.28	5.28	8.67	8.86	6.12	6.25
Observations	63	63	63	63	63	63	63	63	63	63

S.e. in parentheses.*** p<0.01, ** p<0.05, * p<0.1. (1) instruments used: *standard instruments* plus *literacy*,*pc_institutions*.

(2) instruments used:*standard instruments* plus *literacy*, *pc_institutions*, $W * literacy\_spl$, $W * pc\_institutions$.

Table 16: Average direct and total impact (ATDI/ATI): GS2SLS SARAR(1,1)

SARAR(1,1) estimation with first group (1) of instruments

	pc_culture	pc_culture_pos	pc_children	pc1	pc1_val
ATDI	0.51	0.67	0.61	8.63	15.50
ATI	0.97	1.15	1.22	44.47	40.74
		as percentage of average GDP			
ATDI	0.5	0.7	0.6	8.9	15.9
ATI	1.0	1.2	1.3	45.7	41.9

SARAR(1,1) estimation with second group (2) of instruments

	pc_culture	pc_culture_pos	pc_children	pc1	pc1_val
ATDI	0.58	0.74	0.53	9.31	29.55
ATI	1.03	1.15	1.44	42.16	324.19
		as percentage of average GDP			
ATDI	0.6	0.8	0.5	9.6	30.4
ATI	1.1	1.2	1.5	43.3	333.1

As a remainder: average GDP growth between 1995-2000: 97.3

(1) instruments used: *standard instruments* plus *literacy*, *pc_institutions*.

(2) instruments used: *standard instruments* plus *literacy*, *pc_institutions*, $W * literacy\_spl$, $W^2 * literacy\_spl2$, $W * pc\_institutions$, $W^2 * pc\_institutions$.

Table 17: Spatial Durbin

	(1)	(2)	(3)	(4)	(5)
VARIABLES			yp9500		
yp9500_spl	0.07	-0.25	0.14	-0.32	-0.36
	(0.21)	(0.22)	(0.20)	(0.20)	(0.25)
school	0.36	0.60	0.39	-0.23	0.50
	(0.56)	(0.56)	(0.56)	(0.60)	(0.61)
urb_rate1850	0.47**	0.66***	0.49**	0.86***	0.59***
	(0.22)	(0.21)	(0.21)	(0.22)	(0.22)
school_spl	-0.31	-0.44	-0.16	-3.05**	-1.06
	(0.99)	(0.95)	(0.97)	(1.23)	(0.97)
urb_rate1850_spl	0.34	0.74*	0.30	1.30***	0.59
	(0.37)	(0.40)	(0.35)	(0.41)	(0.37)
pc_culture	0.65***				
	(0.16)				
pc_culture_spl	-0.41				
	(0.36)				
pc_culture_pos		0.64***			
		(0.18)			
pc_culture_pos_spl		0.42			
		(0.47)			
pc_children			0.76***		
			(0.20)		
pc_children_spl			-0.86**		
			(0.36)		
pc1				11.9***	
				(3.28)	
pc1_spl				19.8**	
				(8.47)	
pc1_val					10.0***
					(3.43)
pc1_val_spl					11.8
					(8.77)
Observations	63	63	63	63	63

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

Data Appendix

Our dataset includes the following variables:

A) Structural component of civic capital

1) Relational intensity

Data for relational intensity comes from Eurobarometer 62.2 (question QD5, 2004) for all countries, except Switzerland, where we had to rely on MOSAiCH. The survey asks the following question: *"How often do you meet socially with friends?"* We drop *"don't know" - DK* answers. As there is no perfect correspondence between EB and MOSAiCH, we propose a new variable, matching the available answers as indicated in table 18. We are aware of the trade-off between loosing an entire variable (as without Switzerland we should exclude the whole variable) and some information (precisely, we reduce the range of possible answers from 6 to 4) and we opt in favour of keeping the variable. For Denmark and Slovenia we had to merge data up to NUTS 2 level: the territory of Denmark was divided in 13 counties ("amt") up to 2006 which where lately refined to five NUTS 2 regions. Also Slovenia underwent a major change, reducing the number of NUTS 2 regions from 12 to only 2 in 2006. All changes were made following the instructions on "History of NUTS" available on the Eurostat website [15].

2) Voter turnout

Data for voter turnout have been collected from the European Election Database of the Norwegian Social Science Data Services (NSD) and refers to parliamentary election between 2002-10. Precisely, we collect data for the following countries (and years): Austria (2008), Belgium (2007), Czech Republic (average 2002, 2006, 2010), Denmark (2007), France (2002), Germany (2005), Hungary (average 2006 and 2010), Italy (2008), Luxembourg (2009), the Netherlands (2010), Poland (2007), Portugal (2009), Slovakia (2010), Slovenia (2008), Spain (2008), Switzerland (2007).

3-5) Media use

Data for "media use" have been collected from Eurobarometer 62.2 (questions QA18_1-3, may 2006) and MOSAiCH 2009 for Switzerland. The core question is "*About how often do you... watch television news programmes/ read the news in daily newspapers / listen to radio news programmes?*" The range of possible answers is similar in Eurobarometer and MOSAiCH (see table 19). We drop DK and rescale such that value 1 corresponds to the answer "never" and 5 to "Every day". Then

[15] http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/history_nuts)

we take the regional mean (using the available sample weights reported), creating the variables "newspapers", "TV" and "radio". For Denmark and Slovenia we had to merge up to NUTS 2 level[16].

B) Cognitive component of social capital

6-9) Norms, values and beliefs

Norms, values and beliefs, measured in the European Value Study (EVS), are widely used in the literature. Following Tabellini (2010), we select four values: generalized trust, control, respect and obedience. Generalized trust is measured through the question

> "Generally speaking, would you say that most people can be trusted or that you can be too careful in dealing with people?" There are two possible answers: 1 'Most people can be trusted" or 2 'You can't be too careful".

The variable *"G. trust"* is the regional percentage of people who answer that "most people can be trusted" over the total number of responses. Another value measured is *"control"* of life:

> "Some people feel they have completely free choice and control over their lives, and other people feel that what they do has no real effect on what happens to them. Please use the scale to indicate how much freedom of choice and control you feel you have over the way your life turns out?"

The variable is coded with response from 1 to 10, where 1 means "no control" and 10 "a great deal". The variable *"control"* is built as regional weighted average (times 10). As for *"respect"* and *"obedience"*, they both refer to the following question:

> Here is a list of qualities which children can be encouraged to learn at home. Which, if any, do you consider to be especially important?"

The possible answers include respect for others and obedience. The variables *"respect"* and *"obedience"* are then the weighted percentage of people who mentioned these values as qualities that should be taught to children over the total number of respondents. With respect to *"obedience"*, Tabellini (2010) suggests this is a negative value, as it is the basis of hierarchical societies, a

[16]Same remarks as for "relational intensity" apply

Table 18: Variable *"Relational intensity"*

Proposed solution	Eurobarometer (EB)	MOSAiCH
Several times a week (4)	Several times a week (6)	At least once a day (5)
		Several times a week (4)
Several times a month (3)	Once a week (5)	Several times per month (3)
	Two or three times a month (4)	
Less than once a month (2)	Once a month (3)	Several times per year or less (2)
	Less than once a month (2)	
Never (1)	Never (1)	Never (1)

Answer and value in parentheses

Table 19: Question on Media use

Media use: "about how often do you watch/read/listen... TV/newspapers/radio?

Eurobarometer (EB)	MOSAiCH
Everyday (5)	Everyday (5)
Several times a week (4)	3-4 day a week (4)
Once or twice a week (3)	1-2 days a week (3)
Less often (2)	Less than 1-2 days a week (2)
Never (1)	Never (1)
DK	DK

Answer and value in parentheses

coercive cultural environment stifling individuals initiative and cooperation (thus we expect a negative impact). Thus, taking this into account, we have rescaled the variable so that a higher value of *"obedience"* (which is considered as bad) means less people consider *"obedience"* as something should be taught, transforming in the new variable *"autonomy"*. Precisely, *"autonomy"*= 100 - the percentage of people mentioning *"obedience"* as something should be taught".

Islands and merges

Eurobarometer does not include any pieces of information about the french island of Corsica while we dropped the Spanish islands (Balearic and Canarias). Instead we have data about Sicily and Sardinia, the greatest Italian islands.

Table 20: Countries and regions involved

Country name	Number of regions	Type
Austria	9	NUTS 2
Belgium	11	NUTS 2
Czech Republic	8	NUTS 2
Denmark	5	NUTS 2
France	21	NUTS 2
Germany	16	NUTS 1
Hungary	7	NUTS 2
Italy	17	NUTS 2
Luxembourg	1	NUTS 2
Netherlands	12	NUTS 2
Poland	16	NUTS 2
Portugal	5	NUTS 2
Slovak Republic	4	NUTS 2
Slovenia	2	NUTS 2
Switzerland	7	NUTS 2
Total	156	NUTS 1/2

Table 21: Descriptive statistics of the dataset

	Min	1st Q	Median	Mean	3rd Q	Max	n. obs	range
Relational intensity	2.5	2.9	3.1	3.1	3.2	3.7	156	[1-4]
Voter turnout	45.5	62.6	71.3	70.3	78.7	94.2	156	[0 - 100]
Newspapers use	2.0	3.0	3.4	3.4	3.9	4.5	156	[1- 5]
TV use	3.7	4.3	4.4	4.4	4.6	4.9	156	[1- 5]
Radio use	1.8	3.2	3.6	3.5	3.9	4.5	156	[1- 5]
Respect	32.0	67.9	77.5	75.5	85.6	100	156	[0 - 100]
Control	44.4	62.0	65.8	65.7	69.2	84.0	156	[0 - 100]
G. trust	0.0	22.2	33.5	36.3	45.8	100	156	[0 - 100]
Autonomy	23.2	64.0	72.5	72.7	81.7	100	156	[0 - 100]

Table 22: Distribution of connections in the weighting matrix

n. neighbours	0	1	2	3	4	5	6	7	8	9	10	11	12
n. regions	2	9	7	16	28	41	25	15	8	2	1	1	1

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